

Knowledge: The Cornerstone of SA's Adaptation to CLIMATE CHANGE



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South Africa's food production could be severely hampered should warmer climatic conditions prevail in future.

The Water Research Commission (WRC) has redefined its research portfolio on climate change in the water field over the next five years.

The evidence for global climate change, largely as a result of human activities that produce greenhouse gas emissions, is overwhelming. There is rapidly growing consensus among global climate model projections regarding the nature and extent of the change. The main climate change consequences related to water resources are increases in temperature, shifts

in precipitation patterns, an increase in the frequency of flooding and droughts and, in the coastal areas, sea-level rise.

While the temperature signal produced by climate change is relatively clear, the precipitation signal is mostly still dominated by natural climate variability, as opposed to anthropogenic drivers of change. This could very well remain the

case for the next decade or so, especially at the river catchment scale.

With hydrological variability further amplified in response to variable rainfall; the small 'signal' amid the large level of 'noise' will make it difficult to detect hydrological and water resource impacts with any degree of confidence, thus adding to the challenge of planning appropriate water-sector responses to climate change.

Despite these challenges South Africa knows enough about what needs to be done to adapt or minimise the impact of climate change on its water resources, says WRC research manager: climate change, Chris Moseki. "A significant challenge is that the effects of climate change are often superimposed on other factors or stressors, such as the overutilisation of resources, and the effects of anthropogenic land-based activities on the quality of water. As a result, it may not be easy to state or apportion liability in quantitative terms to climate change as opposed to other culprits."

At present, most of the global circulation models used to project climate change are not appropriate downscaled to the level at which water resources are managed. "Consequently, uncertainties inherent in our model predictions are often used by sceptics whose main objective is to deny the reality of climate change," notes Moseki. "Paucity of monitoring data and climate information also pose challenges to appropriate input to climate models."

A POTENTIAL THREAT IS RECOGNISED

The WRC first recognised the potential impacts of climate change on the water resources of South Africa as a priority area for research area in the mid-1980s. At the time it was impossible even to begin to address the topic in a meaningful way because of the lack of scientific capacity and (especially computational) resources.

Still hydroclimatology was identified as a research field deserving of dedicated support and funding commenced in this area in 1988, initially focusing on mechanisms and teleconnections (especially links with sea surface temperatures that affect South Africa's climate. Over almost 20 years, roughly R30-million (excluding funding for cloud seeding research) was invested in more than 30 research projects in the field of hydroclimatology.

This research included topics such as the compilation of comprehensive

precipitation databases for South Africa, stochastic modelling of precipitation processes, cloud and precipitation physics (including rainfall enhancement), global and regional climate modelling, climate variability studies in relation to ocean-atmosphere processes and teleconnections (including El Niño and El Niña phenomena), precipitation prediction, scale interactions and downscaling.

Partners in this research have included various departments at the universities of Cape Town, KwaZulu-Natal and Pretoria, Witwatersrand and Zululand, as well as the South African Weather Service, and the Department of Water Affairs & Forestry (DWAFF). Besides the knowledge gained, significant contributions have been made to the development of local climate-related research capacity in climate science and its linkages to water resources.

PROJECTS IN PROGRESS

The first major WRC-funded study focusing explicitly on climate change and its impacts on South Africa's water resources started in 2002, with a comprehensive report being published in 2005, named *Climate Change and Water Resources in Southern Africa*. This project provided valuable insight into the

magnitude of the potential impacts and the consequential adaptation needs in the sector.

Present climate-change related projects being funded by the WRC include research on predicting the secondary impacts on water resources due to primary changes in precipitation and temperature associated with climate change; applications of rainfall forecasts for agriculturally-related decision-making in selected catchments; using enhanced knowledge of climate variability for the benefit of water resource management; and multidisciplinary analysis of hydroclimatic variability at the catchment scale.

New climate change-related projects to be approved by the WRC include identification, quantification and incorporation of risk and uncertainty in water resource management tools; an evaluation of the sensitivity of socio-economic activities to climate change in climatically divergent South African catchments; and integrating water resources and water services management tools.

Capacity building forms an important part of every research project. "While projects are undertaken graduate students form part of the product of



South Africa's poor population is especially vulnerable to the potential effects of climate change.

deliverables. Research project reports are also made available to all interested parties, including researchers, policy-makers, water managers, students and the general public for awareness and other purposes," reports Moseki.

REDEFINING THE FOCUS

The rapid growth in awareness and understanding of global-change issues over the past decade has produced the need to periodically refocus climate-change research. Accordingly, it has been decided to redefine the portfolio of climate change-related research that the WRC envisages supporting in the medium term.

The most necessary shift is probably for such research to be integrated into the larger body of national climate change research, thereby embracing a multi-sectoral, multi-level approach towards securing the water sector's contribution to enabling South Africa deal effectively with a multiplicity of existing stresses that climate change impacts will undoubtedly be adding to over coming decades.

The WRC's new proposed climate change research portfolio will provide direction for Commission funding of climate change-related research over the next five to ten years. The recommended portfolio consists of three main thrusts:

- **Impacts of climate change: Refinement and communication of climate-change scenarios, projections, information and data.** Internationally and locally, climate change science is continually refining and building on available data, information and knowledge. Because of currently poor communication channels, decision-makers and managers are not able to access up-to-date, suitably interpreted scientific products for immediate use. A high priority, therefore, is for the water sector, in partnership with other sectors, to research the development and sup-

port of an appropriate institution to fill this gap.

Identification and quantification of impacts. While the need for inter-sectoral collaboration to establish total water-related impacts of climate change across sectors is recognised, immediate research priorities remain water-sector focused. This is because of remaining critical knowledge gaps relating to direct and indirect impacts of climate change on water quality, the Ecological Reserve, river flow extremes and groundwater resources.

- **Adaptation to climate change: Enhancing adaptive capacity.** A water-sector specific research priority is for DWAF-led collaborative research that would enable DWAF and catchment management agencies to develop an integrated climate-change adaptation response strategy, thereby mainstreaming adaptation within water resource management, nationally and regionally. This would also inform the next revision of the National Water Resource Strategy.
- **Delivering (piloting) adaptation actions.** A high priority for national and local water-resource and water-use planning and management is to pilot the mainstreaming of climate change considerations into water institutional arrangements, including policies, strategies, pricing, governance etc. At catchment or community level, priority is given to either leading or contributing to cross-sectoral case studies that pilot adaptive action aimed at reducing the socio-economic impacts of climate variability and change on already stressed and vulnerable groups.
- **Mitigation of climate change:** With relatively few exceptions, the water sector will not be responsible for taking the lead in mitigation-related research and development projects. However, the sector is clearly a stakeholder in other

projects that have water use or water resource implications. In such instances, the forging of inter-sectoral research partnerships with water sector participation is highly appropriate.

This re-defined research portfolio is intended to ensure that, henceforth, water-sector research funds are invested effectively in the interests of making South African society better able to adapt successfully to the impacts of global climate change and more resilient in the face of enhanced climate variability.

The new portfolio has been well received by the sector, since they now have a direct link to a dedicated focal point at WRC on issues of their particular interest. "Researchers expect and deserve predictable support in their efforts to develop the knowledge base and skills on climate change issues," says Moseki.

He adds that decision-makers, especially at local government level, can no longer close their eyes to climate change and its associated challenges. "The impact of climate change on water resources and ecosystem goods and services have direct bearing on most of the other challenges municipalities currently face, including food security and health. Decision-makers should understand that dealing with climate change is not about undertaking some additional tasks, but rather about doing the same things differently or more efficiently. Taking account of the likely impacts of climate change is similar to taking your rain coat or umbrella with you when undertaking a journey to a rain-prone area."

To order a copy of the document, *Towards Defining the WRC Research Portfolio on Climate Change for 2008-2013 (WRC Report No: KV 207/08)* or *Climate Change and Water Resources in Southern Africa (WRC Report No: 1430/1/05)* contact Publications on Tel: (012) 330-0340 or E-mail: orders@wrc.org.za 