

Climate Change

Climate Change and Water

Refining a water-sector research portfolio to address potential challenges brought on by climate change.

Global Climate Change – Implications for Water Resources

The evidence for global climate change, largely attributable to human activities that produce greenhouse-gas emissions, is overwhelming. Predictions obtained from a range of global climate models reveal rapidly growing consensus regarding the nature and extent of the change. Water resources (surface and groundwater) are likely to be impacted through increases in temperature, changes in potential evaporation, shifts in precipitation patterns, increases in the frequency of floods and droughts, and, in coastal areas, sea-level rise.

Responding to Climate Change

At global and national level, appropriate ways of responding to climate change fall broadly into two categories, namely mitigation (i.e. reducing the net input of greenhouse gases into the atmosphere) and adaptation. Both are essential.

The International Panel on Climate Change (IPCC) has indicated that the momentum of climate change is already such that even the most stringent global mitigation efforts would not serve to reduce impacts in the next few decades. This makes adaptation at national and local scales essential in addressing short- and medium-term impacts.

At the same time, reliance cannot be placed on adaptation only. If climate change were allowed to proceed unmitigated, it is likely that the capacity of natural and human systems to adapt would be altogether exceeded.

National responses should thus comprise a mix of strategies that includes both adaptation and mitigation, appropriately supported by research (across the climatic, physical and human sciences) and technological development. On the other hand, sectoral responses should be biased towards either adaptation or mitigation, depending on the nature of the particular sector.

Water sector-focused climate change research: The *status quo*

In 2002, the South African water sector, through the WRC, initiated a comprehensive research programme on water-resource impacts of

climate change, which provided valuable insight into the magnitude of the potential impacts and consequential adaptation needs in the sector. Subsequently, first steps to incorporate research on vulnerability and adaptation into this programme have also been taken.

The largely successful impacts research leaned heavily on the outcomes of considerable prior investment by the WRC in water-related climate, atmosphere and ocean-atmosphere research, as well as hydrological modelling research, undertaken over a period of more than 15 years.

The rapid growth in awareness and understanding of global-change issues over the past decade has produced the need to continually refocus climate-related research. Accordingly, it was decided to redefine the portfolio of climate-related research that the WRC envisages supporting on behalf of the water sector.

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 to deal effectively with a multiplicity of existing stresses that climate change will undoubtedly be adding to over coming decades.

Redefining the research portfolio

The re-development of the water sector's climate change research portfolio was initiated and pursued with the assistance of a wide complement of stakeholders from within the sector and from other sectors. Material assembled from a range of national and international sources provided the contextual information for the drafting of a discussion document and for the construction of a framework defining the scope and content of research activities of potential concern to the water sector.

Research topics suggested by stakeholders were subsequently captured within this framework. A screening and prioritisation exercise, which included a stakeholder workshop, culminated in the production of a working document which, after further refinement in consultation with stakeholders, took the form of a proposed climate change research portfolio, for consideration by the WRC.

It is intended that this portfolio will provide direction for WRC funding of climate change-related research over the next five to ten years.

The context of the new research portfolio

Apart from the international context, captured in various reports, products by IPCC working groups and sources in the EU and UK, particular attention was paid to the South African context to ensure close alignment between the research portfolio being developed for the water sector and all other national climate change-related initiatives. In reviewing the local context, national water and environmental legislation, relevant initiatives of various government departments and applicable South African research projects (past, ongoing and near future) were considered.

Relevant government initiatives that provided insights of value in developing and aligning the water-sector climate change research portfolio include:

- National Climate Change Response Strategy (DoE);
- Assessment of South Africa's Climate Change-related Technology Needs (DST);
- National Climate Change R&D Strategy (DST);
- Discussion document: Climate Change and the Agricultural Sector (DoA);
- National Water Resources Strategy (DWA); and
- Clean Development Mechanism (CDM) projects (DME).

Research portfolio framework and priority projects

The recommended portfolio framework consists of three main thrusts (numbered 1-3), with subdivisions as indicated by the bullet points.

1 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. A high priority for the water sector is to partner other sectors in researching the development and support of an appropriate institution that will interpret new information and make useful knowledge available to decision-makers for immediate application.
- Identification and quantification of impacts. The portfolio framework recognises the importance of water sector-specific impacts research for filling crucial knowledge gaps. High priorities in this regard relate to the direct and indirect impacts of climate change on water quality, the Ecological Reserve, river flow extremes and groundwater resources.

The portfolio framework also provides for water-sector participation in inter-sectoral and cross-sectoral research. Inter-sectoral collaboration is needed to establish total water-related impacts of climate change across sectors.

Cross-sectoral research with water-sector leadership or input is typically needed to establish the integrated social, economic and environmental impact of climate change within a vulnerable region or community, given the fact that vulnerability invariably includes a water component.

2 Adaptation to climate change

- Enhancing adaptive capacity. A water-sector specific research

priority is for DWA-led collaborative research that would enable DWA and Catchment Management Agencies to develop an integrated climate-change adaptation response strategy. This is needed to, among others, enable the next revision of the National Water Resource Strategy to address climate change issues more adequately than was previously possible.

Another research priority in the water sector's domain concerns the development of adaptive management capacity with regard to water-linked ecosystems, based on a growing understanding of the effects of climate change on ecosystem biodiversity as well as on ecosystem goods and services.

Normally, however, useful research into enhancing adaptive capacity would transcend sectoral boundaries, especially where society is the beneficiary. Furthermore, adaptive capacity is only truly enhanced if the outcome is well-balanced in terms of enhanced social, economic and natural resilience. Priority research includes the development of tools and measures for assessing the effectiveness and efficiency of adaptation, preferably within the context of carefully chosen, socially relevant, case studies.

- 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 to reduce the socio-economic impacts of climate variability and change on already stressed and vulnerable groups.

3 Mitigation of climate change

With relatively few exceptions, the water sector will not be responsible for taking the lead in mitigation-related R&D projects. However, the sector is clearly a stakeholder in other sectors' projects, including CDM projects that have water use or water resource implications. In such instances, the forging of research partnerships to secure water sector participation is clearly appropriate and desirable.

Conclusion

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.

Further reading:

To obtain this report, *Towards Defining the WRC Research Portfolio on Climate Change for 2008-2013* (WRC Report No: KV 207/08) or the related report, *Climate Change and Water Resources in Southern Africa* (WRC Report No: 1430/1/05), contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; E-mail: orders@wrc.org.za; or Visit: www.wrc.org.za