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The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

TECHNICAL BRIEF

Water resources management

How does South Africa's water resources management compare internationally?

A newly-completed Water Research Commission (WRC) study compared the South African approach to water resources management and planning with four other countries.

Background

South Africa has, for many years, managed its water resources in an efficient manner as evidenced by the infrequent requirement for water restrictions on strategic users despite the semi-arid nature of the country. However, the South African approach to managing water resources systems has largely been the same.

This study aimed to compare South Africa's approach to effectively manage its water resources with other countries. The overall objective was to determine whether or not South Africa can learn from other countries with similar water resources issues and improve the current methodologies, approaches and techniques based on their experiences.

The study compared the following areas: legislative framework; required documentation and typical studies carried out; institutional arrangements and modelling techniques.

Study approach

In order to benchmark South Africa's water resources management capabilities, four other countries were selected for evaluation and comparison. The selection was carried out randomly with factors such as water resources, language, availability of information and economic status all being considered.

The study was carried out purely as a literature review. A country representative was also selected based on knowledge of the water resources sector, and was asked to review their relevant country's information gathered for correctness.

Overview of water resources management

South Africa

South Africa is now well endowed with abundant freshwater resources. Despite this major challenge, the country has thus far managed to harness this resource in support of a strong economy and a vibrant society. This is achieved through effective water resources planning, infrastructure development, demand side management and effective service delivery.

It must, however, be stated that the country is facing serious challenges with regard to its water resources and the management thereof. Various concerns have been raised regarding pollution and resource quality, water security for both social and economic development, protection of the ecology as well as services quality. These concerns must be addressed as they have major social, economic, environmental, legal and political impacts on the lives and businesses of the population.

Australia

The management of water resources in Australia is a complex process, which differs in each state and territory. There are five levels of water management in Australia, namely national, cross-border, state/territory, regional and local.

Water management includes the following functions:

- Water pricing and economic regulation;

- Water planning and management;
- Water markets;
- Water supply and services; and
- Water quality management.

Due to this wide variation of activities in Australia, the focus for this literature review was narrowed down to 'water planning and management' on the state/territory level, focusing on the State of New South Wales.

Brazil

Brazil is a federal republic of South Africa, and is known as a country of plentiful water. About 13% of the world's surface water resources are in Brazil.

This perceived abundance, however, has delayed the realisation of water's scarcity and the need for it to be properly managed. Water resources management is a key element of Brazil's strategy to promote sustainable growth and a more equitable and inclusive society.

Brazil's achievements over the past 70 years have been closely linked to the development of hydraulic infrastructure for hydroelectric power generation and more recently for the development of irrigation infrastructure, especially in the Northeast region.

England

Salient features of the water sector in the United Kingdom compared to the other developed countries is the full privatisation of service provision and the pioneering of independent economic regulation in the sector. On average, only about 10% of freshwater resources in England and Wales are abstracted.

Water companies abstract almost half of this amount. The remainder is used for cooling power plants, other industries, fish farming and other uses. Water companies use mainly surface water and also groundwater.

USA: California

California's water system is large, complex and interconnected. Most precipitation falls in the sparsely populated northern and mountainous regions of the state during the winter, whereas most human water demands occur during the late spring, summer and early fall in the population and farming centres farther south and along the coast.

Precipitation also varies greatly across years, making the state susceptible to large floods and prolonged droughts. These conditions have led to the development of vast water infrastructure systems that store and convey water to demand centres and that protect residents as well as infrastructure from flooding.

Effective water management requires sound information, and water management systems as complex and extensive as California's require commensurately broad and well-organised scientific and technical support. The development of the Central Valley Project, the State Water Project, and the Central Valley flood control system all involved focused and systematic development of scientific and technical knowledge and expertise over decades.

The Hydraulic Era in California's water development required tremendous growth in technical expertise in all branches of government and the private sector. From this emerged one of the most complex and effective water supply and flood control systems in the world.

Comparison

Legislation

The legislative approaches for the five countries that were compared tend to be fairly similar. All use terms such as sustainable, integrated ad participatory.

South Africa, as with the others assessed, has recognised the need to include many levels of participatory inputs. It is interesting to note that all the countries are using legislation that has been updated or changed since the mid-1990s.

While South Africa's changes may have been originally motivated by the changing political environment, all the countries appeared to see the need to modify their legislation surrounding water in the late twentieth century.

This was probably due to a worldwide mind shift that recognised the need to protect water resources, focusing especially on the environment.
South Africa's and Australia's Acts are very similar, with many common threads. Brazil did not completely rewrite their legislation, but rather chose to add to it.

Both England and Brazil's legislation make mention of the 'classification' of water resources and 'resource quality objectives'. This is something that South Africa is currently focusing on, as it also forms part of the National Water Act's requirements.

An interesting aspect to the California legislation is that they view urban uses as the highest priority with irrigation second. They maintain that irrigation is directly linked to food production, and, and a result, should be allocated a high priority.

In South Africa, irrigation has traditionally been one of the lower priority users due to the large inefficiencies in the sector and the concept that farmers can withstand longer periods of drought than other more strategic users. The English legislation appears slightly different due to the focus on competition among companies as a result of privatisation of the sector.

Typical studies and documentation

As with the legislation, many similarities exist between the countries in terms of typical studies undertaken and documentation required to be produced to manage their water resources. The overall feeling is that South Africa is on a par in the documentation requirements, and appears ahead when it comes to studies and approaches to manage the water resources on an annual basis.

However, the delay with setting up catchment management agencies has resulted in some areas not having adequate strategies to manage their water resources as yet, and this is an area of concern.

South Africa's planning horizon of 25 years appears in line with the others, with England using 25 years, California 10 years and Australia 10 years.

Institutions

While it appears necessary to manage the countries on a State level due to their large sizes, New South Wales (Australia), California and Brazil all struggle with management relating to State versus Federal governments.

The States are usually given the mandate to manage, however, they still need to adhere to federal rules. In addition, there appears to be a major issues of governing boundaries not being the same as catchment boundaries.

In South Africa the approach to manage per water management area is sound as it eliminates this issue. The other countries are forming other organisations represented by various States to overcome the problem.

Models

Literature on water resources modelling in Australia makes mention of a modelling community and places a strong emphasis on the requirement to exchange issues, ideas and suggestions for users. South Africa is considered weak in this regard, and, while it was previously set up and maintained, this has all but stagnated to date.

The ad hoc exchange of ideas does take place, however, there is a need to build on this and allow for more users to participate and share information. California mentioned the backup support for the use of their main model CALSIM also lacks and should be improved.

Another aspect to learn from in the Australian context is the significant funding they put behind the development, maintenance and improvement of their water resources models. It is evident that they understand the importance of the models.

Conclusions and recommendations

The general conclusion is that South Africa, though for many still considered a developing country, currently maintains a very high standard in managing its water resources, and is comparable to some of the most developed countries in the world. It appears that, when comparing managing approaches, South Africa was, for many years, leading the group.

However, it appears that in recent years, a stagnation of further maintenance and development of the techniques used has allowed others to catch up and possibly even move past. It is believed that South Africa can learn from the other countries when it comes to model development, though the actual modelling approach and methodology used are still very highly rated.

It is recommended that:

- The legislative requirements for managing South Africa's water resources be adhered to, and that the establishment of all catchment management agencies take place without further delays.
- Mechanisms be put in place to further transfer knowledge and support from the Department of Water and Sanitation to the municipalities who have the responsibility of managing their own water resources.
- South Africa continues to use the standard modelling tools and methodologies that have been used in the past.
- South Africa build further on the existing tools to include GIS technology and explore the option of open source software.
- South Africa continues to provide funding for the enhancement and maintenance of the modelling tools.
- A strong support group for the users of the water resources management tools is established in order to share ideas and assist one another.
- South Africa implements a toolkit where all models are centrally stored and can be accessed, and where the need to duplicate model configuration is eliminated.

Further reading:
To order the report, *A comparison of the South African approach to water resources management and planning with four international countries* (**WRC Report No. KV 341/15**), contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.