

Introduction

Detailed business plans for each of the KSAs have been developed, providing an in-depth presentation of its research portfolio. The following section presents a short summary highlighting the scope for each of the KSAs.

water resource management

Scope

The strategic focus for research in this KSA was reviewed internally and externally and it was concluded that no major changes in focus are required. The focus will continue 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 policy 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 puts 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.

The research focus is shifting 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 puts 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 2003/04 the research portfolio included new initiatives and current projects addressing the objectives mentioned above. Overall, about R21.6m was invested in 144 projects. Of these, 15 projects were initiated during the year under review while 129 were ongoing. During the year under review, 36 projects were finalised and 49 reports published.

water-linked ecosystems

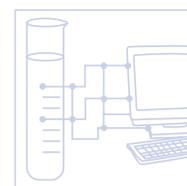
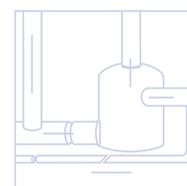
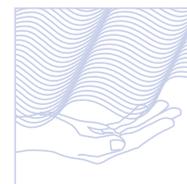
Scope

Research undertaken within this KSA will continue to address the conservation of aquatic ecosystems in order to provide the knowledge for their sustainable functioning in terms of the national commitment to international conventions and the ongoing provision of goods and services which ecosystems deliver. In addition, the National Water Resource Strategy (NWRS) focuses on resource protection as one of its components. The research undertaken in this KSA provides knowledge for protection of the resource, and is therefore central to this aspect of the NWRS. No major changes in strategic direction are envisaged and the research portfolio as presented in the previous year's strategy was found to be sound and applicable. Deviation in programme focus or structure will be highlighted below.

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 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).

The above will be achieved by developing technologies and methodologies, adaptive management processes and capacity to protect the resource 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 will be developed within this KSA to support the implementation of the national water policy to ensure sustainable resource use.

During 2003/04 the research portfolio included new initiatives and current projects addressing the objectives mentioned above. Overall, about R9.2m was invested in 51 projects, of which 8 projects were initiated during the year under review while 43 were ongoing. During the year under review 18 projects were finalised and 22 reports





published.

water use and waste management

Scope

The **Water Use and Waste Management** KSA focuses mainly on the domestic, industrial and mining water sectors. It aims 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 supports 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 is included. A further focus is 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 focuses 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 effect on human and environmental health.

The research portfolio for 2003/04 included new initiatives and current projects addressing the objectives mentioned above. Overall, about R27.4m was invested in 144 projects, of which 24 projects were initiated during the year under review while 120 were ongoing. During the year under review 52 projects were finalised and 47 reports published.

water utilisation in agriculture

Scope

The strategic focus in this KSA has been reviewed and found to reflect current and future research needs. It was concluded that the strategic focus as described in the *2002/03 Knowledge Review* is appropriate. The focus is on increasing the efficient use of water for 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 will be addressed through 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 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.

During 2003/04, the research portfolio included new initiatives and current projects addressing the objectives mentioned above. Overall, about R9.9m was invested in 48 projects. Of these, 7 projects were initiated during the year under review, while 41 were ongoing. During the year under review 16 projects were finalised and 10 reports published.

water-centred knowledge

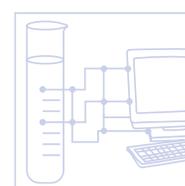
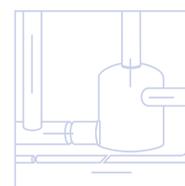
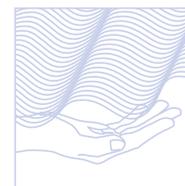
Scope

This KSA continued to focus on knowledge management during the year under review in a similar mode and direction as described in the previous year, while there would be additional emphasis on the development and protection of knowledge resources. 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

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vision. During the next financial year management, creation and transfer of knowledge will continue to be the keys for the WRC in providing a valuable service to the South African water users.

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 core strategy of the WRC calls for specific mechanisms to address key strategic issues of national importance. These issues are dealt with in four crosscutting domains which were established specifically for this purpose. Apart from their national importance, the issues addressed by the domains also enjoy regional and international priority, as the agendas of major events and movements such as the WSSD, the 3rd World Water Forum and NEPAD have clearly shown. The crosscutting domains form integrating frameworks across the KSAs. They draw together programmes and projects which are under way within the portfolios of each of the KSAs and which address issues relevant to each of the domains. It is also the role of each of the domains to provide leadership and support for new KSA initiatives which can further knowledge with regard to domain-related strategic thrusts being addressed within the various KSAs. The domains may also drive specific programmes/projects that are overarching and relate to all KSAs in a general manner.

The crosscutting domains address the following key issues:

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

water and society

Scope

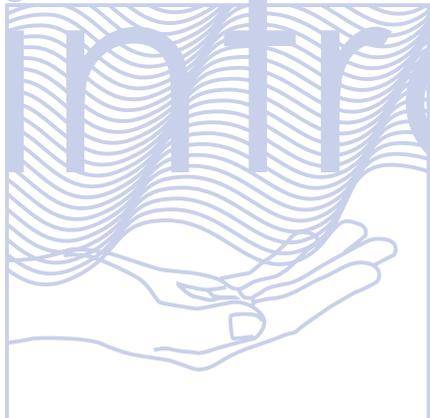
The scope of this domain continues to address water as a social good and the vital role water plays in social development. It provides an integrating framework for, and further facilitates expansion of, that research and development within the different KSAs which contributes to a sound balance between the manner in which water resources are used and cared for by society, and the benefits which society as a whole derive 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 the 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

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management options worthy of investigation and are, in fact, provided for in the National Water Act along with the selling of water use licences under specific circumstances.

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 and 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 has been re-assessed and redefined following extensive stakeholder consultation and needs analysis.

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 resource 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 resource 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 and subterranean) and processes within the hydrological cycle.

The primary focus of the domain will be 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

This domain continues to have an essential role to play 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 mainly at KSA level.

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 symptoms of disease. The focus is on water-linked diseases 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 animal and human health and the need for water treatment. 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.

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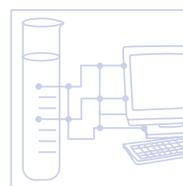
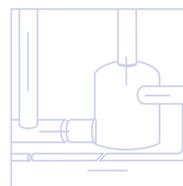
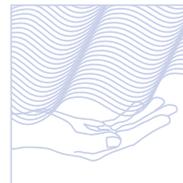
As reflected in the Water Research Commission (WRC) mission and its various undertakings, the WRC functions as a 'hub' for water-centred knowledge. It is a networking organisation linking the nation and working through partnerships. Being an innovative organisation it is continuously providing novel (and practical) ways of packaging and transferring knowledge to the water sector and the community at large, both locally and globally.

The WRC plays 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 competences/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

During 2003/04 the WRC further implemented its core strategy developed during 2002/03. While 2002/03 was a year of rapid transformation, 2003/04 has been a year where strong emphasis has been put on consolidation and positioning of the 'new' WRC, both internally and externally. The WRC has built a strong foundation for functioning as a water-centred knowledge hub locally, and positioned itself in Africa and globally, as reflected in the organisation's achievements to date. During 2003/04 great strides were made in positioning the organisation with a number of key stakeholders locally, including government departments, the SA Parliament and other segments of the water sector (SALGA, SAAWU). Internationally the WRC has built strong links with the Africa Water Utilities Partnerships, African representative partners of *Streams of Knowledge* and WARFSA and many other forums, while globally the WRC is involved in many initiatives of various UN organisations (e.g. UNEP, WHO, WWF) and other international coalitions and bodies (a few examples are WSSCC, GWRC, Penta-Party, IWMI). The organisation consulted widely with many of its stakeholders regarding the scope of its operation and its strategic direction. Feedback from internal and external stakeholders affirms the core strategy and operational modality as described in the *Core Strategy and Business Plan of 2002/03*. In the light of the above the WRC assessed its research portfolio and accordingly, no major changes were implemented in the core KSA structure, i.e. the four water-centred KSAs and the knowledge-centred KSA continued to form the base operating structure. Good progress has been made towards achieving the objectives set with regard to the key performance areas (KPA), which indicate that the WRC is functioning in a manner which is true to its mission and advancing rapidly towards the strategic position set out in its vision. The organisation has improved its internal efficiency and its effectiveness as well as its relevance to its key stakeholders and South Africa at large. The WRC continues to strive towards being a highly relevant and effective organisation, highly sustainable and emphasising continuous renewal.

The WRC has initiated and implemented a number of drives regarding the strengthening of the water-centred knowledge base of South Africa. In the area of **capacity building** the WRC has greatly improved its support to students with special emphasis on historically disadvantaged students. Currently about 428 students are supported by the various WRC projects (an average ratio of about 2 students per ongoing active project). This represents a substantial increase from 300 students reported in the *2002/03 Knowledge Review* (an increase of 43%). Of the total number of students, about 280 students, i.e. 66%, are disadvantaged. In addition to capacity building which is project-specific, the WRC has been and is planning to continue to support student participation in local and international conferences, for example, the WRC sponsored the IWA Conference in September 2003, Cape Town, which included three conferences in one, i.e. *Health-Related Water Microbiology*, *Biofilm Formation and Sustainable Development*. The WRC sponsorship made provision for 25 young South African students (many from disadvantaged backgrounds) to attend the conference. The WRC also supported the youth (*Youth Water award*) and gender-linked awards such as the *Women in Water award*. The WRC is participating in and is planning to further strengthen its involvement in broadening the knowledge of the youth with regard to water issues and has published a short supplement in *The Water Wheel* focusing on role models enjoying successful careers in the water field. The WRC is currently developing a booklet giving a concise account of careers in the water sector.



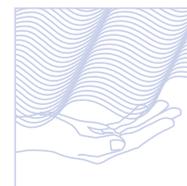
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Organisation	Number of disadvantaged Students	Total number of students
Council for Geosciences	1	2
C Swartz	5	5
Coaltech 2002	4	6
CSIR	10	19
Durban Institute of Technology	3	4
Du Pisanie	2	2
Ecosun cc		1
Envi-Sabi Scientific	3	3
Endocrine Consortium *	22	28
ERWAT	4	4
Highveld Biological Association	1	3
Institute for Water Research (Rhodes)	5	9
Institute of Natural Resources	7	9
Lowveld College of Education	2	2
McCracken Solar Stills	1	2
Northern Gauteng Technikon		1
Palmer Development	1	1
Pegasus	1	1
Peninsula Technikon	8	10
PE Technikon	1	1
Phillip Pybus	1	1
PU for CHE	3	5
Pulles, Howard & de Lange (CE) Inc.	9	10
Rand Afrikaans University		2
Rhodes University	13	24
SA Weather Services	1	1
SRK (CE) Inc.	1	2
Stewart Scott (CE) Inc.	1	2
Techikon Wits	2	4
Technikon SA	3	3
Technikon Pretoria	17	22
Umgeni Water	2	2
University of Cape Town	16	34
University of Durban-Westville	2	2
University of Free State	15	25
University of Fort Hare	6	6
University of Natal	28	42
University of the North	3	5
University of Port Elizabeth	5	14
University of Pretoria	25	35
University of Stellenbosch	13	26
University of the Western Cape	21	27
University of the Witwatersrand	8	17
University of Venda	4	4

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In the area of **knowledge application/commercialisation**, the WRC established an Intellectual Property and Benefit Sharing Policy aimed at improving water-centred knowledge transfer and application and increasing revenue via such commercialisation activities. The WRC has reviewed its patent portfolio and identified a new modality for managing the portfolio. In the area of **knowledge dissemination** the feedback regarding the organisational drives supporting knowledge transfer and dissemination clearly indicate the importance of these activities as part of the WRC key role as a knowledge hub. While *Water SA* continues to be a flagship scientific and technical journal attracting global contributions and wide local and global readerships, *The Water Wheel* provides a route for disseminating popularised water-centred knowledge to the wider sector/public. The *WRC Knowledge Review* provides an accurate account of all WRC research activities on an annual basis and is indicated to be of very high value locally, in Africa and globally. The WRC plans to further improve such knowledge dissemination activities and widen their scope; for example, a book about water in SA from a historical and cultural perspective is to be compiled and published; linking water to the arts is another planned initiative in collaboration with the Department of Arts and Culture, libraries and other parties.

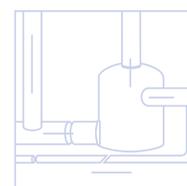


The WRC research portfolio

The research portfolio for 2003/04 (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.



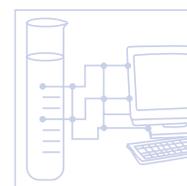
During 2003/04 the WRC assessed its research portfolio and consulted widely with many of its stakeholders regarding the scope of its operation and its strategic direction. In general, the portfolio as planned for the year under review was well received by the various stakeholders. The KSA-based structure, with its four water-centred KSAs and its knowledge-centred KSA, continued to form the core operating framework for WRC-funded R&D, was further consolidated and became accepted generally.



Through its various KSAs and crosscutting domains, the WRC supported 395 research projects, including 371 non-solicited and 24 new solicited projects during the year under review. This group of solicited projects was the first to be initiated in accordance with the WRC's new strategy, i.e. to allocate a significant proportion of available funding to solicited projects that are specifically designed to pro-actively address critical research needs. During 2003/04 solicited projects (to which 52% of available funds for new research was allocated), therefore, already comprised 44% of the 54 new projects which were initiated. Of the 395 projects supported, 341 are ongoing, multi-year research projects. However, the ongoing projects, despite making up 86% of all projects, have been allocated less than 50% of the available funds, reflecting a move to fewer, larger projects, and the fact that many projects were already in their final stages of completion during 2003/04.

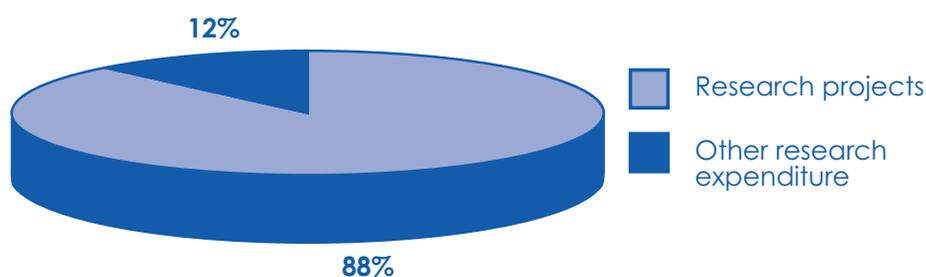


The distribution of research project funds among the various categories of research providers (these being tertiary educational institutions, science councils, consultants, governmental institutions and NGOs) was in general similar to that of the previous year (2002/03), when higher education institutions (university and technikons) were the major contributors to WRC-funded research and thus also the major recipients of funds.

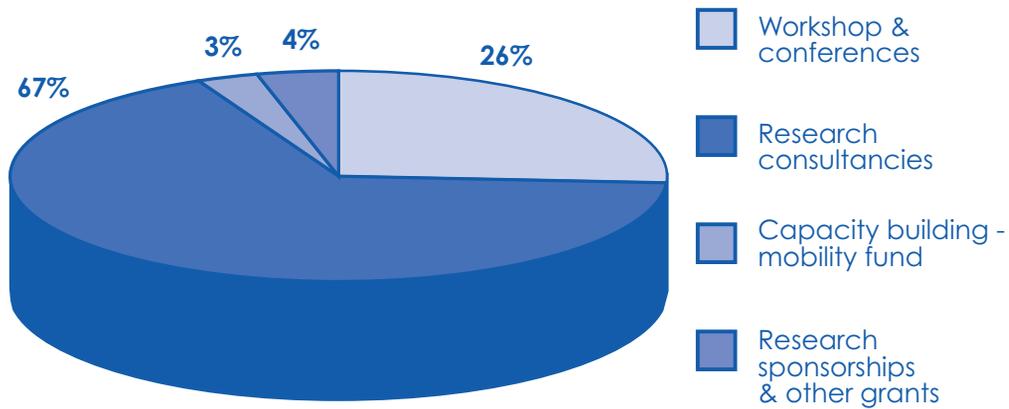


The strategic allocation of research project funds between the water-centred research KSAs for 2003/04 resulted in **Water Resource Management** receiving 31% of the funds, **Water-Linked Ecosystems** 13%, **Water Use and Waste Management** 40% and **Water Utilisation in Agriculture** 14%. The balance (2%) was allocated to the crosscutting domains (1%) and held in the central fund (1%). The relative allocation of funding to research focusing on water resources (including water-linked ecosystems) and water utilisation (domestic, municipal, industrial and agricultural, including effluent treatment and management) has remained very similar to that of the previous year (2002/03).

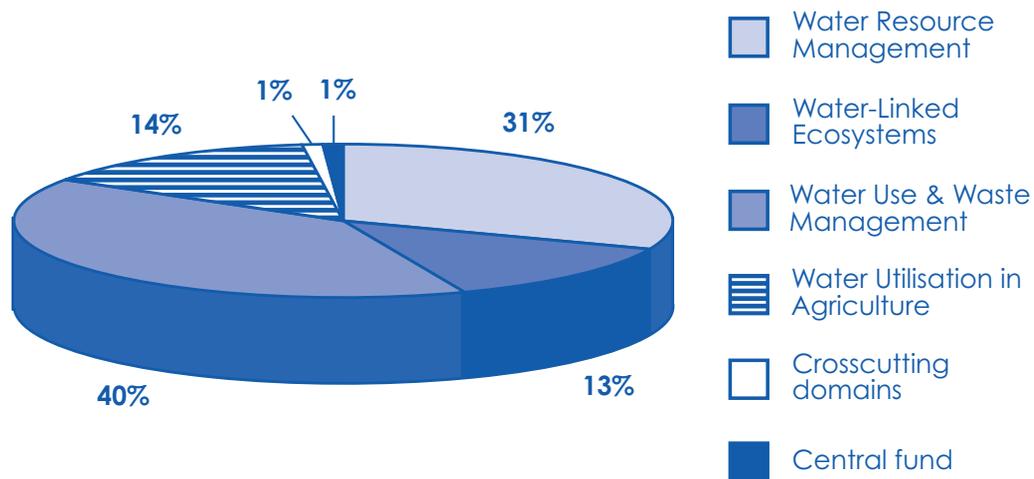
Percentage allocation of research funds to:



Percentage allocation of non-project research funds to other research-related activities



Percentage allocation of project funds to KSAs and crosscutting domains



During 2003/04 the KSAs consulted widely with many of their stakeholders regarding their scope of operations and strategic direction, and accordingly refined their strategic and business plans. As part of this process, numerous workshops were arranged and other knowledge-sharing activities undertaken in support of further development of each KSA's research portfolio. New KSA-specific research portfolios were initiated. The KSAs continued to operate as strategic units which place emphasis on knowledge generation, dissemination and transfer, as well as capacity-building. They have provided strong leadership, directing and supporting water-centred knowledge generation in South Africa, linking and networking with local players and supporting strong partnerships with global players. The **Water-Centred Knowledge** KSA, in particular, has supported a number of knowledge-sharing and dissemination initiatives, including the assumption of the leadership of WIN.

The call for research proposals during 2003/04 (for projects due to commence in 2004/05) was based on KSA-specific research portfolios and included a call for both solicited and non-solicited research proposals. During 2003/04 a call for research proposals based on current research portfolios was followed by a thorough selection process and the acceptance of 81 research projects for funding. This includes 60 non-solicited and 21 solicited projects.