INTRODUCTION

The Role of the WRC is Critical to Meet the Water-Related Challenges Facing our Nation

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Being a water-stressed country, South Africa needs progressively to find innovative ways of managing water resources to ensure that the basic needs of its citizens are met, that social and economic development are not restricted through lack or poor quality of water, and that sustainability of water resources and of water-dependent ecosystems is secured.

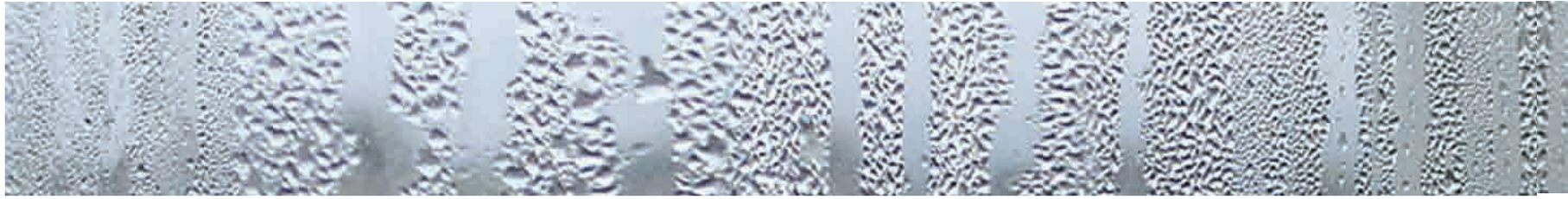
South Africa remains threatened by water shortages. At the same time, water quality issues are becoming more acute and climate change may result in a higher frequency of extreme events. The management of water resources needs to adapt dynamically to such changing circumstances. Challenges posed by the integrated management of both the resource and its uses, issues of water supply and sanitation and the provision of related services and the building and sustaining of a competence-base that will allow the water sector to maintain and further grow its capabilities, skills and ability to address these key issues, are overwhelming. The role of the WRC as a water-centred hub and its dynamic, strategic realignment with the needs of our country and more specifically, the water sector, are therefore critical to the meeting of these challenges. The WRC has already built a substantial knowledge base, rendering the country in a much 'better' position to deal with many of its current and future water-related problems.

During the past three years, the WRC has steadily progressed towards developing the organisation and building it to serve South Africa with a greater level of relevance in an effective and efficient manner. The WRC has undergone a major restructuring, followed by a consolidation period aimed at laying the foundation for ongoing revitalisation and renewal. The organisation has followed a strategy which ensures that, as South Africa's dynamic hub for water-centred knowledge, it provides the nation with knowledge that serves to improve the quality of life of all its citizens. In accordance with this strategy, the WRC has widened its activities from investing in the creation of new water-centred knowledge to the dissemination, sharing, transfer and application of this knowledge.

Functioning as a dynamic 'hub' the WRC continuously and widely engages the water sector and other key stakeholders in order to assist in reviewing and re-directing its research portfolio. During 2004/05 the WRC undertook a survey to determine how stakeholders view and rate the performance of the WRC. Special emphasis was put on the WRC's vision, mission and key strategic objectives. The findings of the survey indicated an average overall rating of above 4 (out of 5) and that the majority of stakeholders agreed that the WRC is relevant and is true to its mission and vision. The WRC attempt to improve its knowledge dissemination and sharing activities was highly appreciated and the feedback given in the above survey indicated that WRC's publications are regarded of high importance and high quality.

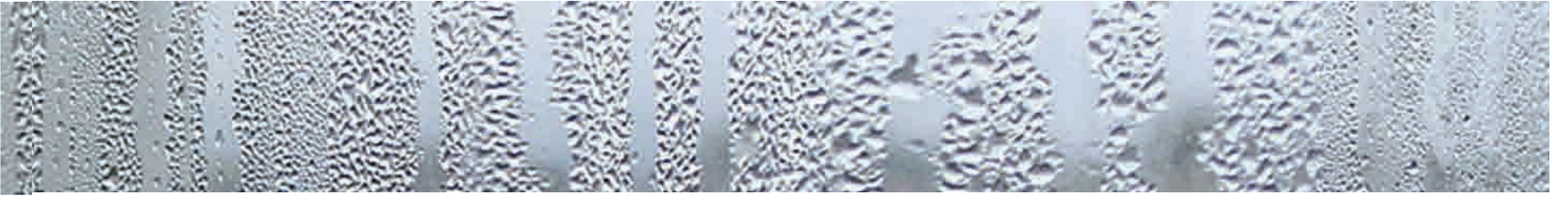
Although the WRC has supported the creation of appropriate new knowledge and has been actively seeking innovative knowledge dissemination and sharing mechanisms many key challenges are still facing our nation, the water sector and the WRC. One of such challenges is the possible role the WRC (and the South African water research community) can play in Africa supporting the spirit of NEPAD and other government initiatives. Another immense challenge facing our country is the building of future professional capacity and a future generation of researchers. The WRC has put great emphasis on strengthening the water-centred knowledge base of South Africa. During the 2004/05 financial year the WRC, with the support of the Minister of Water Affairs and

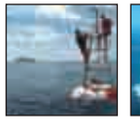
the visible difference



Forestry, launched and widely distributed a booklet *Water @ Work-A Career Guide* addressing potential careers in the water field. In the area of capacity building the WRC has further improved its support to students with special emphasis on historically disadvantaged students. Currently about 465 students are supported by WRC projects of whom about 60% are disadvantaged (see table below).

Organisation	Number of disadvantaged students	Total number of students
BKS	2	2
C Swartz	5	5
Coaltech 2002	1	1
Council for Geoscience	1	1
CSIR	14	31
Digby Wells and Associates	2	4
DSS	1	1
Durban Institute of Technology	6	6
Emanti Management (Pty) Ltd	2	2
Envi-Sabi Scientific	1	1
ERWAT	1	1
Golder Associates Africa (Pty) Ltd	5	9
Hlathi Development Consultants	1	1
Human Sciences Research Council	1	1
Independent Economic Researchers	1	1
Institute of Natural Resources	7	10
Mvula Trust	1	1
Nelson Mandela Metropolitan University	9	17
Ninham Shand (Pty) Ltd	1	1
Cape Peninsula University of Technology	4	4
PD Naidoo & Associates	1	1
Phillip Pybus	1	1
Pulles, Howard & de Lange	11	15
Rand Water	1	1
Rhodes University	12	23
TBR Project	1	1
Tshwane University of Technology / Technikon Pretoria	12	14
Umgeni Water	2	2
University of Cape Town	13	25
University of Free State	17	30
University of Fort Hare	12	12
University of Johannesburg	4	4
University of KwaZulu-Natal	47	88
University of the North	4	6
University of Pretoria	10	24
University of Stellenbosch	10	48
University of the Western Cape	17	28
University of the Witwatersrand	10	18
University of Venda	20	21
University of Zululand	2	2
Zakhe Training College	1	1
	274	465




A special edition of *The Water Wheel* was published in March 2005 to commemorate National Water Week. This edition, which featured articles of interest to learners and included a water quiz, was distributed at the SABC Career Fair, SciTech and delivered to schools in the Gauteng area. The WRC also participated in initiatives for the improvement of public understanding of science such as the Youth Water Prize, Sasolburg Scifest and the WRC-Rhodes University Open Day.

Capacity-building activities have been widened to provide support for African and global initiatives aimed at building capacity in Africa, examples being the WRC's role in the NEPAD initiative aimed at building water-related centres of excellence in Africa and the leadership role the CEO of the WRC plays in *Streams of Knowledge*, a network of capacity-building organisations focused on water and sanitation, with most members being from various parts of Africa, including two institutions from South Africa (Mvula Thrust and NSCWI). In addition, the WRC is represented on the Board of the Water Research Fund of Southern Africa (WARFSA). WARFSA is a water research fund supported mostly through Swedish funding. The purpose of this fund is to build research capacity among individuals and institutions as well as to promote the utilisation of results in the planning and management of water resources in the sub-region. This is in appreciation of the fact that water research activities in the water sector of the Southern African Development Community (SADC) are limited largely due to lack of capacity to develop and carry out sound research projects as well as funding constraints.

The WRC also strongly supports and houses the Water Information Network (WIN). WIN is a network of organisations (both governmental and non-governmental) in the water services sector that works to ensure that this body of knowledge is well-managed, readily accessible and applicable, and leads to improved decision-making and performance in the areas of water and sanitation. The WRC also provides leadership and management to WIN.

In the area of knowledge application/commercialisation, the WRC continues its drive to provide the country with applied knowledge and water-related innovation. One of the recent examples of achievement in this arena is the licensing of the BioSURE™ process (Rhodes University) to ERWAT. Another significant achievement is the transfer of solar still technology to the Municipality of Kerkplaas in the Cape Province. A number of other licensing agreements have been reviewed and some are being re-negotiated. During January 2005 a new licensing agreement addressing the Petro™ process was signed. In addition to the above, the WRC has discussed its new IP policy and benefit-sharing policy with many of its research providers with the aim of clarifying its contractual requirements for future research projects and improving the understanding regarding the protection of IP within the water research community. The WRC has also taken an active part in the activities of the South African Research and Innovation Association (SARIMA).

The WRC has maintained its effectiveness in fund management as reflected in the high ratio (about 75%) between funds invested in knowledge creation/funding and supporting activities and its total income budget. It is planned to maintain and even improve this ratio in the 2005/06 financial year.

THE WRC'S RESEARCH PORTFOLIO AND KEY STRATEGIC AREAS (KSAs)

INVESTING IN THE CREATION AND SHARING OF KNOWLEDGE

During 2004/05 the WRC, based on the assessment of its research portfolio during the previous year when there was wide-ranging consultation with many of its stakeholders concerning the scope of its operations and its strategic direction, continued to invest in the creation of knowledge via four main key strategic areas (KSAs). These areas include **Water Resource Management, Water-Linked Ecosystems, Water Use and Waste Management**, and **Water Utilisation in Agriculture**. In general, the portfolio as planned for the year was well received by the various stakeholders. The KSA-based structure, with its four water-centred KSAs (as mentioned above), supported by the knowledge-centred KSA, continued to form the core operating framework for WRC-funded R&D, was further consolidated during the year and became accepted generally.

Funds invested in the creation of new water-centred knowledge during 2004/05 followed a similar pattern of fund distribution among various types of research providers as in previous years, with higher education institutions being the major recipients.

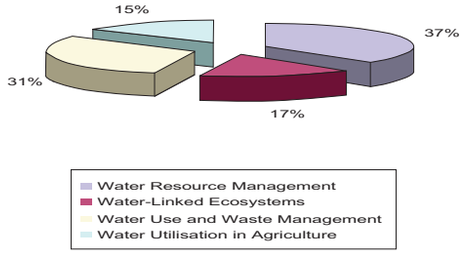
The WRC supported a total of 454 research projects, of which about 78% (356 projects) were active projects (ongoing and new) and about 22% (98 projects) were finalised. The active projects comprised 274 ongoing projects and 82 newly initiated projects that commenced during 2004/05. The various mechanisms of funding include both non-solicited projects, accommodating projects within the broad research strategy of each KSA and solicited projects, where research projects are developed in accordance with clear terms of reference, aimed at solving specific problems. The WRC supported 41 solicited projects, which translates to about 12% of active projects. While 19 solicited projects were ongoing, 22 newly solicited projects commenced during the year.

In comparison with the previous year, 2004/05 shows a 12% decrease in the number of projects, i.e. 454 projects in 2004/05 vs. 517 in the previous year. The number of active projects was reduced by about 10% (from 395 in the previous year to 356 projects during the year under review). The trend of reduction in the total number of projects is a result of a drive to improve management of research projects, with emphasis being placed on prompt finalisation of projects, as is also reflected in the high numbers of projects finalised both during 2003/04 (122 projects) and during 2004/05 (98 projects). While there is a clear trend of a reduction in the total number of projects, there is also a trend towards an increase in the number of new projects, which was up by about 52% (54 new projects commenced during 2003/04 and 82 during 2004/05). The finalisation of 220 projects and initiation of 136 new projects during the past two years illustrates a strong emphasis on renewal of the research portfolio. By using the mechanism of solicited research, the WRC has effectively managed the relevance of the research portfolio and provided leadership with regard to the creation of new water-centred knowledge. During the year the WRC increased the number of solicited projects from the 6% of active projects in 2003/04 to about 12% of active projects in 2004/05. The increase in the number of solicited projects also contributed to the overall reduction in active (ongoing and new) projects during the year under review, as solicited projects are often large multi-year, multi-provider (consortia-based) projects, often with annual budgets in excess of R1m. per annum.

Utilisation of funds by the various KSAs

The percentage utilisation of research project funds (based on amounts actually paid out) by the KSAs during 2004/05 was as follows:

Utilisation of Research Project Funds



About 54.5% was invested in projects that focused on water resources (including water-linked ecosystems) and about 45.5% in projects that focused on water utilisation (including effluent treatment and management, as well as agriculture).

While, based on cash paid out, the overall investment in research projects (knowledge creation) was R53.7m., investment in the total support of knowledge creation, sharing and dissemination amounted to R62.5m. Both the investments in research projects and in research support, expressed as a percentage of total expenditure, were close to the set budgeted ratios. The ratio addressing funding of the creation of new knowledge (research projects only) is very similar to that of the previous year, with a slight (2%) increase. The decrease in the ratio for research support is due to savings in publication costs and the more effective management of the WRC's patent portfolio that resulted in an additional saving of about R0.33m.

KEY STRATEGIC AREAS (KSAs)

During 2004/05 the KSAs funded research and other related knowledge-sharing, dissemination and application activities using their business plans and more specifically, their revised strategic research portfolios, as the basis for their operational frameworks.

Based on the outcome of a recent customer/stakeholder survey, the WRC in its current strategic structural format, provides leadership and direction to South Africa. Consequently, no major changes in the core KSA structure, i.e. the four water-centred KSAs and the knowledge-centred KSA, are envisaged for the next financial year. The knowledge-centred KSA will continue to support the water-centred KSAs in knowledge dissemination and IT services as well as contributing towards water-centred knowledge management in Africa and globally.

Water Resource Management

Scope

The strategic focus for research in this KSA continued to be 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 utilisation. This KSA supports the implementation of the NWA by developing tools and technologies for water resource assessment, guidelines and decision-support systems to support decision makers in achieving equitable and efficient allocation of water resources among competing needs. The research places emphasis on multidisciplinary approaches that provide decision makers and planners with appropriate tools that enable them to take cognizance of social, environmental and economic factors in the planning of water resource development. During 2004/05 the research focus shifted from supporting policy-making to providing guidance for policy implementation and development of policy instruments. The challenge for research in this KSA is to provide 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, social and economic development. The NWA places emphasis on stakeholder participation in water resource management; this requires effective participatory tools and approaches that can support multi-stakeholder participation in water resource management at catchment level. The potential negative impact of global climate change on water resource management is also being addressed through research within this KSA.

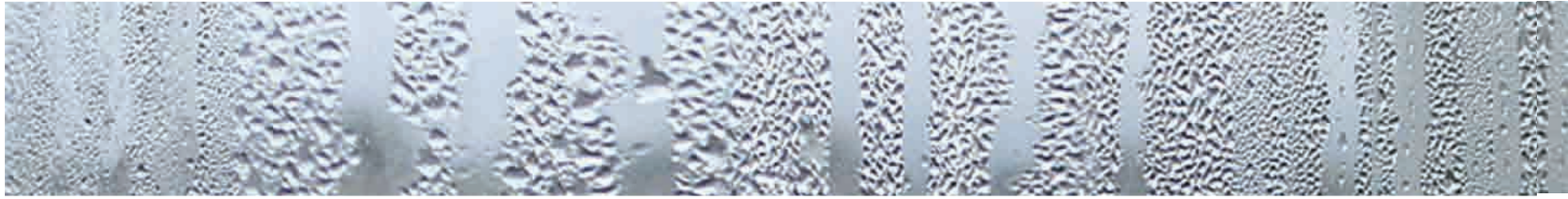
During 2004/05 the research portfolio included new initiatives and current projects addressing the scope described above. Overall, about R19.35m. was invested (paid out) in 168 projects. Of these, 28 projects were initiated during the year under review while 113 were ongoing. Of the 141 active projects (new and ongoing) about 9% (12) were solicited. During the year under review 27 projects were finalised and 30 reports published.

Water-Linked Ecosystems

Scope

Research undertaken within this KSA during 2004/05 continued to address the conservation of aquatic ecosystems in order to provide the knowledge for their sustainable functioning in support of the National Water Resource Strategy (NWRS) focus on resource protection, the national commitment to international conventions and the ongoing provision of goods and services that ecosystems deliver. No major changes in strategic direction were implemented during the year under review.

Water-linked ecosystems are defined as in-stream (fully aquatic), riparian (dependent on water stored in the riverbanks and linked to the river) and water table-dependent (dependent on a water table, but not on surface water). This KSA continued to focus on the protection and sustainable utilisation of the aquatic environment and biota (in-stream, riparian and groundwater). This includes the 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 2004/05 the research portfolio included new initiatives and current projects addressing the scope described above. Overall, about R8.77m. was invested (paid out) in 56 projects. Of these, 9 projects were initiated during the year under review while 30 were ongoing. Of the active ongoing and new projects (39 projects) about 15% (6) were solicited projects. During the year 17 projects were finalised and 12 reports published.

Water Use and Waste Management

Scope

This KSA focused mainly on the domestic, industrial and mining water sectors. It aimed to proactively and effectively lead and support the advancement of technology, science, management and policies relevant to water supply, waste and effluent management, for these sectors. This KSA also supported studies on institutional and management issues, with special emphasis on the efficient functioning of water service institutions and their viability. Research on infrastructure for both water supply and sanitation was included. A further focus was on water supply and treatment technology serving the domestic (urban, rural, large and small systems) as well as the industrial/commercial and mining sectors of our economy. This KSA also focused on waste and effluent as well as reuse technologies that can support the municipal, mining and industrial sectors and improve management in these sectors with the aim of improving productivity and supporting economic growth while minimising negative effects on human and environmental health.

During 2004/05 the KSA continued its activities in the light of the results of strategic needs analysis and stakeholder engagement. Feedback from these exercises has ratified the KSA direction and contributed many valuable inputs in strengthening the portfolio. A new dedicated and focused thrust addressing issues regarding sanitation and hygiene was introduced and the scope of the thrust Wastewater Treatment and Technology was broadened to include stormwater and sewerage research. These two subjects are strongly related to wastewater management and are best integrated and incorporated into this thrust. These changes contributed to strengthening the portfolio of the KSA and provided the KSA with greater relevancy and focus.

During 2004/05 the research portfolio included new initiatives and current projects addressing the scope described above. Overall, about R17.37m. was invested (paid out) in 181 projects. Of these, 38 projects were initiated during the year under review while 99 were ongoing. Of the active ongoing and new projects (137) about 7% (10) were solicited projects. During the year under review 44 projects were finalised and 40 reports published.

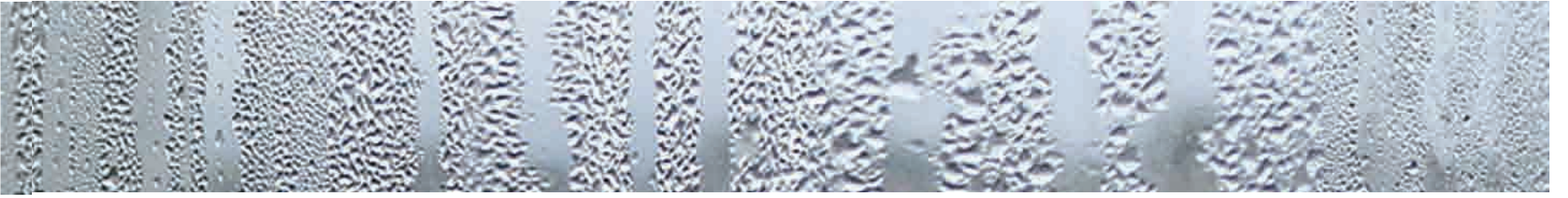
Water Utilisation in Agriculture

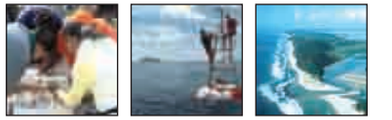
Scope

The strategic focus in this KSA has been on increasing the efficient use of water for the production of food, fibre, fuel-wood and timber; ensuring sustainable water resource use; reducing poverty and increasing wealth of people dependent on water-based agriculture. The needs and requirements of present and future generations of subsistence, emergent and commercial farmers continued to be addressed through the creation and application of water-efficient production technologies, models and information systems within the following interrelated subsectors of agriculture, namely:

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

The challenge for applied research and knowledge dissemination has been 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.





During 2004/05 the research portfolio included new initiatives and current projects addressing the scope described above. Overall, about R7.9m. was invested (paid out) in 49 projects. Of these, 7 projects were initiated during the year under review while 32 were ongoing. Of the active ongoing and new projects (39) about 33% (13) were solicited projects. During the year under review 10 projects were finalised and 6 reports published.

Water-Centred Knowledge

Scope

The WRC continues to function as a knowledge organisation and hence its fundamental business processes are knowledge-based, thereby creating value for the WRC and its stakeholders. Our knowledge capabilities determine our effectiveness at creating value through those processes. Knowledge management, i.e. the creation and dissemination of knowledge, requires both cultural and functional changes. The embodiment of the culture of knowledge forms the basis of the WRC mission and is the focus of the WRC vision.

Driven by external needs, the WRC will strive to continuously improve its position as the dynamic hub for water-centred knowledge, innovation, and intellectual capital in South Africa. The knowledge to be managed is both explicit, documented knowledge and tacit, subjective knowledge. Management of knowledge in the WRC will therefore entail all the processes associated with the identification, sharing and creation of knowledge. This will require systems for the creation and maintenance of knowledge repositories, and for the support of the cultivation and facilitation of the sharing of knowledge and organisational learning. Internally, for the WRC to succeed in knowledge management, it has to view knowledge as an asset and to develop organisational norms and values, which support the creation, and sharing of knowledge, both internally as well as externally.

Crosscutting Domains

The WRC's mission statement requires the WRC's R&D portfolio to contribute to a better quality of life for all South Africans. This means that investment in the creation of water-centred knowledge must seek outcomes which promote social development and societal well-being, economic growth that benefits all, a better environment and minimisation of health risks. Achieving these goals has called for the establishment of four crosscutting domains: **Water and Society; Water and the Economy; Water and the Environment**; and **Water and Health** to serve as frameworks for integrating research initiatives across the KSAs and for ensuring that the R&D portfolio of the WRC as a whole is sufficiently well focused on these important national issues. Not only are these issues of national importance, but they also enjoy regional and international priority, as clearly indicated by the agendas of major events and movements such as the WSSD, the 3rd World Water Forum and NEPAD.

The domains draw together relevant programmes and projects that are under way within the portfolios of each of the KSAs and focus them on issues falling within the scope of the various thrusts in each of the domains. It is also the role of each of the domains to provide leadership and support for new KSA initiatives needed to further knowledge with regard to various domain-related strategic thrusts. When necessary, the domains may also drive specific programmes and projects that are overarching and relate to all KSAs in a general manner.

Water and Society

Scope

The scope of this domain continues to address water as a social good and the vital role water plays in social development. It provides an integrating framework for, and further facilitates expansion of, that research and development within the different KSAs which contributes to a sound balance between the manner in which water resources are used and cared for by society, and the benefits which society as a whole derives from the use of water. The domain endeavours to find ways to assist society in developing a sound understanding and appreciation of the various issues around water as a scarce resource, as these relate to the need for equitable (including transboundary) sharing of the resource,

avoidance of conflict, promotion of co-operative water resource management and productive and sustainable resource use. Finding improved, sustainable and socially acceptable ways of meeting society's needs for water services is another important focus area because of the continuing service backlog. Furthermore, inter-linkages between poverty issues, gender issues and access to water and water services need to be established, and the knowledge gained applied in promoting poverty alleviation and better quality of life for society as a whole.

Water and Economy

Scope

The scope of research addressed by this domain has remained unchanged from the previous year. In the SA context water is first and foremost treated as a common (social) good. Water is recognised as being essential for sustaining life and is a commodity to which people and the aquatic environment have a legally protected right. However, water is also recognised as an economic good, the use of which has a major impact on the creation of wealth and the well-being of people. Almost without exception, there is an increasing interest in assessing the economic value of water, using water as a catalyst for the generation of wealth and prosperity, and using economic instruments to increase efficiency and effect desired behavioural change among water users. The use of water tariffs to effect changes in water consumption and the use of waste discharge charges to internalise pollution costs and, in so doing, effect pollution reduction and desirable improvements in water quality, are currently being investigated with a view to implementation.
This domain will integrate the economic aspects of water-related investigations funded by the KSAs. It will also identify overarching issues that need to be addressed at a higher level of integration. Projects and activities under this domain will determine the value of water, assess its role in wealth creation and the use of economic instruments in changing the behaviour of society at the appropriate micro-, regional and national levels.

Water and the Environment

Scope

The scope of research in this domain will remain the same following changes introduced at the commencement of the 2004/05 financial year as a result of extensive stakeholder consultation.

Incomplete knowledge and understanding of the linkages between environmental components (atmospheric, marine, terrestrial, aquatic, subterranean) within the hydrological cycle, and between the hydrological cycle and governance systems, hinder sustainable water resources management. This crosscutting domain promotes enhanced understanding of whole-ecosystem functioning in the context of the broader environment and its effects on water resources, and supports the development and application of good environmental governance systems. Activities within this domain contribute to sustainable water resources management that meets the changing needs of society, by combining:

Our understanding of good governance principles; with
Our knowledge of environmental components (atmospheric, marine, terrestrial, aquatic, subterranean) and processes within the hydrological cycle.

The primary focus of the domain is to integrate existing and new insights generated by research within and between the KSAs and by other institutions working in related fields. In addition, this domain will stimulate the generation of specific new knowledge and understanding that will equip the water sector to anticipate and respond appropriately to changes within the biophysical environment. Although this domain is characterised by integrating research at a high / meta-data analysis level, it is recognised that such research is only possible on the assumption that we have a sound foundation of appropriate basic research (and data) in place.

Water and Health

Scope

Water-related health forms a crucial and integral component of our daily quality of life. Health-related

water research is undertaken with the aim of improving water quality and hygiene practices in order to save lives and reduce the cost and effort in treating diseases and their symptoms.

This domain continues to play an essential role in providing an integrating framework for all the WRC's health-related research and development initiatives, identifying gaps and negotiating the initiation of gap-filling research in crucial areas. In fulfilling this role, the domain assumes the responsibility for the structuring of a co-ordinated, needs-driven, dynamic health-related water research portfolio on behalf of the WRC, with contributing projects being funded and managed in the appropriate KSAs.

The focus is on water-linked health impact associated with microbial or chemical contamination or transferred via water-associated vectors. The domain aims to improve knowledge regarding the origin, survival and persistence of microbial, biological and chemical agents that may pollute water and may affect human health. The domain supports the development and utilisation of methodologies to identify and quantify the occurrence of pathogens and contaminants in water, as well as risk assessment and epidemiological studies.

A holistic, multidisciplinary approach is followed in order to develop a comprehensive understanding of the origin/sources and spatial extent of pollution; water usage patterns; the effects of degraded water quality on human and animal health and the need for, and efficiency of, various water treatment options. The development of guidelines, protocols, manuals and pamphlets as tools to disseminate research findings is supported. The emphasis is on a pro-active approach to identify and address causes, rather than on a passive response to addressing symptoms. This approach should ensure research products that are relevant, user-friendly, practical and scientifically valid.