



South Africa Enters a Water Crisis: Management, Agriculture, Public Health Considerations and Government Ineptitude are some of the Causes for this Grave Dilemma

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Authors' contributions

This work was carried out in collaboration between both authors. Author AMK designed the study, wrote the protocol and supervised the work. Authors AMK and SK reviewed the article and undertook the analysis to assemble the article. Author AMK wrote the first draft of the manuscript. Authors AMK and SK managed the literature searches and edited the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

The paper looks at the water crisis in South Africa. The crisis of water to a developing country and to its people, to agriculture, to other important variables important and necessary to economic growth and development cannot be under estimated. South Africa is on the precipice because, it is faced with extreme levels of electricity load shedding that, is projected to continue for at least three years and is now confronted with a burgeoning water crisis. The current electricity crisis is a grim portent and soon South Africa will be in the same boat with water. It is simple the government is

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dragging its feet while the taps run dry. There is no doubt that there is political doublespeak in respect to water access in the country. The paper posits and argues that the lack of rain also compounds the problem of the water crisis. Agriculture is seriously threatened as dry spells damage agricultural output and maize prices rise. The paper further argues that that the cost of water losses is increasing and damaging a very fragile economy and stymies development. It is therefore, vital and most important that water resources have to be managed for purposes of food production. On the other hand, the paper alludes to some ways to fix the water woes of South Africa. In this regard the paper posits and argues that political will and administrative and regulatory changes are necessary and needed to reduce the problems. In finding solutions, the paper will unpack the need to conserve groundwater and will also discuss salinity management in terms of favourable water balance. It also shows that rainfall forecasting requires more investment, including decisive political and administrative intervention by government in many directions. The paper concludes by unpacking the need for greater public health awareness and more research because the water crisis can cause devastating public health consequences.

Keywords: Water; crisis; management; growth; development; access; agriculture; food production; regulatory changes; conserve groundwater; salinity; water balance; public health; Irrigation.

1. INTRODUCTION

Two consecutive water ministers have agreed, and parliament has acknowledged, that whether South Africa faces a water crisis is a matter of semantics or perhaps timing. But right at the top the political establishment is still clinging to a different and far more positive narrative. In his 2014 State of the Nation address President Jacob Zuma said that 95 percent of South Africans have “access to water,” and hailed it as a great accomplishment, given that apartheid gave great priority to white people and industry” [1]. Access “requires that citizens have a water system in their area of residence, but does not mean that water needs to come out of the taps consistently or in a drinkable form. President Zuma was wrong and ill advised. In 2013 the North Gauteng High Court in the town of Carolina in the province of Mpumalanga said, water had to be 200 meters away from people’s houses and consistently available, and that each person should have access to 25 litres a day free. Water is a general constitutional guarantee” [1]. The astounding reality of this situation is that the water department has never directly contradicted President Zuma and the African National Congress (ANC) claim” [1]. The Mail and Guardian [1] states that “reliable services are in the order of 65 percent nationally and this equates to five million households, or nearly 20 million people, who do not have regular flowing water, far more than the 2.6 million people the 95 percent figure would suggest” [1]. This is what can be termed political doublespeak and hoodwinking the South African population, and the government unnecessarily tapping itself on

the back. The issue of water is far deeper than the government would admit and, by the same token is in a state of denial that there is no water crisis confronting the country. It is far more serious than the government would want South Africans to believe.

2. RESEARCH METHODOLOGY

The paper relies mainly on newspaper articles and journals to unpack the discussion in this paper. In addition the authors use their own critical skills to formulate the discussion in this paper and utilize their own critical thinking via the processes of their observations over time. Although some of the references are dated, it does not alter the thrust of the article and the aims and objectives of the discussion undertaken because of the relevance of these dated articles. As such the paper does not use the classical approach of research; it is not a limitation to the discussion.

3. THE GREAT THIRST HAS BEGUN

For many South Africans, the water crisis has already come and is a reality and researchers say that, it will only be a matter of time before the water crisis holds the country to ransom. Due to load shedding and a shortage of water when electricity is restricted and, it has been announced officially that, the load shedding will continue for three years. It is a clear indication that the country is in dire straits. All of this can be attributed to poor governance, a lack of accountability by the government, the collapse of the rule of law, the erosion of constitutional

democracy, mismanagement, corruption and so on. Thus a thirsty summer is not far away for South Africans. South Africa has seen in many areas protests because of a lack of water in many townships and areas of the country including the large city of Johannesburg. Taps in townships continually run dry. Kings, Wild, Moatshe and de Wet [2] report that “people are scared to drink water from the tap. They only use it for bathing and washing clothes. There is much diarrhea. In 2013 the University of Rhodes in Grahamstown was confronted with extreme water shortage and warned that the University might have to close its doors. The townships near the university experience water shortages without any warning from the authorities. Many of the residents are poor and very old. In the township of Thlolong outside Kestell in the Free State Province the government promised that a dam will be built. Residents said that neither the dam nor emergency water supplies have come to fruition”.

Residents indicated that they were thirsty and that it is eight years now that we live in these conditions. Municipal supply of emergency water is most erratic and not consistent in many areas. Kings et al. [3] further state that “In Johannesburg, some suburbs were warned in February of 2015 to expect water outages including hospitals that had no water for days. There is just no maintenance taking place. These are no longer isolated cases and government officials said that about a third of all towns are in some form of distress. The department indicated that one in ten municipal water systems are totally dysfunctional, and those that are working, a quarter experience regular service disruptions of more than two days at a time. The situation in Mpumalanga Province is frightening and can be linked to municipal incompetence, a lack of engineering skills and the failure of management. There is a total breakdown of financial administration and planning. “These problems show no signs of abating. If you provide money to government officials and municipal workers they can fix the problem for a while and this form of corruption has become the order of the day in South Africa” [2].

In Johannesburg, water shortages in 2014 were caused by electricity failure to key pumping stations and in turn were linked to cable theft. The South African population is reeling; the economy is in tatters and with the Electricity Supply Commission (Eskom) warning that there will be regular load shedding for the rest of the

year, and will be unable to deliver consistent power for several years, it does not appear that the water shortages will be adequately solved. “In many areas, water systems have either little or very meager reserve margins. Electricity outages at pumps that move raw water could leave treatment stations without water. And, without treated water to move, pumps responsible for distribution would be idle when they do get water. These two factors, local incompetence and a national electricity shortage, will have the biggest impact on what, if anything comes out of the taps for the next several years. But within the next decade, two other fundamental issues are likely to be felt; problems that no amount of local governance excellence or electricity will solve. There is simply not enough water left to go around” [4]. In this regard Kings et al. [2] state that “the situation currently in South Africa is that we have 98 percent of the water in the country being considered fully allocated. There is only 2 percent left for usage going into the future. On the other hand Eskom has a 99.5 percent assurance of receiving water, meaning the power utility gets water before any other sector of the economy [2].

The 2030 Water Resources Group [5] has indicated that by 2030, the demand for water will exceed supply by 17 percent. In most catchment areas of South Africa, demand is already out – stripping supply, and it is only by piping water from places such as Lesotho that there is enough for now. It further added that that climate change projections are that, by mid – century, reduced rainfall could lower the amount of available water by 10 percent. Rainfall will be inadequate with more violent spells and the collection in dams and underground will be made all the more difficult.” Easy water in South Africa is already being harvested and it is difficult to say and calculate as to how much water is available. There is a crisis burgeoning and dams are functioning beyond their capacity and river systems require an ecological reserve, which is a minimum amount of water to continue functioning and in order to be useful. This is now in danger.

“Water systems in South Africa that can and could handle dams are far from population centers and, therefore, limited in their ability to supply water. This is also a very serious problem and contributes to the challenges and problems confronting the country. More dams are required but this requires money, expertise and government political will to achieve. It is highly unlikely in the short and medium term to achieve

in a country beset with huge other social problems. Many parts of the country are fast approaching the point where freshwater resources are fully utilized and new dams will therefore not address the problems and challenges. This was indicated by the Department in its 2013 Strategy Report" [6]. The Lesotho Highlands project will be used by South Africa but it is not a finite resource that can be relied upon in perpetuity. High global temperatures do not help the situation because of increased evaporation. More groundwater must therefore be exploited (The paper discusses ground water and desalination, in another part of the paper). It must be remembered that desalination is a distinct possibility but it requires large amounts of electricity and is very expensive. Another issue that will be discussed elsewhere in the paper is the growing agricultural use and, this therefore, increases the amount of land required for irrigation. This is the important variable identified by government to improve employment, food security and for industrial use. Steve Hedden and Jakkie Cilliers, of the Institute of Security Studies wrote in (2014) "that the water crisis cannot be solved through engineering alone" [7].

There is a huge structural problem as concerns water in South Africa. In reality the government is in a state of denial as concerns this structural deficiency. It is the ecological disaster, making water all the more difficult to access, to treat and thus in the future this will exacerbate the use of untreatable water. The government, its Ministry of Water Affairs must fully comprehend that "water ecosystems are not in a healthy state, according to the National Water Resource Strategy, 2013 [6]. Of the 233 river ecosystem types, 60 percent are threatened, while 25 percent of these are critically endangered [8] and of the 792 wetland ecosystems, 65 percent have been identified as threatened, and 48 percent as critically endangered." (*National Water Resources Strategy Report, 2013*) [6]. *The sources of pollution in fresh water include industrial run – off and acid mine drainage, but human waste is larger and more immediately dangerous (Some aspects of public health consequences and healthcare management will be discussed elsewhere in the paper). Kings et al. (2015: 4) state that "Most waste treatment facilities are under stress in South Africa because so much more waste water needs to be treated. Some of the biggest problems in the water system are caused by treatment works that are not functioning. A chronic lack of investment*

in treatment plants meant conditions that should not exist, such as diarrhea, were killing people. The whole environment where people live is contaminated. This is a massive, massive problem, but one that people will not talk about. There are just a few angry people trying to raise awareness. The amount of faecal matter that was found in a study by the Water Research Commission in 2012 in all 9 provinces of the country found that in many water systems made it unsafe for irrigation, because eating raw produce watered with it could cause illness [2].

In South Africa, there are so many informal settlements and townships with poor services provided by government and municipalities that, they contribute to the pollution and in turn are affected by it and, is a very serious public health problem and some draw directly on groundwater. There are over 1.3 million families living in these informal settlements. If 6 people make up a family, some nearly 8 million people are directly affected and exposed to potential public health consequences. Many of them will be children. This is only the tip of the iceberg and, is an indictment to the democratic government 21 years down the road of freedom and democracy. The clock is ticking to a possible crisis and disaster which if not dealt with by the government and its municipalities could have devastating effects on the economy and to development, including serious public health consequences.

4. THE BUREAUCRACY AND GOVERNMENT DRAGGING THEIR HEELS WHILE TAPS RUN DRY

Given the above dangerous scenario, in South Africa, there is a consensus that, it faces a thirsty future, even if there is no agreement as to how bad the situation is, as to what is unfolding and the devastating and real public health consequences will be. The struggles of ordinary people too access water and that too safe water, piped to their homes is too ghastly to contemplate. The government response to all of this is that we are dealing with alarmists causing unnecessary sensationalism. This is far from the truth and indeed, it appears that when government and its bureaucracy are criticized and alerted on many issues that have gone awry, they blame the press, the opposition and brand people racist and state that these people are most keen to decry the successes of the democratic government. We acknowledge that in 21 years of democratic rule the government has achieved much but, by the same token, it has

failed the people in many directions. It has failed in essential services and basic delivery of services, in order to create a better life for all, which is a slogan that it often and continually uses, given the oppressive history that most black people come from. Kings, Wild and de Wet [9] point out that “only in the past two years have scientists across different disciplines and technocrats across different levels of government come to agree, with notable political exceptions, that trouble is looming. But agreement is not action and those same scientists and technocrats now find themselves watching, increasingly aghast, as water follows the same course as electricity did between 1998, when consensus about a looming crisis was reached, and 2008, when the lights actually went out for the first time. This has now moved full swing and with great fury in respect of electricity load shedding which will continue for the next three years.” Something is rotten in the state of South Africa. To use Shakespeare’s words, which are apt as the water and electricity crisis looms in spite of the grave consequences that the country confronts, amidst the ineptitude of the government and its bureaucracy; the legitimate shouts of the masses of the country are drowned - “Out, out brief candle. Life is but a walking shadow, a poor player (the poor citizens) that struts and frets his hour, upon the stage and, then is heard no more. It is a tale told by an idiot (as government purports – the masses of depraved people), full of sound and fury, signifying nothing.” It brings home the reality that the government is out of tune with the suffering of the people and, therefore, the words of the outstanding South African liberal Alan Paton, is a stark reminder when he said – “Cry the Beloved Country.”

The SABC reported that seven years later there is still no security of electricity supply. And relative to water, electricity is not a particularly hard problem to solve [10]. Between 1998 and 2004 new sources of electricity were not considered because of a controversial, and eventually scrapped, plan to privatize the sector (Privatization is not the ideal but it would be better than enduring a corrupt government that does not have a plan to deal with real problems). That policy reversal was itself partially reversed when it came to renewable energy. Much the same debate continues about municipal water supply, with talk of ‘public – private partnerships’ rather than ‘privatization.’ The government’s, Eskom’s, the municipalities efforts to sell their

feeble action plans which have not really been identified, rationalized, with no money being provided, except that consumers are being charged higher tariffs, its inability to deal with both the electricity and water crises have been shelved into promises that have not materialized. Eskom argues that electricity tariffs are too cheap in South Africa in spite of constant price hikes hitting the consumer very hard. Eskom, like South African airways and other public entities are a drain to the fiscus; they pay millions of Rands to their executives for inefficiency and they justify these bonuses with government approval.

Kings et al. [3] report that “Last year the water affairs department said municipalities owe more than R2 billion for water sold to them, and the Water Research Commission said R11 billion in revenue is lost annually, because of leaks and users not paying their dues. Eskom is also owed enormous amounts by municipalities, and there is also a problem with illegal connections. To date the utility has been unable to collect debt effectively or contain theft” [1] this is the state of play within a corrupt administrative system, where inefficient municipalities are unable to govern and, in reality, all of this has become burdensome to the rate payers and taxpayers of the country. The situation is bursting at the seams and is ready to explode and could have devastating consequences for the ANC, especially in the metropolitan municipalities in the 2016 municipal elections. Mines have not kept their bargain in terms of financing a dam in the province of Limpopo and now claim that they will pay for water as consumers. The government must hold them accountable, but it has failed to do so. As long as people do not pay for services, there is no hope in South Africa to bring about stability, peace and promote economic growth. The options for new water are much more expensive than the current cost of water. Recycling water comes at double the cost of sourcing water from dams, and water from desalination plants costs five times more. Kings et al. [3] point out that to “try and solve some of the issues, an amount of R670 billion will be required. Where will the money come from? The former minister of Water Affairs only two years ago promised this amount and, the current minister cannot carry through this promise because the money is yet to be forthcoming and, the longer South Africa waits, the more expensive it will be.

5. WATER SYSTEM ROTTEN AND BLEEDING CASH

“Costs of water in South Africa have soared in spite of a high profile political bid to fix the problem. Recently South Africa has seen extreme acts of violence and protests as concerns water shortages in such places as Malamulele and Majakaneng (the former in the Limpopo Province and the latter in the North West Province of South Africa). In fact in the Limpopo Province communities have been suffering because of the erratic supply of water. This has been the feature of the larger towns of the province such as Tzaneen in the west and Phalaborwa in the east and in Giyani near the districts northern border, the water troubles are worse. Often there is no water at all. According to de Wet [7] “official figures reveal that that as many as a fifth of the people living in Mopani district do not have access to running water, and another third have to carry water from far – off communal taps. In recent years alone, nearly R500 million has been spent trying to fix the problems but in vain. Everything was broken a contractor said and nothing was working not even the boreholes, not even the pipes or the pumps. For two decades, the district, local and provincial governments seemed unable to do much about the situation. The National Minister then announced that her department was taking over water services and sanitation. This would cost R96.4 million. The work was not done and the estimated costs had grown to R502.6 million.” This is astounding and reeks of possible corruption and is the state of play in many parts of South Africa.

“In January 2015, the Mail and Guardian reported that one of the reasons for South Africa’s water woes is that the acting directors general in charge of the department, have one after another, been suspended and the Director General was in conflict with the Minister because he failed to sign a information technology contract that he disagreed with and indicated that he was being pressurized to do so. In reality the department is divided between different camps and accusations of sexual impropriety, fraud, and corruption, back – stabbing and office politics (None could be proven) according to de Wet [7].” This behaviour characterizes the body politic of South Africa currently and the water wars expose a rotten system that is bleeding cash while communities suffer. Despite hundreds of millions of Rands being spent over a decade, the people of Giyani do not have a regular supply of water

and the SABC on the 16th of February, 2015 reported that “in the West of Pretoria the situation is so bad with regards pollution of the dam that supplies water and, that, this was reported to government two decades ago and nothing was done.” In most parts the water is stagnant and layered with algae and many poor communities have to pay private providers R3 for a container of drinking water. In Giyani there is a single small dam which was built for providing irrigation for local farmers not for the town. The repair works are shoddy and pipes have burst because of substandard pipes and the engineer was fired because she faked her professional qualifications. Tender contracts were rigged and given to friends by government officials. The High Court found that the bids for tenders did not meet specifications. The current upgrades to Giyani’s water infrastructure, the price of which has escalated to R500 million from R100 million have done little to ease the problems. In other words there is a total lack of neglect and no maintenance that takes place. Many residents indicate that money is being siphoned away by unscrupulous municipal official and there is total breakdown of management” [11].

Every house in Giyani according to Sipho Kings [12] “has a 1000 – liter water tank in the yard and to the west of the town there is no water. The river water is no longer safe to drink and the municipal water tanks supplying water every day do not have sufficient water to supply the homes and people have to travel to buy water because they cannot rely on the municipality to supply water. In the North West province in Majakaneng residents have lived in this area for twenty five years without running water. According to Zwane “Majakaneng has no running water since the 1980’s [13] a scheduled meeting with the Minister of Water Affairs and the Premier of the province with the community was cancelled. Old people had queued since 4 am in temperature soaring above 30 degrees centigrade but to no avail. This is shameful democracy and, an uncaring government. The main sentiment in Majakaneng is that, the ANC has failed them and the only way to get the government’s attention is through violent protest. People shouted you must see how we live. We struggle to get water, we struggle to get food, we struggle to go to the toilet, and no person should live like this. It is painful to live like this especially because I am a woman. Why must we pay for water? I can afford 5 containers at R2 per container per day (Water is a basic human right). This is not enough and all our money goes into buying water. On the 17

of February, 2015 the SABC reported on prime time news that “hospitals in Johannesburg face water shortages and that the residents of the village of Klipgat in the District of Madibeng in the North West Province are connecting water illegally from the Province of Gauteng because the government cannot provide water to the local residents” [14]. The ANC only understands violence”. The state is in denial about the water crisis in South Africa and, if it does not act soon, South Africa will see unprecedented violence in many parts of the country because the situation is worsening and people are restless. With both electricity outages and scarce water resources to deal with, the government has to intervene decisively or its development agenda will come to naught, people will become poorer, economic growth will be completely stifled and the country will be on a path of ruin and destruction.

6. THE COST OF WATER LOSSES IS INCREASING

The Star [4] reports that people are disputing their bills for water and electricity, including businesses, that it is alleged owe R667 million in unpaid bills and, most of this is unrecoverable. The Auditor General of South Africa in terms of a report for 2013 / 2014 says R478 million of this, that is, 72 percent must be regarded as unrecoverable.” The Star spoke to several people about massive bills ranging from R15 000 to R50 000. Most are poor and live in Reconstruction and Development Programme houses, supplied by the government. They question the authenticity of the bills because their houses have prepaid electricity meters. There are no measures instituted by the municipality in respect to infrastructure to prevent the loss of water and electricity, which is collectively costing the municipality an estimated R71 million. Service delivery by the municipality is seriously compromised because the ‘bucket system’ of sanitation has not been eradicated. Rubbish is strewn all over including fecal matter animals drink the overflowing water. The new pumps that were installed are not working. The municipality conceded that the spillage could not be contained because the plant did not have an emergency dam alongside it and, was flowing into a nearby stream. Table 1 below shows the costs listed in the Auditor General’s (AG’s) report for the period mentioned – 2013 / 2014 for the Merafong Municipality [15].

It must be noted that the situation reflected above appears to be a universal problem across municipalities in South Africa.

The discussion undertaken thus far clearly indicates that there is a major problem in South Africa as concerns water. The writers also acknowledge that it is not possible to further expand the discussion and critique as concerns the issues discussed. However, the writers using the work of Kings and Wild [16] outline eight ways as expounded by them to fix South Africa’s water woes. The South African water crisis is a complex series of interlocking problems that preclude a silver bullet solution. “Each water system is unique, with different geographies, different demands, different challenges, different problems, weather, populations that these systems serve and so on. There is a tremendous problem of leaking pipes in South Africa. Intervention in this direction is expensive. The other issue is can South Africa move towards using renewable electricity sources, which do not require water for cooling or to run turbines as quickly as possible. We need to acknowledge and factor into the equation that much of the problem is administrative and regulatory. More importantly it is political because almost all issues in South Africa’s noisy democracy automatically become political” [17]. A number of the issues captured in the discussion of this paper have not been addressed or largely misunderstood over the 21 years of democracy, according to Kings and Wild [16]. They propose and discuss eight solutions which are captured and listed below, but not discussed by the authors of this article. The list is as follows:

- ✓ Admit that water provision is a serious problem.
- ✓ Fix the department of cooperative governance and traditional affairs.
- ✓ Ensure municipalities have qualified engineers.
- ✓ Make the polluter pay.
- ✓ Save the water affairs department.
- ✓ Reduce demand.
- ✓ Move away from coal (for obvious reasons).
- ✓ Pump up the groundwater.

7. AGRICULTURAL DISASTER LOOMING

Leading from all of this, it is important to very briefly discuss the dry water spell in South Africa, in respect to maize as a staple and, sugar to the food industry. The dry spell that is going on for a protracted period has drastically affected electricity supply, but it is not the major driver of the electricity supply in South Africa, coupled with the recent very hot temperatures. On the

Table 1. The cost of water losses is increasing



WATER DISTRIBUTION LOSSES		
Date	Value	% of water distributed
2014	R30m	42%
2013	R23m	39%
ELECTRICITY DISTRIBUTION LOSSES		
Date	Value	% of Electricity distributed
2014	R40m	18%
2013	R27m	18%
WHAT CONSUMERS OWE MERAFONG		
Date		
2014	R667m owed	(R478m irrecoverable)
2013	R793m owed	(R611m irrecoverable)

other hand the lack of rain has taken its toll on agriculture and human living. No rain means in large measure grain imports for South Africa. This affects South African farmers and consumers. On the other hand, we use the example of sugar, an industry that is part of our South African history. The issue is further complicated by the reality that the South African Rand according to the SABC news, “analysts and the media has reported as of the 9 of February, 2015, the currency began trading at R11.86 to the US dollar” [18]. This means that traders, farmers and importers would have to pay nearly R12 to the dollar, if one factors bank charges into the equation. Food prices will increase substantially and importing maize and other grains will be too costly for the country and would impact negatively on the lives of people, households and will add to the burden of the economy.

There is no doubt that a dry spell with little or no rain in the maize quadrangle of South Africa threatens the crop and the cumulative effect is the spiking of prices. It will diminish the size of the crop, if large volumes of rain are not received by the country. This will result in South Africa importing maize and thus having side and serious effects upon workers, the farmers and indeed consumers. As a result of this Magwaza [19] reports that “the price of white maize shot up by R80 (about US dollars \$7) to close on to R2409 a ton (plus / minus \$219 dollars. Expensive by South African economic standards). This is the highest level since March, 2014.” Fears in respect to the lack of rain and the extreme dry spells and weather has caused a devastating impact on the maize crop, which has

seen the spot price for white maize go up by 23 percent over the past week. A difficult scenario for the majority of the poor population to absorb within their food basket, thus increasing poverty and further enhancing inequality. Maize farmers have warned that there is insufficient water in South Africa to irrigate farm land and that if the country does not receive rain within the next week in large volumes, it could result in tragic conditions in the grain farming communities, for general agriculture and have serious implications for the rural economy. Grain South Africa (In Magwaza, [19] has said that “This will result in high food prices for the next 12 months, which the poor cannot and will not be able to absorb” or level with for this is a protracted period of time. The maize produced under irrigation represents almost 20 percent of the crop and is taking strain as well, with load shedding and the crises that confront the country with extreme shortages of water, does not help the dire situation. According to Magwaza [19] “if there is a crop failure in South Africa this year, prices will increase by 30 percent and, all of this will impact negatively on poor people because maize forms the basis of processed products like poultry, dairy and meat, is the staple for the predominantly poor population.” The situation does not look good. The South African President presents his State of the Nation address to the country on the 12 February, 2015 and in this regard, would have to address issues of drought, corruption, the grave water and electricity crisis, issues of agriculture, land reform and the creation of jobs in order to stimulate the economy for prosperity. Failure to tangibly address these issues will place the country into a trajectory of no return.

We are entering a phase of drought and are no different to the situation experienced last year. The issue is will our farmers be in a position to produce sufficient food given the water crisis for the local population? The rainfall patterns and the impending drought has not only affected maize production but has taken its toll on sugar cane growers and it is estimated that cane growers have already lost R920 million due to the drought. If one has to travel around the country and into farming areas, one will see damaged fields because of the high temperatures and a lack of water. The situation is serious.

According to Mokhema and Alberts [20] who report that "Drought in South Africa's main sugar producing region may cost the industry R920 million. South Africa is the continent's biggest producer of sugar cane, the nation's largest crop by quantity according to the United Nations' Food and Agricultural Organization (FAO). The government has declared disaster areas in 9 of 11 districts in KwaZulu – Natal, where more than 80 percent of the nation's sugar is produced. There is now a distinct possibility that some mills will be closed adding to the serious unemployment problem and could have devastating effects on the KwaZulu – Natal province and its economy" [20]. This situation is not only affecting maize and sugar. In reality the whole of South African agriculture is now affected and has reached dire straits.

The paper now turns to some important issues in respect to water and now goes beyond the criticism offered in this paper as concerns the looming water crisis in South Africa. The paper turns to the following issues that require attention by the South African state. These are:

- Salinity Management to Conserve Groundwater.
- Arid Zones and the need to conserve groundwater.
- Rainfall forecasting requires more investment.

8. SALINITY MANAGEMENT TO CONSERVE GROUNDWATER

There is no doubt that favourable water balance is vital and the reclamation of large areas affected by alkali soil to reduce flood hazards sees governments and their policies on irrigation

projects that are implemented without financial consideration nor the provision of drainage measures," according to Abrol, [21]. The dated literature presented in these three discussions bear relevance because, not much has been achieved in South Africa and other developing countries, as concerns these issues. Abrol goes on to state that "salinization and alkalization are phenomena reducing the productivity of otherwise highly productive soils in several parts of the world. Reduced soil productivity and in extreme cases abandonment of productive soils is a serious issue threatening sustainability of agricultural production systems particularly in irrigated areas." In South Africa, we see that efforts to increase food production by small farmers have failed to increase food production. These efforts were concentrated and are still concentrated even in commercial South African agriculture where irrigation water was and is available or where irrigation facilities can and could be easily created. In this regard, the government has failed the small farmer and in some cases commercial agriculture because of a failure of providing assured water availability at the farm gate, the availability of improved and high – yielding varieties of crops and the increased use of fertilizers. All of these are the basic elements and building blocks that must contribute to increase in food production. This will allow for the empowerment of small – holder farmers to engage with agriculture and thereby serve the economic growth of the country and by the same token contribute significantly to food production and food security.

A clear understanding of damage must be taken into consideration and to this end Abrol [21] points out that "large areas of unproductive soils are often rendered unproductive due to the accumulation of excessive quantities of soluble salts in the root zone of soils and that degradation problems in irrigated regions often result from the rise in the groundwater table. There has to be equilibrium between precipitation and runoff, evapotranspiration, groundwater level and stream flows in the arid and semi arid regions." This is all affected by the high levels of development and construction near these areas causing pollution, excessive application of water, restricted drainage and when the groundwater table rises to within 1 – 2 meters of the ground surface, it contributes to evaporation. This causes serious evaporation from the soil surface, leaving the dissolved salts in the root zone of soils. The salt content of most groundwater in the arid and semi - arid regions is high [21]. And thus

leads to the formation of salt affected soils. More research needs to be undertaken in this regard by the South African government and African developing countries. This lowers productivity of the soils tremendously. Thus the degradation of productive land must be prevented at all costs by using appropriate measures. In this regard basic specific approaches are required for their management. Based on the nature of soluble salts and soil characteristics, salt affected can be broadly grouped into two major categories. (These will be listed but not discussed for obvious reasons). They are:

- Alkali soils, and
- Saline soils

Although efforts to revitalize such soils have been made for several decades throughout the world, efforts are only now paying dividends. It has been shown by many soil scientists that farmers that have left their field fallow for years are now returning and have made them productive using new technologies and become most productive within 3 to 4 years. Reclamation will also go a long way in mitigating or reducing the hazards of floods in many affected areas in South Africa and the continent of Africa. The technologies for reclamation have been extensively demonstrated and their effectiveness established. Success in the reclamation of salt affected soils has been confined to areas which have groundwater of relatively good quality. In areas where groundwater has high salt content, problems of drainage continue to pose a major impediment in ensuring long term productivity in irrigated areas. Although it has long been realized that drainage should be an integral feature of newly irrigated areas this has been rarely followed in practice. Abrol [21] points out that "As early as 1928, the Report of the Royal Commission on Agriculture in India stated: "It would appear that many of the troubles that have arisen in the irrigated tracks of India, in regard to water logging and formation of salty lands have been due to failure to properly correlate a new irrigation system with the natural drainage of the tract [21]. We have little doubt that the lesson has been learnt and where this is not already the practice, a careful drainage survey which could include estimates for drainage construction will, in future, form an integral part of new irrigation projects." Unfortunate as it is, most irrigation projects continue to be approved throughout the developing world, including South Africa and Africa in the 21st century. They are implemented without any financial provisions for drainage

measures. This is done and undertaken on political compulsions, which is a feature of South African democracy where, almost all issues are politicized unnecessarily in our noisy and unsettled democracy. It is also due to the anxiety to spread irrigation to as large an area as possible within the limited funds available.

When problems become serious there are no funds and little support from politicians for the implementation of drainage projects. South Africa's future efforts to minimize degradation of prime agricultural land must aim at more realistic planning which is sorely lacking in government departments because of a shortage of skills and a lack of competency by incumbents that drainage measures must be considered an integral feature of future irrigation projects. All of these measures must and need to be matched by measures to improve the efficiency of water use, which is lacking in South Africa, at the farm level which by all accounts is extremely low, compounded by an inefficient agricultural and water bureaucracy, ineffective and inept municipalities in respect to service delivery and water provisioning and interference by politicians. Problems of salinity management are therefore, intimately related to the need for maintaining a favourable water balance in the irrigated areas of the country. The ability to live and manage with the problems, Abrol [21] points out in this regard that "the problems of salinity will depend on an in depth knowledge of the soil – water – plant relations in a hydrologic unit and the manner in which the system responds to interventions aimed at overall productivity gains." Politicians and the agricultural and water bureaucracy of South Africa must take cognizance of these issues in a period of the water crisis being experienced, which will linger on for a protracted period of time and will most definitely impact negatively upon agricultural transformation.

9. ARID ZONES: THE NEED TO CONSERVE GROUNDWATER

It is absolutely necessary in South Africa and in this paper to unpack the vital importance of the causes for the degradation of the resource base in arid lands of the country and therefore ways has to be found to increase productivity of food grains and livestock. In this regard [22] points out that "the main problem of arid areas is the biotic pressure with human population and the livestock population. The large densities of human and livestock populations, the resource base automatically gets continually degraded

with the passage of time. It leads to groundwater exploitation without the necessary checks and balances by government and its agencies and therefore many areas turn grey. Groundwater is getting depleted and the quality of this water is generally poor and salinity is hampered, the common property resources (CPR's) which make up the backbone for the sustenance of livestock, are fast dwindling" [22]. The natural recourse and consequence to this is that farmers open up new areas of cultivation for purposes of fodder, without again the application of controls by the government and its water and agricultural bureaucracies. This causes farmers to bring stable sand dunes under cultivation and thus the sandy soils are exposed to high winds which lead to increased wind erosion. Sand movement causes nuisance to settlements, besides ruining cultivated areas. As more areas are overgrazed and cultivated, the catchment areas of the streams and rivers are exposed to soil erosion with the rains. The streams automatically widen due to these scenarios and thus encroach upon the adjacent cultivated areas due to sand casting. Wells get damaged in the process and industrial effluents exacerbate the situation even further, which cause high levels of pollution of arable areas. Some technologies are listed hereunder as suggested by Venkateswarlu (1991: 31 – 32). These are listed but not discussed for obvious reasons. They are as follows: [22].

- Minimize the use of water to arrest overexploitation of groundwater
- Sand casting of ephemeral streams – limited use of such water.
- Sustainable means for productivity and the selection of suitable crops, weeding, moderate use of fertilizers, using improved technology.
- *In situ* rainwater harvesting by ridging and furrowing of the surface and providing an area for catchment; in spite of resistance the extension services must show farmers how productivity will be improved.
- Rainwater harvesting system.
- To look at nutrient supply systems.
- Proper use of tractors.
- Other issues.

The above issues need urgent attention in South Africa. It brings about conservation of groundwater and will increase agricultural productivity and simultaneously generate wealth, create employment and contribute to food security.

10. RAINFALL FORECASTING AND INVESTMENT

Given the diminishing water resources in South Africa, there has to be a call for action by government in respect of rainfall forecasting and therefore more investment in this direction is required. Virmani [23] says that "the variability of seasonal rainfall, in particular the uncertainty of the amount and distribution in any given season, forms the greatest source of risk to crop yields within agriculture. Unfortunately, impacts of climatic variability are felt most in Dryland farming areas of semi arid areas." The need for prior information about seasonal rainfall is therefore great for these areas. A correct forecast will be important to increase agricultural productivity in average and above average rainfall years and will save on costs of inputs in drought years, like South Africa is currently experiencing. It is therefore necessary that government energy is directed to an effort in increasing agricultural productivity of Dryland agro ecosystems and to sustain these efforts. This is important for the following reasons. The reasons are again listed but not discussed.

These are:

- There has to be climate prediction for agriculture. A greater study is required in this direction. The limits of predictability in respect to averages must increase substantially. It is most important that climatic predictions be expressed both in semi – quantitative and probabilistic terms because only part of the variance of monthly seasonal means is even theoretically predictable. Forecasting is important for South Africa, given the lack of water, in order to sustain agriculture, support farmers, increase production and therefore long – term weather forecasts, for the country as a whole, are important for planning and resource allocation.
- Invaluable to Dryland farmers are assisted by forecasting in terms of choosing the type of crops to choose and fertilizer schedules that must be followed. Losses will be minimized by proper selection of the crops that will be grown. The farmer could determine short or long term interventions and thus reduce risks for a dependable crop production. Some of these operations will be weeding, spraying of insecticides, application of fertilizers and harvesting.

- Accuracy of forecasts is important together with the predictions on heat waves and frost, extreme weather conditions on a regional basis is vital. Long – term rainfall records must be kept and their reliability must be ensured
- The ability to forecast should be improved and this must be communicated to farmers and land users. In this regard Virmani [23] suggests the following:
- More metrological stations are required to provide local specific information.
- There need to provide these stations with modern instrumentation and equipment and reporting to a central collecting location.
- There have to be links created for these stations internationally to determine regional weather patterns.
- The need for greater use of satellite imagery to obtain real time information.
- The need for online information or weekly summaries for extension agencies and agricultural institutes for dissemination to farmers on a weekly basis.
- A think tank with universities other stakeholders, farmers and the government must be put into place. This will be important for technological and policy adjustments, for improving techniques. This will alleviate crisis management.
- It may be expensive to start – up but the benefits will be far greater.
- It will improve and achieve self – sufficiency and sustainability of food and fibre production and develop export capability.

South Africa with the government and its bureaucracy must turn these infirmities into advantages. There are indeed many aspects that go beyond the thrust of this paper which cannot be discussed and this is an inherent difficulty and a limitation of the paper. This is unavoidable but the paper speaks to the title of the paper.

11. MANAGING WATER FOR FOOD PRODUCTION

Levine and Coward (1984) state that “during the early 1970’s severe food shortages occurred in many parts of the developing world. These shortages were caused by a growing world population and adverse climatic conditions and, in 1974 this led to the United Nations World Food Conference. The conference was in recognition of the critical role that water plays in the

production of food. The conference made an urgent appeal to make new efforts to expand irrigation rapidly [24]. In respect of South Africa, given the water crisis that it faces as we approach the first quarter of the 21st century, indicates that not much has changed since the clarion call made by the United Nations to consolidate our efforts in respect to irrigation, after over 40 years and, it appears in no uncertain terms that the democratic government post 1994 has not meaningfully addressed the importance of irrigation to agriculture in the country. The investments that have been made undoubtedly have contributed to an improved food situation in many of the developing countries, but Levine and Coward [24] state that “At the same time, however, the performance of many of these systems, from both production and economic perspectives, has fallen short of expectations, sometimes in major ways.” There is thus a need to improve the management of the systems, and greater interests in other options for increasing production. In respect to irrigation the questions that relate to the special place that irrigation has in food policies of many developing countries must seek to answer the following questions as identified by Levine and Coward [24].

These are:

- ✓ How can the performance of existing and new irrigation systems be improved?
- ✓ How can the benefits from the investment in irrigation be shared more equitably?
- ✓ How can undesirable environmental effects be minimized.”

In this regard four terms require an understanding by government bureaucrats involved with water. (These are listed but not discussed). They are: 1. the physical basis for irrigation; 2. the historical perspective must be factored into the equation; 3. How can the performance of existing and new irrigation systems be improved? 4. How can benefits from the irrigation investment be shared more equitably?

12. SOME PUBLIC HEALTH ISSUES AND CONSIDERATIONS

12.1 Minimization on of Undesirable Environmental Impacts

Large – scale development of water resources and their application to croplands produces significant and sometimes undesirable impacts

on the physical environment. Downing and Gibson (In Karodia, 1987, [4]), identify these as follows: "disruption of the natural regime of river systems; spread of disease and other health problems, and, deterioration of land quality." They add that "the construction of large storage dams on major rivers almost always has significant impacts on the associated river system and only some are anticipated at conceptualization and planning. Fish populations may be altered; aquatic plant life may be affected; patterns of periodic flooding may be changed; human populations living below the dam site will observe changes; dislocation, upstream reservoir construction will lead to new activities, for example, commercial logging, the spread of upland farming, increased residential settlements and so on." These activities often lead to undesirable land uses that contribute to physical deterioration of local resources as well as to problems of reservoir siltation. The techniques to deal with human settlements are not fully understood and currently are in a rudimentary stage of development.

The increase in the use of irrigation is accompanied by an increase in incidence of diseases and difficult waterborne phases. For example, malaria can increase significantly. The problem of schistosomiasis (biharzia), a parasitic disease because human waste enters the water supply, a waterborne snail as intermediate host and contact by humans. The disease can be fatal and debilitating. There are other diseases that need to be considered from a public health perspective including pollution of water. "The health problems of people are mirrored in health problems of land, in the irrigated arid and semi arid regions. Technical solutions are expensive and a change of irrigation practice is essential, but often is temporary with little or no support from the authorities. There has to be changes in attitudes, human interaction and farmer interaction" [24]. These issues will become increasingly important in developing countries. Major efforts by governments should therefore be directed to find solutions.

12.2 Pesticides in Groundwater and Some Other Chemicals

The application of pesticides to agricultural areas constitutes a potential and dangerous source of water contamination. The extent of contamination depends on the dose applied and the degradability of the pesticide, the soil conditions

and other ecological determinants [25]. Pesticides have to be regulated stringently by government authorities in the developing countries. The rules and regulations are at times in developing countries not stringent enough and this has allowed pesticide residues to reach groundwater and has affected humans. It is obvious that South Africa should do everything possible to identify and abate sources of pollution and find corrective solutions to existing sources whose effects are tangible. It would be most desirable, to avoid exposure to all possible risks, the tangibles and intangibles. This requires tremendous resources which are not, and most probably will not, be available to developing governments in the near future. Zaki, Moran and Harris [26] in this regard aptly put it in perspective as follows: "Our society seems to be willing to accept tangible and measurable risks in our daily activities as a result of cigarette smoking, excessive food and alcoholic intake, and the use of the automobile. The same society, however, is unable to tolerate potential, intangible, and un - measurable risks from food additives, pesticides, air pollutants, and water contaminants. As public health administrators and as government, we have a responsibility not only to monitor and control these substances but also to help the public become aware of their risks and benefits, hold government, its bureaucracy, pesticide makers and others accountable, and not to resort to rhetoric on either side of the issue."

12.3 Chlorine Disinfection of Water and Alternatives

12.3.1 Chlorine dioxide

Some alternatives to chlorine must be considered for the disinfection of water. Anderson, Reimers and deKernion [27] have researched this issue and have stated as follows: "Chlorine must be reevaluated as the standard for disinfection of drinking water and wastewater." Alternative methods are being sought "due to the cost of manufacture of hypochlorite, its potential carcinogenic effects [28], mutagenic effects [29], toxicity to aquatic species [30,31] and explosive properties [32]. Among the most promising chemical alternatives at that time were chlorine dioxide and ozone. South Africa has to undertake research in this direction. Chlorine dioxide effectively destroys coliforms, entero - viruses [33] and pathogenic amoebae [31]. It is a stronger oxidant than chlorine and also provides a longer residual in

potable water [34]. "When chlorine is absent from water, chlorine dioxide does not react with ammonia or aromatic organics and does not produce trihalomethanes [32]. Disadvantages of chlorine dioxide include its cost and production problems. "Chlorite is a hemolytic agent and may initiate hemolytic anemia in susceptible individuals at the levels found following disinfection" [9].

12.3.2 Ozone

Since the first ozonation plant was constructed in 1893, over 1000 plants have been built throughout the world [3]. It is a strong oxidizing agent and reacts with a wide variety of organic compounds. Ozone can oxidize trihalomethanes in the presence of ultraviolet light [3], does not form trihalomethanes in water [35], and can also remove trihalomethanes precursors [36] Ozone is also effective in controlling taste, odour, colour, and algae and for removing bacteria [37,38] amoebae [39] and viruses [40]. There are no concerns about its health effects or the inorganic reaction produced. The lack of information about ozone is a concern. It does not provide a residual and must be used in combination with another disinfectant to protect the distribution system.

12.3.3 Bromine chloride

It is a complex of two halogens and possesses all the advantages of chlorine as a disinfectant and oxidizing agent. "When used It is more reactive than chlorine for inactivating enteric viruses" [41]. The disadvantages in the use of bromine chloride indicate that chlorine is still present, and is more toxic than its chlorinated counterparts. They are unstable; toxicity to aquatic life appears similar to that of chlorine [28,42]. More testing is required before it can be used as an alternative disinfectant.

12.3.4 Ultraviolet light

Its potential is known for many years. The manufacture is now feasible and has proven effective against many microorganisms. Dozes differ in respect to microbe type. "It is effective against viruses with a fourfold reduction in viral concentration in wastewater treatment" [43]. The disadvantages are that the penetrating capacity is limited, its disinfectant potential can be reduced by colour, turbidity, organics, and iron salts. Voltage changes and temperature fluctuations may reduce lamp intensity. It is harmful to the eyes and the skin. It produces no residuals it must be used in tandem with a

method that maintains germicidal activity throughout the distribution system.

12.3.5 Ultrasonic's

Ultrasound is becoming an important alternative to chemical disinfectants. A wide range of microbes are subject to the lethal effects of sonication including bacteria, yeasts, and Ascaris [44]. They increase the settling rate of both activated sludge when ferric chloride is added [45]. Sound waves reduce effectiveness and it is expensive almost 15 times the cost of chlorination.

12.3.6 Induced field processes

These processes involve passing fluid through an electrostatic or electromagnetic field. There has been much controversy over these processes and mixed reports about their effectiveness. They are viable for water treatment and for corrosion and reduction of bacteria and viruses.

The idea of introducing the subject of alternatives to chlorine as an agent for disinfection of water was to open up critical thinking in respect of alternatives to chlorine disinfection. To appeal to the scientific community in developing countries, to undertake more research in this direction, particularly in South Africa and the so – called "Third World" countries and, appeal to governments, to support the initiatives for greater sustained and coordinated and meaningful research and, above all, to provide the necessary funding, and technical expertise in this direction.

13. SOME ISSUES ON THE CONTROL OF DIARRHEAL DISEASES IN THE "THIRD WORLD:" A CALL FOR SOCIAL CHANGE

Alfred Yankauer [46] wrote in his editorial piece in the American Journal of Public Health, Volume 7, Number 10 as follows. His analysis remains most relevant to the discourse of water some 33 years later. As an introduction to his narrative, the authors state as follows: As water levels drop, dry spells set in over a protracted period of time ushering drought periods, and as groundwater resources diminish, as water tables become polluted and coupled with government ineptitude in many parts of the world in relationship to water conservation and the engineering of new water systems, the collapse

of agriculture, and thus threatening the very survival of human and animal life, the threat to food security, economies of poor countries are unable to survive, basic foods become limited in supply causing greater hardship among the poor, as poverty and inequality rise to unprecedented levels in South Africa, exacerbated even further by poor evaluation and control mechanisms by governments, we find an increase in waterborne diseases and, above all the very serious compromise to public health. This is the reality of children suffering from malnutrition, cognitive development becomes compromised and learning outcomes are compromised to almost a point of no return. These are the realities and some outcomes that manifest themselves in populations because of a lack of water.

In 1958, the following statement appeared in the Bulletin of the World Health Organization: "A practical programme cannot be complete without consideration of methods for the prevention of death in those children who, for a number of years, remain subject to diarrheal disease. For a programme of simple measures that would seem to be economically feasible and technically logical, the emphasis is on early rehydration. How can this be achieved in areas lacking of basic medical staff and professionals." In 1964 there was successful use of oral rehydration therapy in Mexico and other parts of Latin America and, in Venezuela tablets for oral rehydration was successful. Sugar was integral component of the oral fluids which allows for the acceleration of the absorption of electrolytes. This was applied in India, Bangladesh, Pakistan and Latin America with great success. There was an emphasis for fluid balance because of the immense potential it had for public health, not only for cholera but for all types of diarrheal disease. It was 20 years after the Latin American experiences that the WHO launched its Diarrheal Control Programme. Even today, we find that "Western trained pediatricians well versed in the imperatives of the authoritative English –m language text books of pediatrics have created major impediments not only to the concept of providing adequate oral – rehydration treatment but also to the concept of providing adequate caloric intake to children with acute diarrheal disease."

One cannot help but feel because of what is happening in South Africa in respect of the shortages of water, poor sanitation, and the pollution of both ground and surface water that we sit on the precipice of an impending serious

public health disaster waiting to explode. In this regard applied research has to be heightened but it seems that it is too slow as compared to what happened a century ago. It was in 1848 that John Snow terminated a cholera epidemic by shutting off the water that transmitted the disease. He did not know that the cholera bacillus existed, although he speculated about a germ theory of disease. Yet it was not only until 1878, after Robert Koch had published the basic scientific proof of an etiologic relationship between bacteria and disease, that health departments were organized and applications of the principles Snow had demonstrated became accepted practice for many more conditions than cholera. In the intervening 30 years, prominent physicians and sanitarians, well versed in the imperatives of prevailing text books, were impediments to such applications. The inertia generated by unproven conventional wisdom apparently needs a dose of fundamental research to knock out its flimsy underpinnings. This may be the reason why epidemiologic inference and the results of pragmatic health services research are not applied rapidly. Unlike the new technologies whose application yields individual commercial gain without disturbing the status quo, public health progress requires investment and expenditures that can be rapid only to societal gains and it often works to upset the status quo. This is required now than ever before in South Africa as concerns water as we sit on a public health disaster, if not dealt with swiftly.

14. FINDINGS

The findings are dispersed throughout the discussion within the paper and, therefore, there are no finite findings. It is hoped that the paper therefore alerts those in charge of water resources in South Africa of the looming water crisis that confronts the country. It is hoped that the authorities and government intervene, in order to arrest the manifest problems that confront the country. The danger is that South Africa's economic growth and development will and, can be very seriously compromised, if the water crisis is not addressed with the urgency that it deserves. It is not a question of being sensational in the analysis and discussion in this paper but, to alert the South African population and the government of the impending crisis of water management because water and water resources is the life blood of the economy and to the success of the country.

15. CONCLUSION

The paper attempted to show that South Africa is confronted with a crisis with regards water and also electricity. The inefficiencies of government were highlighted in this regard. More importantly some important issues in respect to public health were discussed given the impending crisis of both water and electricity in South Africa. The narrative must not be interpreted as a criticism of government and its inefficiencies but, rather seen objectively as what the South African government can do to remedy this situation in the shortest period of time or court very serious resistance, violence and disaster. This has been a review article and the references used in the preparation of this review article are important from the perspective of remedying the water crisis in South Africa.

Although we might not have in South Africa recognized the growth and strength of the public health movement in the late 19th century and early 20th century, were a part of a larger movement of social reform that led to non – violent changes in social structure. There is still some time for evolutionary changes to replace violence in many aspects of life. This is dependent on government resolve and commitment in South Africa, given its failures in 21 years of democracy. However, time is running short for the South African government given the serious problems of electricity and water shortages. It appears the South African government is forgetful of its past heritage and fears the very revolution it fought for in order to liberate South Africa, as people and the masses are ready to rise against it for basic services, its greed and the corruption within it, which has become the order of the day. Water, sanitation, electricity, basic services, houses, and public health measures coupled with other important interventions after 21 years of freedom and democracy now requires urgent and substantial reorganization, expansion, refocus of public health services, the building of dams, restoring the provision of electricity and water without any let or hindrance and invoking the basic tenets of life that, are expounded in the Constitution and exemplified in the Freedom Charter, as was envisaged by the founding fathers of South African democracy and, in this country, this could be the first step after 21 years of freedom toward evolutionary changes in the social fabric, heralding even greater changes that could come. The alternative is the violence of revolution.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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