

TRANSFORMING WATER RESOURCES MANAGEMENT IN SOUTH AFRICA'S AGRICULTURAL EXTENSION DELIVERY

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1. INTRODUCTION

'Seventy one per cent of the Earth's surface is covered in water. While ninety eight per cent thereof is undrinkable sea water, only 1,2 per cent constitutes fresh water, which is locked in the polar caps and in glaciers. Consequently, inhabitants have a mere 0,8 per cent to inter alia, drink, irrigate their crops, manufacture steel, cool power stations, bath and transport sewage' (Clarke 1991:79).

We might not have believed the aforementioned statement made a long time ago, and now our sometime feeble attempts to manage the very limited potable water resources in a more effective and sustainable manner are furthermore being hampered by climate change. Can the clock to manage and conserve our clean and safe water in South Africa (SA) be turned back on time?

Through this paper some actual realities regarding the nature and extent of water services management in the developing SA will be identified. We will show that the necessary legislation is in place but unfortunately it cannot be enforced effectively. The paper will also try to sensitize and inform the Extension Officer (EO) of the increasing demand for usable water in the semi-arid SA, the primary role-players and stakeholders in the water services management arena, the looming effects of climate change on the changing hydrological cycle, and the resulting collection, storage and management of water in dams and underground water aquifers.

Information was gathered by means of a comprehensive literature study and interviews with selected role-players and stakeholders (actors) on the very diverse and complex terrains of water services management, public management in and by municipalities, and disaster risk reduction.

For the effective consumption and utilization of available potable and safe water, it is believed that each one of us can bring about positive differences in our own work- and living environments. The EO can play a major role in educating farmers and communities in the more effective utilization of water and in conserving it. The EOs must be capacitated with strategically important information on water services management in the water stressed SA, climate change, and how our individual behaviour (not only in agricultural practices but also in our day-to-day lives) must be adjusted according to the slowly but surely changing weather patterns. All actors must be informed of the nature and extent of more effective, efficient, economic, equal, empathetically and environmentally friendly utilization of available and allocated water resources. The principle of "more crop per drop" (Dr. Shaker, 2005) should be applied by especially all farmers, be it commercial or small holder. It is furthermore also important that farmers should understand that their farming practices will have to change due to climate change and the changing availability of water.

2. BACKGROUND

In SA's quest to sustainable development, potable water tends to be its most limiting natural resource. Most of its 22 major rivers have already been dammed up (550 of them!) or have water abstraction schemes in place to supply the growing number of industry, agricultural, and domestic users. The average annual rainfall is approximately 500mm (considerably less than the world average of 860mm). Water is also unevenly distributed across the country with approximately 80% of the country's runoff being towards the east. Water resources are further

stressed by the increasing pollutants, which include industrial effluents, domestic and commercial sewage, acid mine drainage, agricultural runoff and litter (DEAT, 2008:64).

The natural availability of water across the country is variable, and rainfall displays strong seasonality. Stream flow in South African rivers is at a relatively low level for most of the year.

The requirements for usable water already far exceed the natural availability of water in several river basins, and therefore large-scale transfers of water across surface water catchments have been implemented, like the Lesotho Highlands Water Scheme (Mukheibir & Sparks, 2003:2).

The agricultural fraternity must manage macro issues like the current government's transformation of the South African sustainable development- and water policies (determined by democratisation, increasing potable water demands and decreasing raw water qualities), climate change, and an effective, efficient, economical and equal quest to improve the nature and extent of water services management in a holistic, integrated and surface water catchment demarcated manner.

Key risks of climate change include threats to the water-stressed country's water supplies and changing rainfall patterns. Temperature increases could enlarge the area prone to malaria and other vector-borne diseases; and crop production could be affected by 10-20% by temperature changes either way. Higher CO₂ levels could reduce proteins in grasslands of livestock producing areas, in particular in poorer drier parts of the country; and fisheries will be affected by changes in the sea temperature, thus negatively affecting the livelihoods of fishing communities.

Climate change is expected to alter the present hydrological resources in Southern Africa and add pressure on the adaptability of future water resources (Schulze & Perks 2000). Poor distribution of water resources and pollution coupled with frequent droughts and floods have lead to direct hardship for many people, particularly the poor, since it has affected food security, specifically for subsistence farmers.

If the occurrence of drought became more frequent, the impact on water resources, and consequently agriculture, would be significant (Mukheibir & Sparks, 2003:1).

DEAT, (2008:59) has identified the following impacts of climate change on Africa:

- New studies confirm that Africa is one of the most vulnerable continents to climate variability and change because of multiple stresses and low adaptive capacity.
- Agriculture production, including access to food, in many African countries and regions is projected to be severely compromised by climate variability and change. The area suitable for agriculture, the length of growing seasons and yield potential, particularly along the margins of semi-arid and arid areas, are expected to decrease. This would further adversely affect food security and exacerbate malnutrition in the continent. In some countries, yields from rain-fed agriculture could be reduced by up to 50% by 2020.
- Local food supplies are projected to be negatively affected by decreasing fisheries resources in large lakes due to rising water temperatures, which may be exacerbated by continued over-fishing.
- By 2020, between 75 and 250 million people are projected to be exposed to an increase of water stress due to climate change. If coupled with increased demand, this will adversely affect livelihoods and exacerbate water-related problems.
- Towards the end of the 21st century, projected sea-level rise will affect low-lying coastal areas with large populations. The cost of adaptation could amount to at least 5-10% of Gross Domestic Product (GDP). Mangroves and coral reefs are projected to be further degraded, with additional consequences for fisheries and tourism.

Using the Global Climate Models, the following changes to the South African climate within the next 50 years have been predicted:

- a continental warming of between 1 and 3°C;

- broad reductions of approximately 5 to 10% of current rainfall, but with higher rainfall in the east and drier conditions in the west, i.e. increasing the current rainfall disparities;
- increased summer rainfall in the northeast and the southwest, but a reduction of the duration of the summer rains in the northeast; overall reduction of rainfall in the southwest;
- nominal increases in rainfall in the northeast during the winter season;
- increased daily maximum temperatures in summer and autumn in the western half of the country; and
- an extension of the summer season characteristics.
(DEAT, 2008:59-60.)

3. HISTORICAL OVERVIEW OF LEGISLATIVE TRANSFORMATION

The legal and administrative structures inherited by the current Government did not serve the broad population of all the municipalities. Public participation – now a constitutional requirement – was non-existent (Motshekga, 2008:1). Consequently, all decision-making related to public service delivery was undertaken on behalf of the majority. In order to ensure that truly integrated economic development and improved basic public services are delivered in a more effective, efficient, economical, equal and environment friendly manner to all citizens and especially the under-served communities, the municipal boundaries have been re-demarcated, newly merged municipalities with new organisational structures and policies have been created and transformed organisational arrangements incorporated for more accessible and transparent citizen participation (Craythorne, 2006:51-54).

The ANC-led Government immediately emphasized that its Reconstruction and Development Programme (RDP), as part of its political manifesto and foundation of all its new public policies, would be implemented and every effort be made to improve public service delivery in all three spheres of government (municipal, provincial and national).

One of the four pillars of the RDP is ‘meeting basic needs’ of which access to basic drinking water supply and sanitation services for all citizens of South Africa was made a priority (DWA, 2004:4). Consequently, the former Minister of the then Department of Water Affairs and Forestry (DWA) (Prof Kader Asmal), during May 1994, initiated a process to review all water-related legislation (Gildenhuys, 1999:10). The overall objective of this process was to change the South African water dispensation so that socio-economic demands and environmental management requirements would be met in as effective, efficient and economical manner as possible, and equal access for all South Africans would be provided (Pienaar & Van der Schyff in Tempelhoff, 2005:263). See Table 1 for some examples of transformed government policies and legislation (in date sequence) in the water affairs, agriculture and municipal environment of the country.

Table 1: Important examples of legislation in SA since April 1994 as related to water and municipal governance.

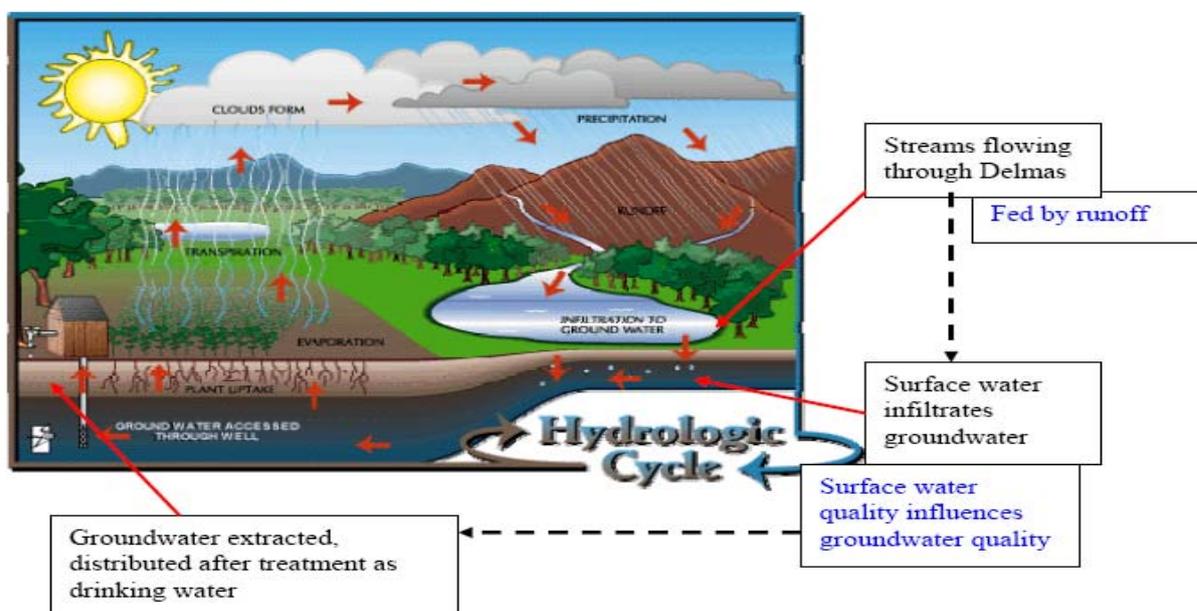
Year:	Act:	Summarised purpose and / or goal:
1983	Conservation of Agricultural Resources Act 43 of 1983.	Aim of this document is to ensure that agricultural land is used for agriculture and not exploited for urban or industrial use (RSA, 1983).
1994 (Nov.)	White Paper on Water Supply and Sanitation Policy.	This document is dedicated to the millions of SA’s citizens who struggle daily with the burden of not having the most basic of services (RSA, 1994).
1995 (Nov.)	White Paper on the Transformation of Public Service.	To establish a policy framework to guide the introduction and implementation of new policies and legislation aimed at transforming the South African public service (RSA, 1995).
1996 (Oct.)	Constitution of the Republic of South Africa Act 108 of 1996.	This is the supreme law of the Republic, which embraces the human rights principles and sets forth the right of access to water as part of a lengthy list of social and economic rights (RSA, 1996).
1997 (Oct.)	White Paper on Transforming Public Service Delivery (<i>Batho Pele</i> [people first] White Paper).	This seeks to introduce a fresh approach to service delivery: an approach which puts pressure on systems, procedures, attitudes and behaviour within the Public Service and reorients them in the customer’s favour, an approach which puts the people first (RSA, 1997a).

Table 1: Cont'd.

Year:	Act:	Summarised purpose and / or goal:
1997 (Dec.)	Water Services Act 108 of 1997.	To provide for, <i>inter alia</i> , the rights of access to basic water supply and basic sanitation, the setting of national standards and of norms and standards for tariffs, water services development plans, establishment of water boards, monitoring of water services, and financial assistance to water services institutions (RSA, 1997b).
1998 (Jul.)	Local Government: Municipal Demarcation Act 27 of 1998.	To provide for criteria and procedures for the determination of municipal boundaries by an independent authority (RSA, 1998a).
1998 (Aug.)	National Water Act 36 of 1998.	To recognise that water in SA is a scarce and unevenly distributed national resource which belongs to all its inhabitants and that the National Government is responsible for the nation's water resources and their use. This should be attained in a sustainable manner by means of, <i>inter alia</i> , integrated water catchment management of all aspects of water resources and, where appropriate, the delegation of management functions to a regional or catchment level so as to enable everyone to participate (RSA, 1998b).
1998 (Nov.)	National Environmental Management Act 107 of 1998.	To provide for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state (RSA, 1998c).
1998 (Dec.)	Local Government: Municipal Structures Act 117 of 1998.	To provide for the definition and establishment of municipalities in accordance with the requirements relating to categories and types of municipalities and provide for an appropriate division of functions and powers between the categories of municipalities (RSA, 1998d).
2000 (Nov.)	Local Government: Municipal Systems Act 32 of 2000.	To enable municipalities to move progressively towards the social and economic upliftment of local communities, and ensure universal access to essential services that are affordable to all (RSA, 2000).
2004 (Feb.)	Local Government: Municipal Finance Management Act 56 of 2003.	To secure sound and sustainable management of the financial affairs of municipalities and other institutions in the local sphere of government (RSA, 2003).

4. CONTEXT IN WHICH LOCAL GOVERNMENT AND AGRICULTURE MUST MANAGE POTABLE WATER SUPPLY

Government, together with its citizens, should know and understand that all of us as inhabitants of a semi-arid country and especially the public service rendering municipal officials, political office bearers and committed citizens of demarcated municipal areas and its structured policy executive institutions require more knowledge on the nature and extent of, *inter alia*, the so-called hydrological water cycle from rainfall to water runoff. See Figure 1 below.



(DWAF, 2002).

Figure 1: Nature of the geo-hydrological cycle in water management.

This hydrological system is highly complex and entails several processes (infiltration of water, surface water runoff, recharge of groundwater aquifers, seepage, re-infiltration of water, and moisture recycling) which are interconnected and interdependent with only one direction of flow: downstream (IUCN, 2005:22).

5. PLACE AND ROLE OF THE EXTENSION OFFICER

The Extension Officer (EO) can play a major role in conveying information such as presented above, convincing farmers of best practices and exposing them to some of these practices. He/she is in daily contact with farmers at various levels. And farmers, more than any other person, rely on water! The biggest demand for change toward water utilization is in agriculture. It is therefore the duty of the EO to make sure that farmers are well informed on the results of their farming practices. Alternatives should be made available to farmers. EOs should be on the forefront to do experiments on better farming methods – be it utilization of zero tillage or crop rotation or zero grazing. Farmers should be assisted in building linkages with fellow farmers which can act as mentors on best practices. They must learn from each other and pass knowledge on to the next generation. The role of the EO can never be under-estimated and he/she must ensure that farmers look after the land and the water that is available to them.

6. WAY FORWARD

The following examples have been adapted from Schulze & Perks (2000) to illustrate examples of existing and possible adaptation measures which could be considered in the water resources sector as a response to changes in climate:

- *Resource management - planned and co-ordinated use of river basin.* A more comprehensive planning across a river basin may allow more coordinated solutions to problems of land-use, water quality and water supply as well as address the effects of population, economic growth and changes in the demand of water;
- *Improved regulation of stream-flow through water storage dams and the control of abstraction and releases;*
- *Groundwater is likely to be most severely affected, with the groundwater static water-tables dropping due to reduced surface water recharge.* More effectively planned and monitored groundwater management systems should be put in place with early warning mechanisms to report depleted groundwater reserves;
- *Conservation of water - / demand management;*
- *Reduction in water services losses.* The domestic sector accounts for 15% of total national use and has the highest expected growth in demand. The level of unaccounted for potable water in urban distribution systems is between 15 and 20%;
- *Reduction of water losses due to agriculture.* As stated before, irrigation accounts for almost 60% of water used in SA. There are significant losses in many distribution and irrigation systems as well significant evaporation losses. Alternative irrigation methods and practices should be investigated;
- *Re-use and recycling of water.* Water not used in a consumptive manner should be re-used or recycled;
- *Control of water pollution / water quality.* Reducing water pollution effectively increases the supply of water, which in turn increases the safety margin for maintaining water supplies during droughts;
- *Allocation of water supplies by market-based systems.* The provision of water at prices below the true economic value is considered the main reason for inefficient use of water and allocation in SA;
- *Modification of catchment vegetation.* DWAF have initiated the 'Working for water' programme to remove invasive alien tree species (wattles, pine etc) from surface water catchments in SA. They cause the loss of some 7% of the annual flow in South Africa's rivers each year;
- *Contingency planning for drought.* Much research has been conducted into the adaptation to climate variability (droughts and floods) and specifically measures that could be taken to prevent or minimise the disruption and damage caused by such occurrences. In the past, most of this research has been conducted in the agricultural sector; more recently research has been focused on the impacts of drought and floods on people and their livelihoods;
- *Improved monitoring and forecasting systems for floods and drought;*

- *Inter-basin transfers*;
- *Marginal changes in construction of infrastructure*. Marginal increases in the size of dams or marginal changes in the construction of canals, pipelines, pumping plants and storm drainage should be considered;
- *Maintain options for new sites*. Potential sites for new dams should be kept open till they are required, since there are a limited number of sites that can be used efficiently as reservoirs. Removing structures once an area has been developed may be very costly or politically difficult; and
- *Crop substitution*. It has been observed that some farmers are substituting their crops with ones which require less water and perform better in high temperature. This is an expensive option, but the economics of this longer-term planning may justify the expenditure.

7. CONCLUSION

Nature does have a way of looking after herself. It is us humans who run the risk of becoming extinct. It is believed that man will come up with ingenious and creative ways to better manage its scarce and valuable natural resources. We therefore must try to become more street-wise and awake enough to adjust and be flexible and to modify systems while we still have the chance.

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