Introduction

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As reflected in the WRC's mission and its various undertakings, the WRC functions as a 'hub' for water-centred knowledge. It is a networking organisation linking the nation and working through partnerships. Being an innovative organisation, it is continuously providing novel (and practical) ways of packaging knowledge and transforming knowledge into technology-based products for the water sector and the community at large, both locally and globally. The *Knowledge Review* before you aims at sharing the knowledge about the research activities of the WRC.

During the year 2002/2003 the WRC successfully implemented a new core strategy and progressed significantly towards turning the organisation into a dynamic and innovative 'hub' for water-centred knowledge. The WRC revised and implemented its core business process of funding. A new process of funding was introduced, allowing for three funding streams and the comprehensive reviewing of research proposals and a new contracting framework.

The WRC followed various routes to discuss the new strategy, research portfolio, new operational structures, funding process and its general *modus operandi* with many of its stakeholders. These included special visits, group presentations and discussions, workshops and presentations at conferences, symposia and other gatherings. Specific interactions with key stakeholders also took place around terms of reference for proposed solicited projects. The WRC has developed strong relationships with many of its stakeholders and has adopted several approaches to improve its understanding of the water sector's needs and aspirations. It has given high priority to appropriate packaging and timely transfer of knowledge and technology products and successfully launched a number of strategic positioning and marketing initiatives. The WRC has invested in building and diversifying the water-centred knowledge base in South Africa, as reflected in the capacity-building drive carried out through the funding of various research projects and other knowledge transfer initiatives. More than 300 students are currently supported by WRC project funds. Of these, about 70% are from previously disadvantaged backgrounds (see table below). The WRC currently supports several historically disadvantaged universities and a number of technikons throughout South Africa.

	Number of disadvantaged students	Total number of students		Number of disadvantaged students	Total number of students
Council for Geoscience	2	2	Tech Wits	5	7
CSIR		1	University of Cape Town	14	22
DIT	5	5	University of	16	16
Ecosun cc		1	Durban-Westville University of Natal	5	8
Endocrine Consortium *	10	14	University of Natal (Pmb)	4	17
ERWAT	3	3	University of Port Elizabeth	5	7
Highveld Biological Association	1	2	University of Pretoria	24	31
Institute for Water Research (Rhodes)	5	9	University of Stellenbosch	7	24
Institute of Natural Resources	12	17	University of the Free State	11	23
McCracken	1	1	University of the North	4	6
MEDUNSA	0	1	University of the Western Cape	18	18
Peninsula Tech	12	13	University of the Witwatersrand	11	16
PU for CHE	3	3	University of Venda	10	10
Pulles, Howard & de Lange	9	10	Water Systems Research Group	2	4
Rand Afrikaans University	3	5	**Total % of total students**	**211 (68%)**	**312**
Rhodes University	9	16			

*The consortium includes the universities of Fort Hare, MEDUNSA, Pretoria, Stellenbosch, Technikon Pretoria, CSIR, ARC, Du Buisson & Partners and SABS.

The WRC was also involved in a number of other local and international drives addressing capacity-building, e.g. the Eskom/NRF drive, WARFSA (Water Research Fund for Southern Africa) and FET-Water (capacity-building and training network for the water sector). The WRC is also represented in the COHORT task team, addressing the issue of R&D capacity in South Africa, and is a founding member of the *Women in Water Awards* (a young female scientist was provided with research sponsorship following this year's event).

The research portfolio for 2002/2003 (as presented in the greater part of this *Knowledge Review*) is

concentrating on generating new knowledge, as well as the transfer and dissemination of knowledge. The WRC supported various knowledge-centred activities aimed at improving South Africa's ability to appropriately address future water problems in the short- to the long-term. It addressed issues such as water for all, quality of life, and environmental sustainability, which are part and parcel of South Africa's national priorities and require considerable attention. In addition, the WRC has led numerous studies on strategic and implementation issues arising from recent water legislation, including the strategic approach to integrated water resource management (IWRM), the recognition of water as a basic human right and the resultant free water policy, as well as the right of the aquatic environment to its sustaining share of water (the Ecological Reserve).

A new funding process was developed and implemented allowing for three funding streams, i.e. solicited and non-solicited research proposals and consultancies. This included the institution of a new review process which raises and widens the reviewer's profile and allows for extensive feedback, as well as the establishment of new project management processes supported by a new contract format. The new approach of soliciting research also emphasises the building of consortia and the transfer of knowledge between organisations and individuals.

The WRC research portfolio: Investment in the generation and transfer of knowledge

During the year under review the WRC placed emphasis on playing a leading role in building a sustainable water-related knowledge base in South Africa by:

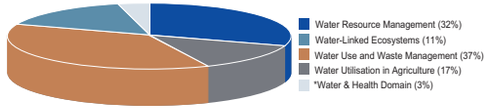
- Investing in water research and development
- Building sustainable and appropriate capacity
- Developing skills for the water sector
- Being adept at forming strategic partnerships in order to achieve objectives more effectively while making optimal use of the latest global information/knowledge and other technologies available.

The WRC met the challenge of being adaptive and responsive to a changing, dynamic environment by maintaining relevance and providing South Africa with value for the money invested in water R&D. This is reflected in the organisation's performance as measured against its strategic and operational objectives, in the portfolio of research projects and in other knowledge-generation and knowledge-transfer initiatives undertaken by the WRC during the year under review.

In 2002/2003 R62.4m. was invested in knowledge generation and capacity-building and a further R4.2m. in technology transfer and dissemination drives (patenting, publication of reports, workshops and conferences, knowledge reviews, publication of *Water SA*, *Amanzi* and *The Water Wheel*). The investment of R62.4m. in knowledge generation and capacity-building represents an increase of 13% from the last financial year (R55.2m.in 2001/2002).

During the reporting period the WRC financially supported 466 projects at a budgeted amount of R54.5m. Of these, 363 projects (about 78 %) were ongoing and 103 (about 22%) were new projects which commenced during the year under review. Of the ongoing projects, 35% (120 projects, or 26% of the total number of projects) were completed (finalised) during the year. In total, 121 research reports were published, some of which pertaining to projects which had been finalised during the previous financial year.

Distribution of research project funds (%)



* Water and Health was the only domain which was allocated research project funds

Key strategic areas (KSAs)

The KSAs commenced operation during 2002/2003, building new working relationships and operational modalities, and supporting both the internal and the external environment. The KSAs have developed their strategic and business plans and implemented these via their new research portfolios, which place emphasis on knowledge generation, dissemination and transfer, as well as capacity-building. Through discussion and consultation, new research thrusts and programmes were established, aimed at addressing key needs and guiding future research. During 2002/2003, these KSAs initiated their leadership role in directing and supporting water-centred knowledge generation in South Africa, linking and networking with local players as well as supporting strong partnerships with global players. The KSAs operate as strategic units, focusing on the recently-established strategic research portfolios, while investigating the need for future refinement based on stakeholder needs and feedback. The knowledge-centred KSA supports the water-centred KSAs in knowledge dissemination and information technology (IT) services.

During 2002/2003, the research portfolio of each KSA was structured on the basis of the new thrusts and programmes mentioned above. The call for research proposals (for projects due to commence in 2003/2004) was based on these KSA-specific research portfolios. Both solicited and non-solicited research proposals were invited, while KSAs also supported other initiatives such as workshops and consultancy projects. Each of the KSAs has also developed innovative processes to effectively manage its ongoing research projects. The WRC has also established a key strategic area addressing **Water-Centred Knowledge**.

• *Water Resource Management*

The strategic focus for research in this KSA is largely guided by the principles and objectives of the National Water Act (NWA) of 1998. The primary principle of the Act is that water resources should be managed to achieve optimum long-term social and economic benefits for all. This implies maintaining an optimum balance between protection of the environment and efficient water utilisation. This KSA supports the implementation of the policy by developing tools and technologies for water resource assessment and guidelines and decision-support systems to support decision-makers in achieving equitable and efficient allocation of water resources among competing needs. During 2002/2003 the research led by this KSA placed emphasis on multidisciplinary approaches that provide decision-makers and planners with appropriate tools that enable them to address social, environmental and economic factors in the planning of water resource development.

During this year, a shift in the research focus was initiated, from supporting policy-making to providing guidance for policy implementation and development of policy instruments. The research carried out during 2002/2003 enabled significant progress to be made towards the development of the necessary information systems, guidelines, decision-support systems, prediction tools and technologies/methodologies that support protection of water resources and equitable allocation of water to meet the needs of the environment and of social and economic development. The emphasis that the NWA puts on stakeholder participation in water resource management called for a number of research projects on effective participatory tools and approaches that can support multistakeholder participation in water resource management at catchment level. The potential impacts of global climate change on water resource management are also being addressed increasingly through research within this KSA.

Thrusts: Water Resource Management	Funds (Rm.)	No of projects	
		Ongoing	New
Water Resource Assessment	9.19	45	12
Integrated Water Resource Development	1.26	7	4
Management of Natural and Human-Induced Impacts	4.36	21	10
Policy Development and Institutional Arrangements for Water Resource Management	2.76	22	5
Total (126 projects)	**17.57**	**95**	**31**

• *Water-Linked Ecosystems*

Water-linked ecosystems are defined as in-stream (fully aquatic), riparian (dependent on water stored in the river banks and linked to the river) and water-table dependent (dependent on a water table, but not on surface water). This KSA focuses on the protection and sustainable utilisation of the aquatic environment and biota (in-stream, riparian and groundwater). This includes addressing research needs around the international conventions on environmental management (e.g. biodiversity) as well as human needs from the aquatic environment (e.g. sustainable management for equitable ecosystem resource utilisation, recreation and ecotourism).

During the year under review, progress has been made in developing technologies and methodologies, adaptive management processes and capacity in order to protect water-linked ecosystems and to sustain the flow of goods and services in a time of both demographic and climatic change in the Southern African context. Technologies and methodologies have been developed within this KSA to support the implementation of national water policy which aims to ensure sustainable resource use.

Thrusts: Water-Linked Ecosystems	Funds (Rm.)	No of projects	
		Ongoing	New
Ecosystem Management and Utilisation	4.85	24	11
Ecosystem Protection	1.05	8	2
Total (45 projects)	**5.90**	**32**	**13**

- ***Water Use and Waste Management***

This KSA focuses mainly on the domestic, industrial and mining water sectors and aims to proactively and effectively advance technology, science, management and policies relevant to water supply and waste and effluent management in the municipal, commercial, industrial and mining sectors. The KSA focuses on providing knowledge that ensures reliable, affordable and efficient services to enhance the quality of life and contribute to economic growth and improved public health. It addresses the management of water services in both rural and urban areas; the development of appropriate technologies for improving the quality and quantity of our water supplies for both domestic use and industrial applications; the development of new approaches to manage and enhance hygiene and sanitation practices; the provision of appropriate, innovative and integrated solutions to water and waste management in the industrial and mining sectors; the development of applications for improved treatment of wastewater and effluent and improved processes for enabling increased reuse thereof.

Thrusts: Water Use and Waste Management	Funds (Rm.)	No of projects	
		Ongoing	New
Water Services - Institutional and Management Issues	3.27	26	12
Water Supply and Treatment Technology	3.49	51	7
Wastewater and Effluent Treatment and Reuse Technology	9.41	78	19
Industrial and Mine-Water Management	3.84	22	9
Total (224 projects)	**20.01**	**177**	**47**

- ***Water Utilisation in Agriculture***

The strategic focus of this KSA is on increasing the efficient use of water for the production of food, fibre, fuelwood and timber, ensuring sustainable water resource use, reducing poverty and increasing the wealth of people dependent on water-based agriculture. The needs and requirements of present and future generations of subsistence, emergent and commercial farmers are addressed through the creation and application of water-efficient production technologies, models and information systems within the following inter-related subsectors of agriculture:

- Irrigated agriculture
- Dryland agriculture
- Woodlands and forestry
- Grasslands and livestock watering
- Aquaculture

The challenge for applied research and knowledge dissemination is to provide solutions to practical problems which are experienced in the process of utilisation, development and protection of water resources, thereby contributing to productivity growth in agriculture.

Thrusts: Water Utilisation in Agriculture	Funds (Rm.)	No of projects	
		Ongoing	New
Water Utilisation for Food and Fibre Production	1.56	9	2
Water Utilisation for Fuelwood and Timber Production	0.13	3	0
Water Utilisation for Poverty Reduction and Wealth Creation in Agriculture	4.56	157	
Water Resource Protection and Reclamation in Agriculture	3.11	15	3
Total (54 projects)	**9.36**	**42**	**12**

- ***Water-Centred Knowledge***

Knowledge management in a knowledge-intensive organisation like the WRC is both a core business activity as well as a support function, while IT-based systems and tools are key enablers. This KSA focuses on key aspects of knowledge management that are of importance to the water sector. This KSA also supports the management of knowledge that affects the efficient and effective 'operation' of the WRC. The focus is on the management and creation of documents, as well as their storage and reuse in IT-based systems. This KSA supports the widest possible dissemination of knowledge and information. This encompasses knowledge created via the support of the WRC as well as from other sources of water-centred knowledge. The main focus is on knowledge as a 'value-adding component' that can be located and re-organised, supporting the creation of, capture, distribution, measurement and management of knowledge.

Crosscutting domains

The core strategy of the WRC calls for specific mechanisms to address key strategic issues of national importance. This has been dealt with in four crosscutting domains which were established during 2002/2003 specifically for this purpose.

The crosscutting domains focus on the role of water with regard to the following major strategic issues:

- Water and Society
- Water and the Environment
- Water and the Economy
- Water and Health.

During the year under review (2002/2003), the importance of the issues addressed by the crosscutting domains was further emphasised by the emergence of similar issues in the agenda of the World Summit on Sustainable Development (WSSD), as well as in the newly developed agenda for New Partnership for Africa's Development (NEPAD). These domains form integrating frameworks across the KSAs and draw together programmes and projects within the portfolios of each of the KSAs which also address issues relevant to the domains.

The goals, intermediate goals, purpose, and outputs of the above crosscutting domains were identified and developed further. The overarching view is given below in 'logical framework' format.

Goals	1. Sustainable social and economic development is achieved at national and catchment levels 2 Poverty and water-associated diseases are alleviated 3 Degradation of the water-linked environment is arrested and reversed.
Interme-diate goals	1. A balanced, mutual understanding and appreciation of societal, economic, environmental and transboundary water roles and requirements have resulted in a reduced potential for conflict and greater potential for co-operation and sustainability. 2. There exists general awareness, understanding and appreciation of the various roles and responsibilities that water managers, water institutions and water users need to assume, in the interests of achieving both environmental/community health and equitable, sustainable, social and economic development. 3. Knowledge, pertaining to best uses of available water resources for achieving sustainable social and economic development and community and environmental health targets, is available to managers and users, and can be effectively applied.
Purpose	1. The WRC and partner organisations are able to facilitate, among stakeholders, awareness creation of key water-associated health, developmental and environmental issues, in the interests of resolving inter-sectoral and transboundary conflict and promoting co-operation (*Outputs 1, 6*). 2. The WRC and appropriate development agencies focus on developmental and environmental issues of real need/concern, and use this strategic focus to guide investment in further research, development and implementation along paths of high priority (*Outputs 2, 3*). 3. Planners and decision-makers use developed analytical and decision-making tools (e.g. water valuation, risk assessment, multicriteria decision-making, social-economic-environmental modelling tools, etc.) to assist in making informed choices concerning water-linked social, economic, environmental and health issues which need to be addressed (*Outputs 4, 5, 6*). 4. The work of planners and decision-makers is facilitated by having decision-making tools which are integrative, i.e. tools which appropriately weight and combine necessary data and information from a variety of relevant sources (*Outputs 5, 6*). 5 Practitioners are able to use appropriate "best practice" guidelines for any water-linked development task at hand (e.g. for obtaining stakeholder/community participation, for providing water services within the context of an integrated approach to poverty alleviation, etc.) (*Outputs 6, 7*). 6. Policy-makers are provided with material to be used for refining water policy, water institutions and co-operative governance, in the combined interests of the health and well-being of society, the economy and the environment (*Output 8*).
Outputs	1. State-of-art reviews pertaining to water as a key factor in sustainable social and economic development as well as community and environmental health. 2. Needs analyses/assessments relating to optimising roles and usage of water in helping to achieve integrated developmental and environmental targets. 3. Strategic research and development portfolios tailored to identified needs. 4. Analytical tools, e.g. integrated risk assessment, tools for valuation of water, modelling tools, etc. 5. Tools for integrated decision-making, e.g. multicriteria decision-making tools, socio-economic modelling tools, etc. 6. Information dissemination and knowledge-transfer strategies for awareness creation and application, respectively. 7. Best-practice guidelines relating to water-linked societal, economic and environmental practices within the context of sustainable development. 8. Policy analyses/assessments and proposals for policy improvement and filling of policy gaps.