

A new strategic framework for water-related health research[#]

G Offringa^{1*}, N Mjoli², SN Venter³, R Kfir¹ and A Moolman¹

¹Water Research Commission, Private Bag X03, Gezina 0031, South Africa

²Hlali Development Services, PO Box 28637, Sunnyside 0132, South Africa

³Department of Microbiology and Plant Pathology, University of Pretoria, Pretoria 0001, South Africa

Abstract

The aim of this study was to compile a new strategic framework to guide the funding and management of research in water-related human health in South Africa. This framework had to identify the research areas of highest need in the country and provide an effective, yet simple, tool for the management of research projects. A review of current water-related human health research was first undertaken. Using this review as background document, input was solicited from key people in Government, water boards, metro councils, science councils and universities. As part of the study, the country's research support infrastructure for water-related health research was investigated. The framework was finalised at a stakeholder workshop. A structure of Thrust Areas, with Programmes under each Thrust Area, was suggested for research management and funding. A matrix system of research thrusts versus impacts/risks, interventions and governance was further constructed to assist in the identification of research gaps, rendering the framework a very useful tool in the funding and management of water-related human health research.

Keywords: water, public health, research needs, research management

Introduction

The core business of the Water Research Commission (WRC) of South Africa is the strategic funding of water research of national importance and the management of water-centred knowledge (Water Research Commission, 2005). Research is addressed under the four, research-related, key strategic areas (KSAs) **Water Resources, Aquatic Ecosystems, Water Use and Waste Management, and Agricultural Water**. A further, matrix system of **Cross-Cutting Domains (CCDs)**, also known as **'Impact Areas'**, was implemented to form integrating frameworks across the KSAs. Each CCD addresses a specific theme and draws together programmes and projects which are being addressed within that theme for the research portfolios of the different KSAs. In addition, the cross-cutting domains provide leadership and support for new KSA initiatives which can further knowledge with regards to domain-related strategic research issues. The domains can also drive specific programmes and projects that are overarching and related to all KSAs in a general manner. The CCDs address the following themes:

- Water and Society
- Water and Economy
- Water and the Environment
- Water and Health (the subject of this paper)

Currently, research falling under the **Water and Health CCD** is categorised and managed in the following thrusts: *Microbial Water Quality and Associated Health Impact*; *Chemical Quality of Water and Associated Impact on Health*; and *Safeguarding Public Health*. However, both internally, and following com-

ments from stakeholders, it became clear that these categories were not adequately accentuating or addressing the real needs of the people of South Africa and had to be adapted.

Valuable research in water-related health has been supported by the WRC and other research institutions in South Africa (Mjoli and Venter, 2006). To guide the development of a new investment strategy for the **Water and Health CCD** over the next 3 to 6 years, and to assist in the improved management of the Domain, the WRC decided to review the research that has been conducted in recent years within the context of national needs and priorities, and to compile a new, strategic framework for the identification, funding and management of research in the **Water and Health CCD**. Adapting the research thrust categories to better address the needs of the population formed an integral part of this framework.

Methods

Firstly, a draft report on the status of water and health research was compiled, using a desk study approach (Mjoli and Venter, 2006). This consisted of a review of the national policy, legislative and strategic context for water and health research in South Africa and a review of the state of current water-related human health research at national and international level. The review for locally executed research was mainly based on research funded by the WRC and the South African Medical Research Council. The review also drew from other, internal (not published) strategic plans already prepared by the WRC in various aspects of water and human health research. The review, including the full findings of the survey, is fully described in Mjoli and Venter (2006).

The draft status review report was subsequently used as a background document for stakeholder consultation. Workshops, as well as group and individual interviews were conducted to solicit inputs from the key sector institutions, namely, government departments, water boards, metro councils, science councils and universities. Researchers were not interviewed

[#] Poster presentation at *IWA World Water Congress and Exhibition*, Beijing, 10 -14 September 2006

* To whom all correspondence should be addressed.

☎ +2712 330-9039; fax: +2712 331-1136;

e-mail: gerhardo@wrc.org.za

Received 19 April 2007; accepted in revised form 18 July 2007.

because most of them already participated in the development of the above-mentioned strategic plans. A matrix that categorises research in the field of water and health was compiled and used to identify strategic health issues and research gaps which will have to be addressed to meet the national water and human health priorities. This information served as the basis for the development of the strategic framework for water-related health research. The draft strategic framework document was subsequently presented at a stakeholder workshop to solicit further inputs before preparing a final strategic framework document.

Results and discussion

Policy and legislation

The survey of national legislation and policy relevant to human health and water revealed that 13 acts and other policy documents published by Government are (at least partly) aimed at improving the water-related health of the South African people, further also providing a governance framework for the national water and health research agenda. These pieces of legislation and their links to water-related health are further described by Mjoli and Venter (2006).

Survey of water-related health research

Both the international and national literature surveys of water-related health research provided a good reference from a point of assessing the WRC's completed and current (portfolio of research in water and health (WRC, 2005). Results from these surveys are fully discussed in Mjoli and Venter (2006). An analysis of the national survey showed that research was performed, *inter alia*, on the following subjects: Identification of sources and understanding the nature of emerging bacteria, viruses and parasites that are responsible for causing water-borne diseases; health risks associated with emerging pathogens; bacteriophages as indicators of water quality; bilharzia and malaria vectors; nitrates, fluorides, pesticides; endocrine disrupting chemicals; algal toxins in surface water; trihalomethanes in water; a series of user-friendly guidelines on the quality of domestic water supplies; membrane treatment; treatment technologies for rural communities and households; promotion of health and hygiene awareness; development of public health awareness and education materials; water reuse; water and sludge reuse for agriculture; linkage between HIV/AIDS and access to water services (Obi et al., 2006). As part of the survey, the country's research

support infrastructure for water-related health research was also investigated and listed (Mjoli and Venter, 2006).

From the literature survey of water-related health research, it was noted that a number of aspects were not addressed – and that very limited research results were actually fed back into the formulation of policy and legislation. There was also no evidence that research was influencing sector practice. It further became clear that the current categorisation of the research thrusts in the **Water and Health** CCD was not adequate to describe the real water-related health needs of the people of the country. From these realisations, a new approach and research matrix had to be developed.

A new research matrix for research needs analysis and portfolio management

Over the years various approaches have been used for the protection of human health against water-related diseases and other hazards such as chemical components. Globally, there is a strong move away from relying only on treatment processes and compliance monitoring to ensure safe drinking water quality, to a more holistic approach that focuses on addressing the entire water supply system. This new approach is referred to as an integrated preventative management approach and covers water supplies from the catchment to the consumer. This approach is, for example, strongly advocated by the *WHO 3rd Edition of the Water Quality Guidelines* (2004). The integrated preventative management approach is, however, not only limited to drinking water supplies but can be used amongst others for agricultural, recreational and occupational water uses as well. For this approach to be successful an understanding of the entire water cycle and its impact on human health is required. It also implies a far better understanding and control of point and diffuse pollution of water resources.

Based on the information requirements of this integrated, preventative management approach, a research matrix (Fig. 1) has been developed. This matrix combines all the key areas which should be addressed by research to ensure adequate protection of human health from negative water-related impacts. In line with international trends, the focus has not only been on research required for the management of drinking water quality but research required to deal with other aspects, such as recreational water quality, grey water management, wastewater re-use for agriculture, sludge disposal and pollution prevention of surface and groundwater sources. Five key areas required for the protection of human health have subsequently been identified (and are further discussed below). The first two areas deal with

		Resource protection		Public health protection		
		Ground water	Surface water	Drinking water	Agriculture and food	Recreation/ Occupation
Impacts/ Risks	Techniques/ Tools					
	Monitoring/ Surveillance					
	Risk assessment					
Interventions	Prevention/ Treatment					
	Management					
	Education and awareness					
Governance	Policies					
	Regulation/ Compliance					

Figure 1
Generic research matrix for needs gap analysis

land and water use issues whereas the other three areas cover important aspects of management and prevention strategies. Together these key areas form the basis of the research matrix. By further categorising the research actions into *Impacts/Risks*, *Interventions* and *Governance* (with each having sub-divisions as shown in Fig. 1), the matrix then becomes a research management tool. This tool allows for the easy identification and categorisation of research gaps existing, as shown in Fig. 3 and assists in the strategic management of the research portfolio.

Components of the research matrix

Resource protection

Resource protection addresses both surface and groundwater; the focus is on the detection, prevention and management of biological and chemical contaminants that impact negatively on the quality of water sources – and subsequently, on human health. A regulatory framework is necessary to regulate compliance to national water quality norms and standards for the different water user groups at a catchment level.

Public health protection

Public health protection addresses all the interventions that are undertaken to protect human and public health from all water-related hazards. These include ensuring access to safe drinking water and adequate sanitation for all sanitation provision, water for personal hygienic needs, wastewater management, public health awareness and protection of human exposure to contaminated water. A governance framework for regulating compliance to public health water quality standards for the different use categories is a very important aspect of safeguarding public health.

Evaluation of the current research portfolio

Utilising the research matrix described above the current and ongoing research projects funded by the WRC have been grouped in the matrix in order to get a better understanding of research gaps that need to be addressed in order to support the implementation of an integrated, preventive management approach.

The fact that certain areas have not received funding may be due to a number of reasons, for example, these areas may be of very low priority in terms of national needs or the methodology for conducting such research may not be available – or the area has been overlooked to date. Both currently running projects, as well as projects completed two years ago were included (Fig. 2). The projects are based on information extracted from the *WRC Knowledge Reviews* (Water Research Commission, 2003; 2004).

Based on the information depicted in Fig. 2, areas (shaded) within the research portfolio that have not received funding from the WRC during the past few years can easily be identified. (The actual *need* to fund projects in the shaded areas obviously depends on the priority of this area). It can further be deduced that until now governance issues have not received much attention in the field of water-related health. The actions that have taken place in governance have traditionally been conducted outside of the research arena within the realm of the government departments and the South African Bureau of Standards. Although water resource management policies have concentrated strongly on the protection of aquatic eco-systems and human health, the integration of the resource water quality and the drinking water quality aspects has not been one of the primary policy drivers. Figure 2 also indicates that the management of health-related water quality for recreational, occupational and agricultural water use is not one of the current priorities and that only limited information on the quality of the water is available for management purposes.

Water and human health research needs identified

Using the matrix as a tool, an extensive list of research gaps, down to project level, was identified as based on the review of current research on water and human health, international research trends and stakeholder inputs (listed and discussed fully in Mjoli and Venter, 2006). This list of research needs, forming part of the final framework, was finalised and ratified at a final stakeholder workshop. It will serve as a guide to the WRC for the selection and funding of future research in water-related health.

Figure 2
Research matrix for needs analysis, where * denotes on-going projects and + indicates projects completed in the last two years. The shaded areas show areas of no direct research funding by the WRC.

		Water resource protection and development		Public health protection		
		Ground-water	Surface water	Drinking water	Agriculture and food	Recreation/ Occupation
Impacts/Risks (adverse affects)	Techniques/ Tools	**	*** ++++ +++	***** ++++	*	*
	Monitoring/ Surveillance	+	*	***		
	Risk assessment		*** ++++ +++	*** +++++ ++	*	**
Interventions	Prevention/ Treatment			* +		
	Management	+	++++ +	*		
	Education and awareness			*** +	+	+
Governance	Policies					
	Regulation/ Compliance					

A framework for human health research

As final product flowing from the literature survey, the initial workshops and interviews, and finalised at the final, stakeholder workshop, the following structure of thrust areas, with programmes under each thrust area, was suggested for effective research management and funding of human health research:

Thrust 1: Resource protection

Programme 1: Detection, prevention and management of water-related microbial agents
Programme 2: Detection, prevention and management of chemicals and radioactive contaminants in water resources
Programme 3: Management of eutrophication and algal toxins
Programme 4: Management of impacts of land- use activities on surface and groundwater at catchment level.

Thrust 2: Drinking water

Programme 1: Drinking water quality management
Programme 2: Water treatment technologies and reticulation systems.

Thrust 3: Public health and hygiene issues

Programme 1: Public health and hygiene awareness and education material
Programme 2: Capacity building and training programmes for public health professionals and practitioners
Programme 3: HIV/AIDS linkage with water quality and quantity and access to adequate sanitation services
Programme 4: Impact of water quantity and service levels on human health.

Thrust 4: Sanitation and waste management

Programme 1: On-site sanitation treatment technologies and waste management
Programme 2: Use of waste as a resource
Programme 3: Management of waterborne sewerage and storm-water systems.

Thrust 5: Health implications of water uses other than domestic use

Programme 1: Impacts of quality of irrigation water on human health
Programme 2: Ensuring safe water for recreation
Programme 3: Management of health impacts associated with occupational exposure to water of poor quality.

Thrust 6: Governance systems for safeguarding human health

Programme 1: Governance system for the protection of public health from water-related impacts on human health
Programme 2: Regulatory framework for an integrated water quality management approach.

Conclusion

Utilising extensive stakeholder participation, a strategic framework was compiled to guide the funding and management of research in water-related human health in South Africa. The strategic framework is based on the fundamental principle of an integrated, preventative management approach applied from the catchment level to the consumer (WHO, 2004). New research thrust areas and programmes within the thrust areas have been suggested that are more logical – from a catchment-to-user approach – as well as more aligned with the true needs of the people of the country. A matrix system was devised, using these thrust areas and programmes, to assist in identifying the research gaps existing in the portfolio of the Water and Health Domain research projects. A number of important research gaps (such as the lack of research necessary to support water governance) were identified for future funding by the WRC. A framework of thrusts with programmes under each thrust was compiled from the surveys and research gaps identified which should provide for a more encompassing management of the research portfolio. It is foreseen that this matrix system and management framework may assist significantly in providing an effective, yet simple, tool for the strategic management of a portfolio of water-related health research projects.

References

- MJOLI N and VENTER SN (2006) A Strategic Framework for Water-Related Human Health Research. WRC Report No TT 257/06. Water Research Commission, Pretoria, South Africa.
- WORLD HEALTH ORGANIZATION (2004) *Guidelines for Drinking-Water Quality. Volume 1, Recommendations* (3rd edn.). World Health Organization, Geneva.
- OBI CL, ONABOLU B, MOMBA MNB, IGUMBOR JO, RAMALIVAHNA J, BESSONG PO, VAN RENSBERG EJ, LUKOTO M, GREEN E and MULAUDZI TB (2006) The interesting cross-paths of HIV/AIDS and water in Southern Africa with special reference to South Africa. *Water SA* **32** (3) 323-344 <http://www.wrc.org.za/downloads/watersa/2006/Jul%2006/1955.pdf>.
- WATER RESEARCH COMMISSION (2003) *Knowledge Review 2002/03*. Pretoria, South Africa.
- WATER RESEARCH COMMISSION (2004) *Knowledge Review 2003/04*. Pretoria, South Africa.
- WATER RESEARCH COMMISSION (2005) *Annual Report 2004/05*. Pretoria, South Africa.