FUTURE SCENARIOS FOR AGRICULTURAL WATER MANAGEMENT IN SOUTH AFRICA:

Andries J Jordaan (PhD) PrSciNat, PrDM, MMM, DWD

Future water management in South Africa will have a direct influence on economic welfare and political stability in South Africa and in the region. Approximately 60 percent of water in South Africa is utilised by agriculture. This figure is calculated by subtracting what can be measured from total annual water supply through precipitation. In other words, it is total precipitation minus measured bulk water supply for industry, tourism and domestic water use. Developing future agricultural water management scenarios is therefore an important tool for timely decision making for policy makers, water managers and water users.

The United Nations World Water Assessment Program (WWAP) indicates that several countries around the world are confronted with water scarcity as a critical problem to socio-economic development. By 2035, more than a third of the world population will be living in countries that will have to adapt to high water stress, including countries and regions that influence global economic growth (Water Resources Group, 2009). Currently, water management in South Africa and other developing countries in Africa, has become increasingly challenging due to the complexities arising from the functioning of hydrological cycles, climate change, socio-economic factors and diverse stakeholder perspectives, needs, values and concerns associated with the use of water for various purposes (Gain and Giupponi, 2015). In particular, complex interactions and dynamic feedbacks between biophysical, political, security and environmental systems make it difficult to understand the potential consequences of decisions made by policy makers (Stave, 2015).

The Water Research Council (WRC) appointed the University of the Free State with Prof Andries Jordaan as project leader to develop future water management scenarios for SA. Other project team members are Dr Abiouden Ogondiji, Prof Sue Walker, Prof Anthony Turton, Me Chantell Illbury and Mr Sebastian Yong as the PhD candidate on the project. This article highlights some of the preliminary results from a first round of workshops.

Previous studies on water resource management have demonstrated that scenarios are also useful to account for uncertainties associated with climatic, demographic, economic, social, technical and political conditions that affect the performance of water resource systems, including their effects on future water availability, water demand and water management strategies (Gallopín & Rijsberman, 2000; Alcamo & Gallopín, 2009 and Gallopín, 2012). The fundamental goal of water resource planning and management is to match the demand for water by the socio-economic system with the supply (quantity and quality) of the water system through administrative control and management (water regulations/ laws and infrastructure), without compromising ecosystem sustainability (WWAP, 2000).

According to Gallopín (2012), scenario development typically involves the following elements: characterisation of the current situation, with a diagnosis of the starting state of the scenarios, focused on the focal issue or problem under consideration, water in this case, identification of major driving forces that represent the key factors, trends or processes that influence the situation, focal issue or decisions that propel the system forward and condition the story's outcome. Some of these forces are invariant eg they apply to all scenarios and to a large extent predetermined (Shiklomanov, 1997). Some of the driving forces may represent critical uncertainties, the resolution of which can fundamentally alter the course of events. These driving forces or drivers, for short, influence but do not completely determine the future. Thus, while the initial state of the drivers is the same in all scenarios, the trajectory of the system follows a different course in each one. The formulation of the plot, the current state, driving

forces, strategic invariants and critical uncertainties form the backbone of the scenarios. In addition, all scenarios unfold according to an internal logic (the plot) that links the various elements (Gallopín, 2012).

Systems thinking and planning

Systems thinking is one of the most innovative tools necessary for identifying drivers of change, policies and strategies that will inform water planning in a face of uncertainties and a constantly changing socio-economic and ecological environment. Systems thinking can be very useful in water planning because it will inform policymakers and all stakeholders in the water and agricultural sectors about the current water situation in the country and provide valuable insights to support future water policies especially regarding the agricultural sector and agricultural development in South Africa. System dynamic modelling can provide a learning tool for policy-makers to improve their understanding of the long-term dynamic behaviour of the water agricultural sectors and as a decision support tool for exploring plausible policy scenarios necessary for sustainable water resource management and agricultural development.

Drivers for change

Ten clusters were identified from literature with each having its influence on what resource management in South Africa. The ten of clusters, which have varying influences and impacts agricultural water management are (i) natural/ecological cluster, (ii) social cluster, (iii) economic cluster, (iv) cultural cluster, (v) human cluster, (vi) infrastructural cluster, (vii) political cluster, (viii) technological cluster, (ix) institutional cluster and (x) organisational cluster. A total of 62 drivers were also identified under each of the ten clusters as the drivers that will influence change in water resource management in South Africa. The list of all the drivers and clusters was submitted for discussion among different stakeholders and review through expert consultations. Stakeholders and experts in the agricultural and water sectors were given permission to propose alternative clusters and drivers, which they thought will have the biggest influence in water resource management and were not listed in the document presented to them. The objective of the expert consultations after different stakeholder workshops was to validate the degree of importance of each cluster and driver of change and to gain an informed opinion on the likelihood of the drivers and clusters influencing agricultural water resource management in future.

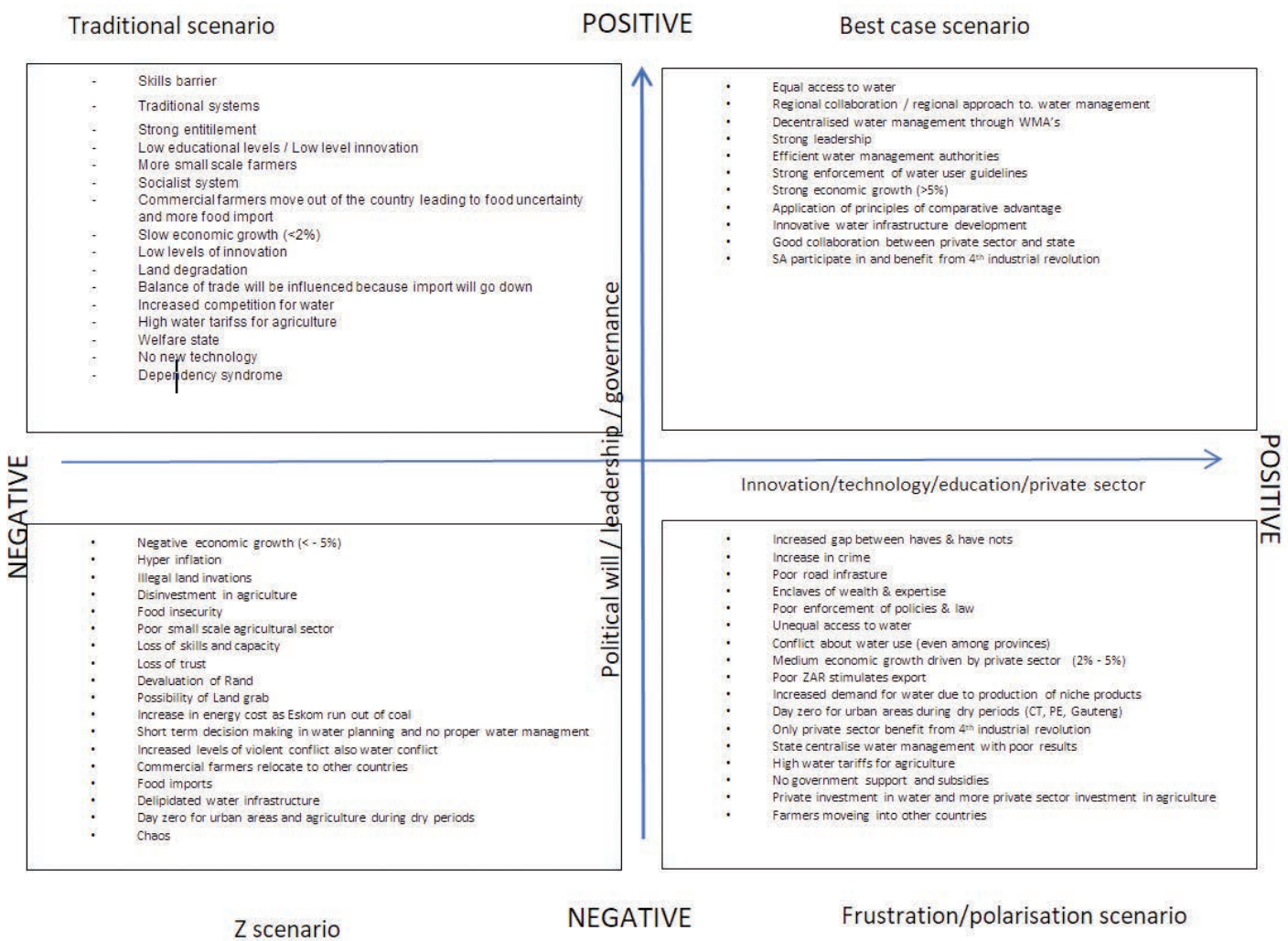
After various workshops, national symposium and expert consultations, various clusters and drivers of change were identified as important to agricultural water management in South Africa and based on these, the project team could build preliminary scenarios for South Africa.

Preliminary scenarios

The results of the preliminary set of scenarios are presented in Figure 1. It is important to note that thiese are the first set of scenarios from the discussions of the project team and hence these are just the starting point.

The two axis identified are political will and support, leadership and good governance on the vertical axis with innovation, technology and private sector initiatives on the horizontal axis. ▶

Fig 1: Preliminary agricultural water scenarios for South Africa



Workshop participants from National African Farmers Union (NAFU)

Workshop with leaders from African Farmers Association of South Africa (AFASA)

National Water Symposium in Pretoria with Dr John Purchase from AGBIZ SA giving his inputs

We identified four basic scenarios. The four scenarios are (preliminary names) (i) Z or chaos scenario, (ii) frustration or polarisation scenario, (iii) traditional scenario and (iv) best-case scenario.

The Z scenario is the result of poor leadership in both the political and water environment with low education standards and a private sector that withdraw from the national discourse due to extreme polarisation between private sector and Government. The country will experience continuous recession with negative economic growth. Unemployment will increase dramatically and the safety and security situation will get out of hand. Violent civil unrest will be a daily occurrence with security forces ie the South African Police Service (SAPS) and the South African National Defence Force (SANDF) using deadly force to control the masses. Most commercial farmers will abandon their farms and move to neighbouring and other countries. More than half of the population will be food insecure. South Africa will become a net importer of food and the World Food Programme will become active in South Africa to help avoiding famine amongst the poor. Water infrastructure is not maintained and rivers and dams are heavily polluted. This is the chaos scenario, very similar to Zimbabwe today.

The frustration or polarisation scenario is the results of poor governance and political leadership with a strong private sector that is still functioning in a hostile political climate. More people are educated and civil society take responsibility for its own functioning. The gap between the haves and have nots will continue to increase with the poor totally depended on the State who is nationalising all resources. We will see slow economic growth of about two percent, which is mainly driven by the private sector. Only the private sector will benefit from the advantages of the fourth industrial revolution with the State still working with outdated systems and not able to apply regulations and policies. The private sector, however, will invest the bulk of their funds in other countries. The private sector will take responsibility for water management where it is possible but many towns and cities will experience day zero scenarios during dry periods because of poor management at all governance levels. Agriculture will be heavily taxed with high water and electricity tariffs. Production from commercial agriculture will slow down with many farmers investing in other countries. South Africa will become a net importer of staple food five out of 10 years.

WHY DISASTER READINESS IS CRITICAL

FOR AFRICA AND WHAT THE COMMONWEALTH IS DOING ABOUT IT

By The Rt Hon Patricia Scotland QC, Commonwealth Secretary-General

Five months ago, Cyclone Idai ripped through the Southern African region, causing a massive humanitarian disaster that affected three million people. More than a thousand perished, while 200 000 lost their homes, many of whom are still to this day living in refugee camps.

Economic losses were estimated at more than $1 billion across the affected countries, Mozambique, Malawi, Zimbabwe and Madagascar. However, the devastating impacts of such disasters, especially for Least Developed Countries (LDCs) and small states in Africa, tend to be deeper and more far-reaching than initial reports would indicate.

The consensus among scientists is that extreme weather events such as droughts, floods, cyclones and landslides, are now occurring with increased frequency and greater intensity. There are long term consequences such as desertification, erosion of arable land and changes in ecological balance, which can prove difficult to reverse. As a result of climate change, there is a heightened risk that while vulnerable Commonwealth states are recovering from one natural disaster, another will strike.

The consensus among scientists is that extreme weather events such as droughts, floods, cyclones and landslides, are now occurring with increased frequency and greater intensity

For instance, Mozambique was still reeling from the impact of Cyclone Idai in March when Cyclone Kenneth, the strongest in the country's history, bore down barely six weeks later. In fact, there have been no fewer than 13 emergency events in Mozambique since 2015, mirrored by 12 in neighbouring Malawi. Indeed, 109 disasters recorded in the country over the past 50 years have incurred more than $1,15 billion in economic damage.

Statistics such as these demonstrate the vital importance for all our member countries of planning long term strategies to manage disaster risks and of building resilience through disaster preparedness, as was acknowledged by Commonwealth Heads of Government when they met in 2018.

They affirmed their commitment to the Sendai Framework for Disaster Risk Reduction, the international agreement ▸

The traditional scenario is a scenario where political leadership take strong action to reduce corruption and increase productivity and good governance in the State. The private sector, however, views it as a short-term trend and due to low education levels it starts investing more in other countries. Due to historical experience between Government and private sector, distrust remains high between private sector and Government. This scenario will see slow economic growth with less than two percent and little innovation in the water sector. Farmers do not trust Government and food production will slow down with many farmers investing in other countries. The smallholder sector will increase dramatically with Government enforcing more socialist policies and became a welfare state. Land and other resources are nationalised with new farmers having no title deeds for their land. Food insecurity will increase and South Africa will become a net importer of staple food seven out of 10 years.

The best-case scenario is the result of strong leadership, good governance, more people receiving good education and a private sector who works together with Government to reduce unemployment rates and increase efficiency in production and water use through innovative new technologies. Economic growth increases to more than five percent. All sectors and people have equal access to resources. The smallholder sector received good extension support from Government and commercial agriculture actively assists with the mentoring of new farmers. South Africa remains a net exporter of food even during dry years. The exchange rate is stable and global markets reacted positively to developments in South Africa. New water infrastructure is built with the newest technologies. Current infrastructure is well maintained and pollution levels in all rivers and dams are within 'specs'. The country as a whole benefited from the fourth industrial revolution.

Conclusion

Scenario building is an important planning tool and is also an integral part of risk assessment. The project team believe that the water management scenarios developed during this research will enhance resilience against climate extremes and climate change provided that policy makers and practitioners understand implications of policy and management decisions.

The project continues until the end 2020 and refinement of the different scenarios are expected as more information became available.