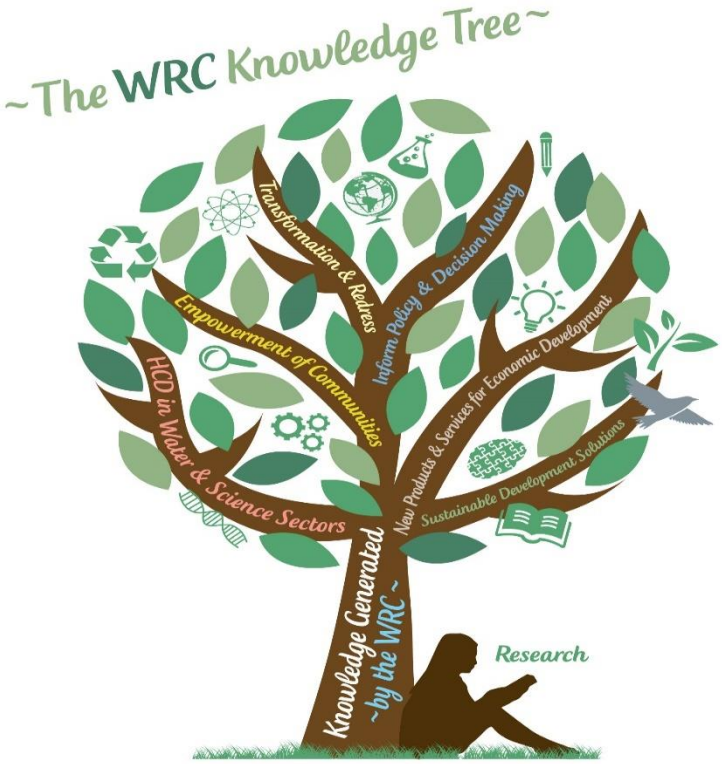
# WATER
# RESEARCH COMMISSION




## Corporate Plan for the fiscal years 2015/16 – 2019/20

# The WRC Vision

To have highly informed water decision-making through science and technology at all levels, in all stakeholder groups, and innovative water solutions through research and development for South Africa, Africa and the world

# WRC Mission

To be a global water knowledge node and South Africa's premier water knowledge hub active across the Innovation Value Chain that:

- informs policy and decision making;
- creates new products, innovation and services for socio-economic development;
- develops human capital in the water science sector;
- empowers communities and reduces poverty;
- supports the national transformation and redress project; and
- develops sustainable solutions and deepens water research and development in South Africa, Africa and the developing world.

# WRC Values

- A culture of learning and sharing
- Innovation and creativity
- Integrity and fairness
- A spirit of professionalism and service orientation
- Facilitating empowerment and social change
- Good governance

# OFFICIAL SIGN-OFF

It is hereby certified that this Corporate Plan:

1. Was developed by the Water Research Commission under the guidance of the Water Research Commission Board.

2. Takes into account all the relevant policies, legislation and other mandates for which the Water Research Commission is responsible.

3. Accurately reflects the strategic outcome-oriented goals and objectives which the Water Research Commission will endeavour to achieve over the period 2015/16 – 2019/20.

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Chief Financial Officer

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Chief Executive Officer

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Chairperson of the WRC Board

# EXECUTIVE SUMMARY

This five-year Corporate Plan (CP15) focuses on the period 2015/16 to 2019/20, in line with Treasury directives, and builds on the WRC Corporate Plan developed for the 2013/14 – 2017/18 and 2014/15 – 2018/19 periods. This expanded planning period provides an opportunity to take a longer-term perspective and covers very important national and international milestones.

CP15 is therefore positioned three years into the current planning cycle and has seen several strategic elements come to fruition, most notably: the first WRC Knowledge Tree Reports supporting the expanded drive to an increased emphasis on the outcomes and impact of WRC research and development (R&D); the multi-year, multi-project WRC Lighthouses; and an Annual Performance Plan (APP) which is constantly improving toward a more streamlined post-transition indicator set.

CP15 is founded on four core principles conceptualised in the first iteration of the five-year Corporate Plan for 2013/14 – 2017/18:

**Investment in the 'multiplier effect':** The 'multiplier effect' relates, firstly, to the *WRC Knowledge Tree* which aims to *inform policy and decision-making*, *contribute to sustainable development solutions*, *develop products and services* for the economy, actively *contribute to human capital development*, directly *empower communities*, and *enable the national transformation project*. Secondly, it speaks to the continuous improvement of a programmatic approach to choose a significant proportion of new projects in each funding cycle that build on the knowledge base of existing and previous funding cycles.

**Research concentration for accelerated knowledge and solutions development:** This will be done through the development of *WRC Lighthouses*. These are trans-disciplinary, multi-KSA and inter-institutional *mega-projects (platforms)* that will examine priority water issues across the innovation value chain.

**A further diversification of the research philosophy:** This will allow the WRC to expand the number of projects in the portfolio that move from the classical independent-observer scientific approach to an action-research paradigm. This entails the broadening of our scope to one that *actively involves communities in the research project*, and engages key partners to upscale and maintain interventions post-project.

Several key points of focus will be further enhanced through **elevations in research** during this five-year period, for example, through the development of new WRC Lighthouses, and the broadening of scope of others, while building new research cadres and capability and expanding participation in Centres of Excellence.

**Elevations in important impact areas**: The WRC is pursuing elevations in several key impact areas through, among others, technology scanning, reverse engineering, and the pursuit of ready-to-use solutions in a plug-and-play mode.

**Partnership:** To stretch the impact of the Water Research Fund, the WRC has a strategy to increase the WRC's partnerships in various domains. These include research partnerships, implementation partnerships and innovation value chain partnerships.

In addition to the above-mentioned principles, the key issues for CP15 include the following:

1. Toward a National Research and Innovation Framework
2. A better performance measurement system
3. A higher index of intervention and impact
4. Realising the WRC Knowledge Hub – a better information management model
5. Expanding the resource envelope for water research, development and innovation through a revised funding model

CP15 is driven by the WRC's four research units or Key Strategic Areas (KSAs), which cover the water value chain, as well as the KSA on Business Development, Marketing and Communications, which includes matters relating to partnerships (local and international), knowledge dissemination, communications, technology transfer, and stakeholder management. Additionally, it also gives attention to key developments in the two support-based KSAs of Corporate Services and Finance.

Part A of CP15 provides the strategic overview of the organisation and introduces the WRC's vision, mission and values; outlines the relevant legislative and other mandates; provides a situational analysis; and plots the WRC's strategic outcome-oriented goals against several key Government Outcomes and the WRC Knowledge Tree.

Part B provides a more in-depth account of the KSAs, and outlines their respective scopes and strategic objectives.

# TABLE OF CONTENTS

# LIST OF ACRONYMS

| | |
|---|---|
| AMCOW | African Ministers' Council on Water |
| CEO | Chief Executive Officer |
| CMA | catchment management agency |
| CP14 | WRC Corporate Plan 2014/15 – 2018/19 |
| CP15 | WRC Corporate Plan 2015/16 – 2019/20 |
| DAFF | Department of Agriculture, Forestry and Fisheries |
| DEA | Department of Environmental Affairs |
| DHS | Department of Human Settlements |
| DMR | Department of Mineral Resources |
| DRDLR | Department of Rural Development and Land Reform |
| DST | Department of Science and Technology |
| DWS | Department of Water and Sanitation |
| GDP | gross domestic product |
| HCD | human capital development |
| HEI | higher education institution |
| IP | intellectual property |
| IWRM | integrated water resource management |
| KSA | Key Strategic Area |
| MDG | Millennium Development Goal |
| NDP | National Development Plan |
| NEPAD | New Partnership for Africa's Development |
| NGP | New Growth Path |
| NPC | National Planning Commission |
| NWRS | National Water Resource Strategy |
| PDI | previously disadvantaged individual |
| R&D | research and development |
| RDI | research, development and innovation |
| RHP | River Health Programme |
| RPS | Research Policy and Strategy Committee |
| SADC | Southern African Development Community |
| S&T | science and technology |
| TIA | Technology Innovation Agency |
| WEF | Water–energy–food (Lighthouse) |
| WIN-SA | Water Information Network for Southern Africa |
| WRA | Water Research Act |
| WRC | Water Research Commission |
| WSD | Water sensitive design |
| WWF | Worldwide Fund for Nature |

# PART A: STRATEGIC OVERVIEW

## 1. INTRODUCTION

This five-year Corporate Plan (CP15) focuses on the period 2015/16 to 2019/20 and adopts the concept of the water science and technology (WS&T) Transformation Bridge as a principal strategic planning objective. This entails moving South Africa from a resource-driven economy to a knowledge-based economy with a successful South African water and sanitation industry; science-based and evidence-driven policy, decisions and actions; and a larger, more diverse water community of practice. Additionally, the Transformation Bridge also signifies the need to move from a focus on a knowledge generation axis to action and impact.

Today, the South African water science sector is relatively strong, ranking 18$^{th}$ in the world in terms of research publications, and the WRC has been a catalytic agent in this regard. We have also seen the positive impact of the WRC dialogues as a 'glue' factor in bringing together diverse stakeholders on various issues related to water. The WRC's partnership record is also a high point for the WRC, having received 17.5 million Rand in leverage funding.

Despite these achievements, South Africa is burdened by significant market failures in the water innovation value chain. The WRC remains underfunded, and its impact and implementation visibility is limited to specific segments of the water sector. Additionally, the WRC's internal systems and knowledge management strategy need to be strengthened to absorb a broader and deeper portfolio approach, and to ensure that the knowledge generated is accessible to all parts of society.

The keystone then of CP15 is the development of the WRC impact narrative that provides a pathway from research to impact. (What is our impact story? How are we relevant to everyone else?) This entails a review of current actions and activities (such as developing the WRC Lighthouses further) as well as the identification of new actions that will ensure impact realisation (such as developing and profiling other research concentration priorities). It also requires the fine-tuning of the R&D steerage through a series of measures including:

- Leading the development of NWRDS
- Developing core competencies in water science
- Developing water science infrastructure
- Developing a robust geo-political analysis portfolio
- Expanding the development of water economics as a discipline
- Building new research cadres and capability
- Expanding WRC participation in Centres of Excellence and Research Chairs

Given this, the WRC is at the advantageous stage in its evolution to give significant attention in the next planning cycle to achieving a higher impact profile and higher relevance index of the WRC portfolio. However, the following enablers are required in order to achieve this:

- Innovative highly functional partnerships across the innovation value chain with local and international partners along the entirety of the stakeholder spectrum
- Sowing a robust funding strategy with business development as a core pillar
- Managing information smartly
- Revisiting the function–form fit
- Defining the Performance Plan narrative

Further elevations in impact are expected through initiatives to enhance the WRC's Knowledge to Action suite, providing 'black-box' solutions, and exploring customisation and reverse engineering, among others.

CP15 has also been informed by an integrated and iterative consultation process comprising of direction setting by the Executive Authority and the Department of Water and Sanitation (DWS) as the shareholder; the WRC's constant stakeholder, partner and reference group conversations; the regular guidance of the Parliamentary Portfolio Committee on Water and Sanitation; and, more recently, the WRC Institutional Review 2013.

CP15 includes priority areas such as the WRC Lighthouses, the development of the National Research, Development and Innovation (RDI) Framework, the WRC Funding Strategy, improved information management, a stronger focus on research impact and interventions and a relook at the WRC institutional structure to accommodate our evolving mandate.

## 2. LEGISLATIVE AND OTHER MANDATES

The WRC serves as the R&D partner of the sector leader, the DWS, and provides the sector with knowledge and capacity to ensure sustainable management of water resources and enhance water services.

### 2.1 Constitutional mandate

The WRC is bound to the Bill of Rights contained within the Constitution that is applicable to all laws. In the execution of its mandate, the WRC upholds several key principles of the Bill of Rights, most notably section 27.1.b that gives everyone the right to have sufficient access to water. The WRC regards the ready availability of water knowledge and understanding as critically important to the adoption of effective and innovative strategies for equitable water service provision, management and use. It also has the pivotal role of being the knowledge partner to the respective implementing agents in the realisation of the Bill of Rights.

Additionally, section 16 of the Constitution, which addresses freedom of expression, including the right to academic freedom and freedom of scientific research, also applies to the work of the WRC. The development of the WRC's media strategy will directly speak to the way in which freedom of expression is aligned with the principles of scientific integrity and accountability.

## 2.2 Legislative mandates

The WRC is governed by the Water Research Act (WRA), Act No. 34 of 1971, which outlines the purpose and mandated objectives of the organisation. The WRC also operates and accounts for its activities in accordance with the Public Finance Management Act (PFMA), Act No. 1 of 1999, and is listed as a national public entity in Schedule 3A of this Act.

The mandated objectives of the WRC are also in accordance with the requirements of the policies of the DWS for the Water Services Act (Act No. 108 of 1997) and the National Water Act (Act No. 36 of 1998). Key legislative frameworks and their applicability to the WRC are highlighted below.

***Water Research Act (Act No. 34 of 1971 as amended)***

The principal aim of the WRA is to provide for the promotion of research in connection with water affairs. The Act requires the establishment of the WRC and the Water Research Fund, and sets the framework within which the WRC operates. It also provides for the establishment of the WRC as a Schedule 3A public entity, thereby requiring compliance with the PFMA Act (Act No. 1 of 1999) and Treasury Regulations.

The WRC's mandate as set out in this Act highlights the following functions to be carried out by the organisation:

- Promote co-ordination, co-operation and communication in the area of water research and development
- Establish water research needs and priorities
- Stimulate and fund water research according to priority
- Promote the effective transfer of information and technology
- Enhance knowledge and capacity building within the water sector

***National Water Act (Act No. 36 of 1998)***

The objective of the National Water Act (NWA) is to ensure that South Africa's water resources are protected, used, developed, conserved, managed, and controlled in a sustainable and equitable manner, for the benefit of all persons. The NWA also provides for the pricing strategy for water use charges. The role of the WRC in this regard is to provide high-quality water science that enables the implementation of the NWA.

***Water Services Act (Act No. 108 of 1997)***

The objective of the Water Services Act (WSA) is to provide for the right of access to water supply and sanitation by setting national standards and norms. Section 156, read in conjunction with Part B of Schedule 4 of the Constitution of the Republic of South Africa (Act No. 108 of 1996), vests in the executive authority and responsibility to support and strengthen the capacity of municipalities to manage their own affairs, to exercise their powers and to perform their functions.

## 2.3 Planned legislative mandates

The current water and sanitation legislative environment is in a state of transition, the outcomes of which will have a dramatic effect on the WRC's operations, including but not limited to a revised governance structure, an expanded research agenda, as well as an expanded mandate beyond applied research

### *2.3.1 Review of the water-related legislation*

The Department of Water and Sanitation (formerly the Department of Water Affairs) is currently reviewing the National Water Act, 1998 (Act 36 of 1998), the Water Services Act, 1997 (Act No 108 of 1997) and the Water Research Act, 1971 (Act No 34 of 1971). While the National Water Act provides a legal framework for the progressive realisation of the right to access to sufficient water, the act is under review to ensure that there is equity in the allocation of water, to improve water resources management and to streamline the regulatory processes. The Water Services Act is being reviewed to improve provision of water services to ensure alignment with the provisions of the Municipal Systems Act, 2000 (Act No. 32 of 2000) and the Municipal Finance Management Act, 2003 (Act No. 56 of 2003). The revised policy positions necessitated the consolidation of the National Water Act and the Water Services Act into one piece of legislation that will govern the entire water value chain covering water supply and sanitation services as well as water resources infrastructure. This consolidation will allow for not only managing water across the value chain but also enhance cooperative governance and have clear institutional roles and responsibilities with commonly agreed targets for water delivery.

### *2.3.2 Water Research Amendment Bill*

Addressing current and future water knowledge gaps and the way in which these are currently prioritised in the South African context demands the evolution of the regulation and governance structures of any research institution. The purpose of the Water Research Amendment Bill, 2013 is to:

- Amend the Water Research Act, 1971, so as to insert certain definitions and substitute others;
- Effect certain textual improvements and name changes;
- Provide for the appointment of members of the Board and the Chief Executive Officer;
- Regulate the governance of the Water Research Council *(Water Research Commission in the current Act)*;
- Align the Act with applicable legislation, such as the National Water Act, 1998, Water Services Act, 1997 and the Public Finance Management Act, 1999; and to
- Provide for matters incidental thereto.

While the new clauses in the Amendment Bill do not legislate for a change in the relationship between the DWS as the shareholder department and the WRC as the public entity, the process of developing the draft bill has created the space for the these two public sector partners to draw

closer together and iron out the modalities of governance, co-operation and the complementarity of roles.

One of the key components of the Water Research Amendment Bill is the development of a five-year National Water Research and Development (R&D) Plan. This will put into law what has been approved as part of the National Water Resource Strategy 2 (NWRS 2). The Bill also demands a reasonable consultative process to be co-ordinated by the WRC to inform the research plan. The second major change is that the new bill acknowledges the need to work beyond the political borders of South Africa in order to increase the knowledge pool, to ensure both water security and water productivity that is beneficial to the Republic. This reflects the recognition that many issues in this domain, e.g., climate and weather variance, do not respect political borders, and that more that 60% of South Africa's waters are within watercourses that we share with our neighbouring countries. This will enable a regional approach in certain key research areas that will greatly enhance our integrated water resource management capabilities. The new bill is also more explicit about our responsibility to work across the innovation value chain, from research to development to market.

## 2.4 Policy mandates

The WRC will continue to support DWS in its call for mainstreaming of water and sanitation as the basis to enable and catalyse economic growth and sustainable development. The WRC is therefore actively involved in key DWS initiatives, including the legislative and policy review, and the institutional realignment programme, as well as the implementation of the NWRS 2. Specifically, the WRC's five-year strategy is designed to support the further refinement and implementation of NWRS 2, together with the DWS and associated departmental plans for water services and sanitation. This is closely followed by the water-related components of the Presidential-led National Infrastructure Plan and its associated 18 Strategic Integrated Projects (SIPS), the Department of Environmental Affairs–led Climate Change Response Strategy and the Department of Science and Technology's 10-year Innovation Plan, and the broader South African sustainable development agenda. A third layer addresses the water-related components of the other core development strategies for these five years, for example, in the areas of local government, agriculture (including forestry), rural development, mineral resource development, the spatial development plans, and water-related enterprise development. The outcomes of our research projects provide scientific knowledge which informs initiatives such as the water pricing strategy and water infrastructure management.

### *Alignment of WRC activities to NWRS 2*

The NWRS 2 has made a significant shift to a knowledge-based paradigm, as reflected in the consultations as well as the gazetted NWRS 2, and calls for a much higher contribution from R&D to empower the implementation of the strategy. In addition, the strategy also engages the further development of water sciences in South Africa. One of the key deliverables that the NWRS 2 emphasises is the Sector Research and Innovation (R&I) Strategy; the NWRS 2 also supports

the development of the National Water R&D Plan. The latter is also emphasised in the Water Research Amendment Bill. The WRC is called upon to play a leading role in achieving this particular outcome.

Some of the additional research and development contributions that the NWRS 2 requires from the WRC include:

- Desalination of seawater
- Job creation
- Mining, energy and manufacturing industries
- Awareness and communication
- Scenarios, climate change modelling and water availability
- Hydraulic fracturing and coal-bed methane extraction

These areas call on the WRC to collaborate with the DWS and other Government departments such as the Department of Trade and Industry (dti), Department of Human Settlements (DHS), Department of Agriculture, Forestry and Fisheries (DAFF), Department of Economic Development (EDD), and the Department of Mineral Resources (DMR), as well as other sector partners such as the Trans-Caledon Tunnel Authority (TCTA), Eskom, Sasol, WISA, and similarly relevant actors, to develop appropriate technologies and to support the development of relevant centres of excellence in several of the fields of research described above. Additionally, the WRC is tasked with revising documents outlining water-use efficiency targets for sub-sectors including mining, energy and manufacturing. The engagement with civil society partners will be crucial to ensure relevance, implementation and sustainability.

## 3. SITUATIONAL ANALYSIS

The 2014/15 financial year ended for the WRC just as South Africa stood at the cusp of the 20$^{th}$ anniversary of its democracy. The country is a remarkably different place than it was in 1994, no doubt characterised by the rollercoaster ride of divided experiences witnessed in the last 20 years. Additionally, the sector is in a state of flux. The legislative and policy environment is undergoing major changes, most notably the amalgamation of the sector's key pieces of legislation, the National Water Act (Act 36 of 1998) and the Water Services Act (Act 108 of 1997), which could profoundly change the way the sector operates. In May 2014, we have seen the ushering in of a ministry unifying water and sanitation, and also the appointment of the Honourable Minister of Water and Sanitation, Ms Nomvula Mokonyane, and Honourable Deputy Minister, Ms Pamela Tshwete.

One thing that has not changed is the fact that South Africa is a water-scarce country. Even in the parts of the country where rainfall figures are more favourable, climate and weather variability has added to the availability challenges, with periods of intense flooding interspersed with long dry periods. This has made storage difficult and assurance of supply hard to attain.

Water and sanitation services remain core challenges of our time globally, and particularly for South Africa's growing political economy. Yet while South Africa has met the Millennium Development Goal (MDG) targets in these areas, our primary goals remain that of universal access to safe and sustainable water and sanitation services to all in South Africa as well as water infrastructure to support new entrants into the economy.

'Ma-Dlamini', the iconic symbol of poor, Black, rural or peri-urban women, who bear the greatest burden with regards to water and sanitation delivery, remains unserviced. The change in fortune for Ma-Dlamini with the achievement of universal access to sustainable water and sanitation services in South Africa should be one of our main priorities. In addition, it should also enable people like Ma-Dlamini to access water for economic purposes and sustainable livelihoods.

Rather than be paralysed by these challenges, the WRC regards these as opportunities for innovation. For the WRC, the challenge is to get useful information to Ma-Dlamini that can influence and aid service delivery interventions. In this planning cycle, the WRC will work to provide more information to Ma-Dlamini; provide more appropriate information to her; but also look at the solutions that can be used to help her. This requires an expanded knowledge dissemination strategy beyond the confines of the water and sanitation research and policy communities. It also requires a closer look at game-changers such as: 1) how RDI can strengthen the role of local government in service delivery; 2) how to enable the water and sanitation policy environment; 3) how to increase community involvement in RDI solutions; and 4) how to strengthen R&D partnerships with the private sector to unlock growth and development in the water and sanitation sector.

The WRC embraces this new paradigm in its strategy. The project portfolio gives effect to the notion of water as a strategic national asset, from the basic planning regimes of water-sensitive design to the mining of freshwater and valuable minerals from acid mine drainage. The notion can be applied from developing sustainable low-/no-water safe sanitation solutions to women-led small-scale agriculture initiatives, and from research to empower the notion of ecological infrastructure as a key element of water infrastructure, to novel governance mechanisms to encourage wider empowered participation.

This the WRC does in partnership with South Africa's small but highly productive water and sanitation R&D community, the dedicated South African water practitioners, the prudent water users and our friends around the world, in the quest to ensure the reality of universal access to water and sanitation services. Indeed, the expanded partnership model is key to ensuring that water and sanitation innovations succeed in being pulled through the entirety of the innovation value chain.

The operating environment of the WRC in the five-year period 2015/16 – 2019/20 at the national level will therefore be characterised by providing science, technology and innovation support to the roll-out of both recently-introduced as well as impending national policies and strategies.

## 3.1 Performance environment

The WRC's performance environment is created on the premise that the crux of the water and sanitation challenge in South Africa is a capacity and capability challenge. The WRC addresses the three dimensions of this challenge, namely, new knowledge, human capital, and technological solutions. It will endeavour in its projects to create a high concentration of activities that support each of these dimensions. In so doing, the WRC funds and facilitates research in water-related innovation and disseminates such knowledge for the advancement of national water security. The recipients of this knowledge may be higher-education institutions (HEIs), science councils, or private agencies/contractors, as well as the various tiers of government.

While our increased efficiencies, innovativeness and partnerships will continue to maintain the knowledge production levels, it is becoming increasingly difficult to meet two very basic challenges in the South African water and sanitation system. The first is the ability to address the increasingly complex nature of water problems such as non-revenue water and acid mine drainage. The second is the WRC's ability to both transform the South African R&D community through the development of researchers from the designated groups as well as to create further avenues for job creation and entrepreneurship development, which are all restricted by the limited availability of R&D funds.

At the same time, technological innovation, improvements in communication, increased collaboration and international partnership have enhanced our ability as a South African water R&D community to conduct better research, to train students at higher levels, and to organise for better translation of research into products and services for the economy. These improvements, together with new resources, will guarantee our ability to make a significant difference to South Africa's water fortunes.

## 3.2 Organisational environment

The primary functions of the WRC are to fund and steer the water research agenda in South Africa, and to effectively disseminate and communicate research findings. Administrative activities are carried out to ensure compliance with regulatory requirements and to provide an enabling environment for research management.

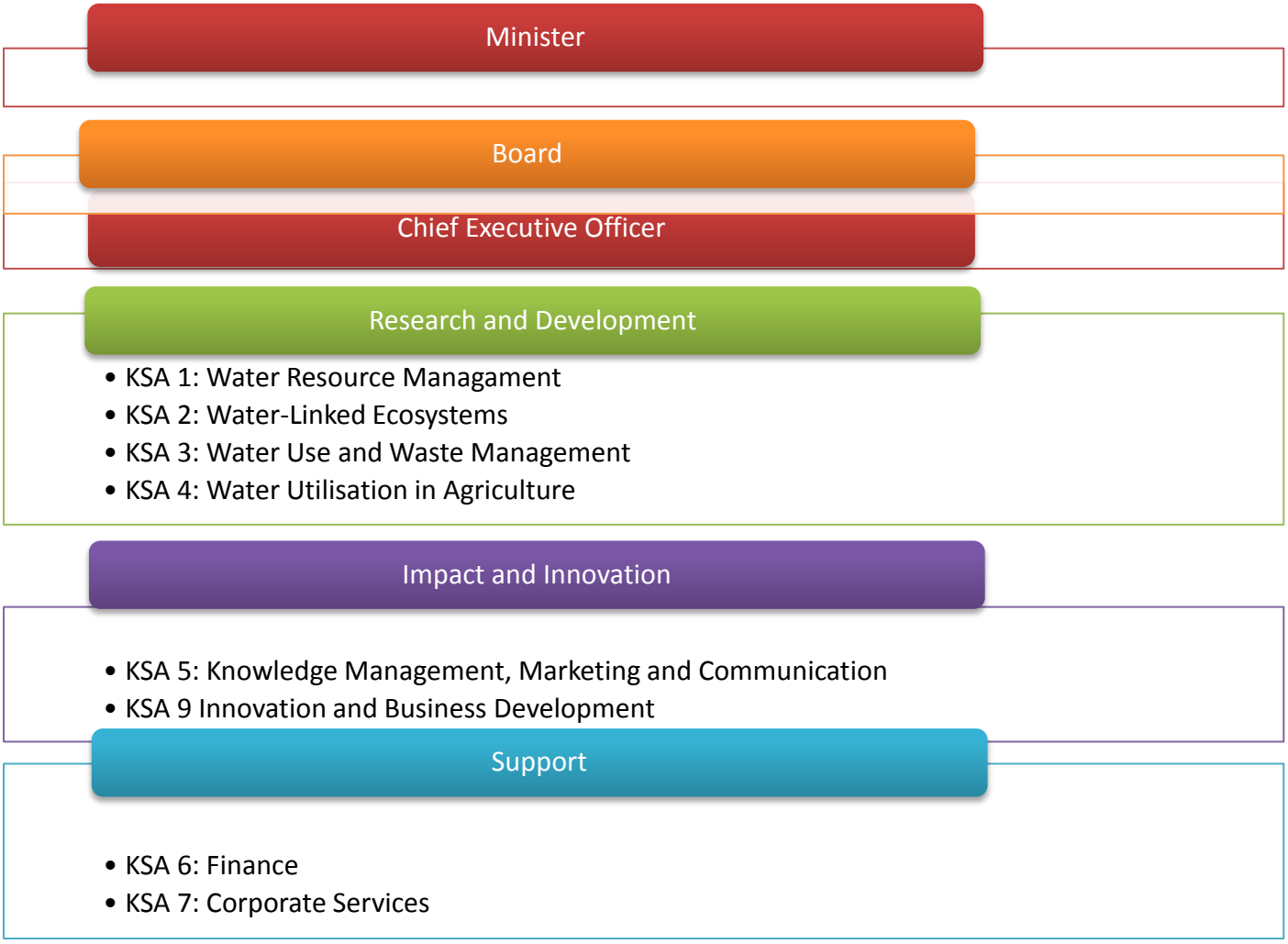



***Figure 1. The WRC organisational environment***

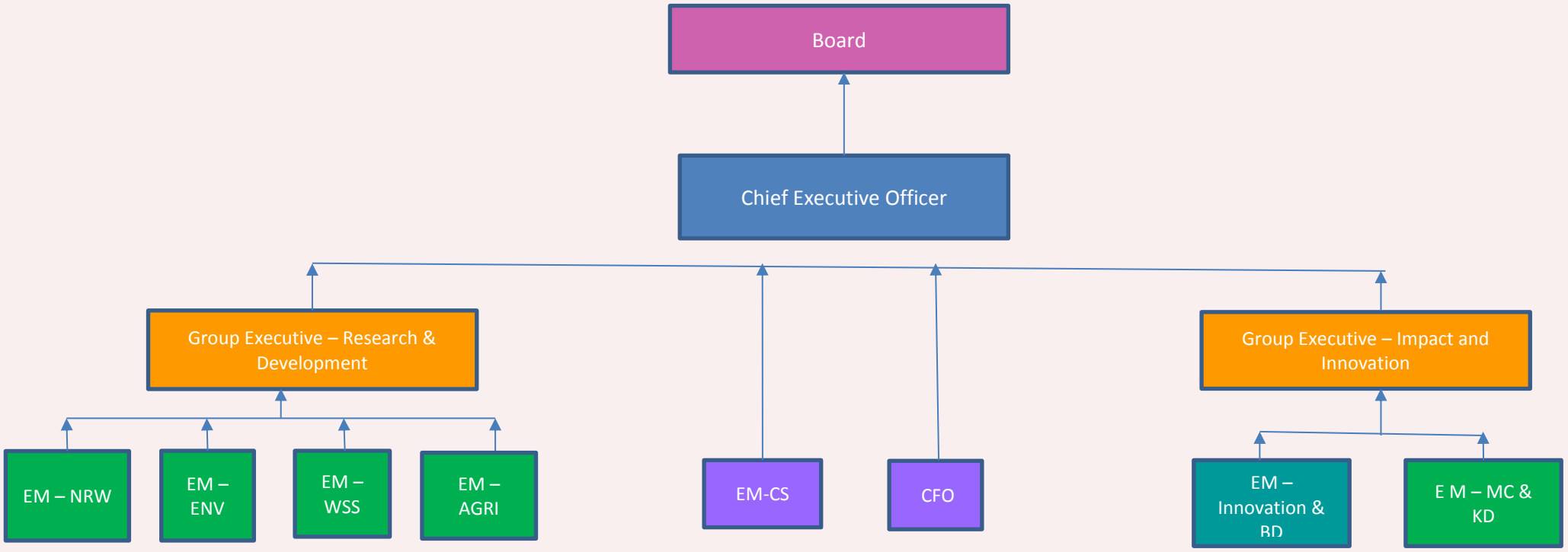



***Figure 2. The WRC organisational structure***

The following structure defines the internal governance framework:

- The Minister of Water and Sanitation is the Executive Authority of the WRC.
- The Department of Water and Sanitation is the shareholder representative
- The WRC Board is the Accounting Authority of the WRC.
- The Chief Executive Officer (CEO) is the Accounting Officer and an ex-officio member of the WRC Board.
- The Group Executives (GEs), the Chief Financial Officer and the Executive Manager for Corporate Services report directly to the CEO.
- The Executive Managers for Water Resource Management; Water-Linked Ecosystems; Water Use and Wastewater; Water Utilisation in Agriculture; Innovation and Business Development; and Marketing and Communications report to the GEs.

This describes the new organogram that is operational in 2015/16, and in this planning cycle the WRC will also review its institutional structure to ensure that it is able to cope with its expanding mandate.

### 3.3 Description of the WRC's corporate planning process

The process conducted to develop this Corporate Plan is characterised by three important elements. Firstly, it has been an ongoing and iterative process. Secondly, it has been consultative, incorporating discussions and considerations from the Department of Water Affairs (now DWS) and WRC stakeholders in various forums including the WRC Institutional Review. Thirdly, it has employed both forecasting and back-casting approaches to the development of strategic objectives, involving an analysis of the WRC's current positioning in the sector as well as a reflection on developments and potential developments in the external and organisational environment that could have an impact on the five-year planning cycle. All of these processes have been under the guidance of the WRC Board.

The formal planning process continued from the developments in the previous year's iteration of the Corporate Plan for 2014/15 – 2018/19 (CP14). Other important inputs and events feeding into the corporate planning process are shown in Figure 3.

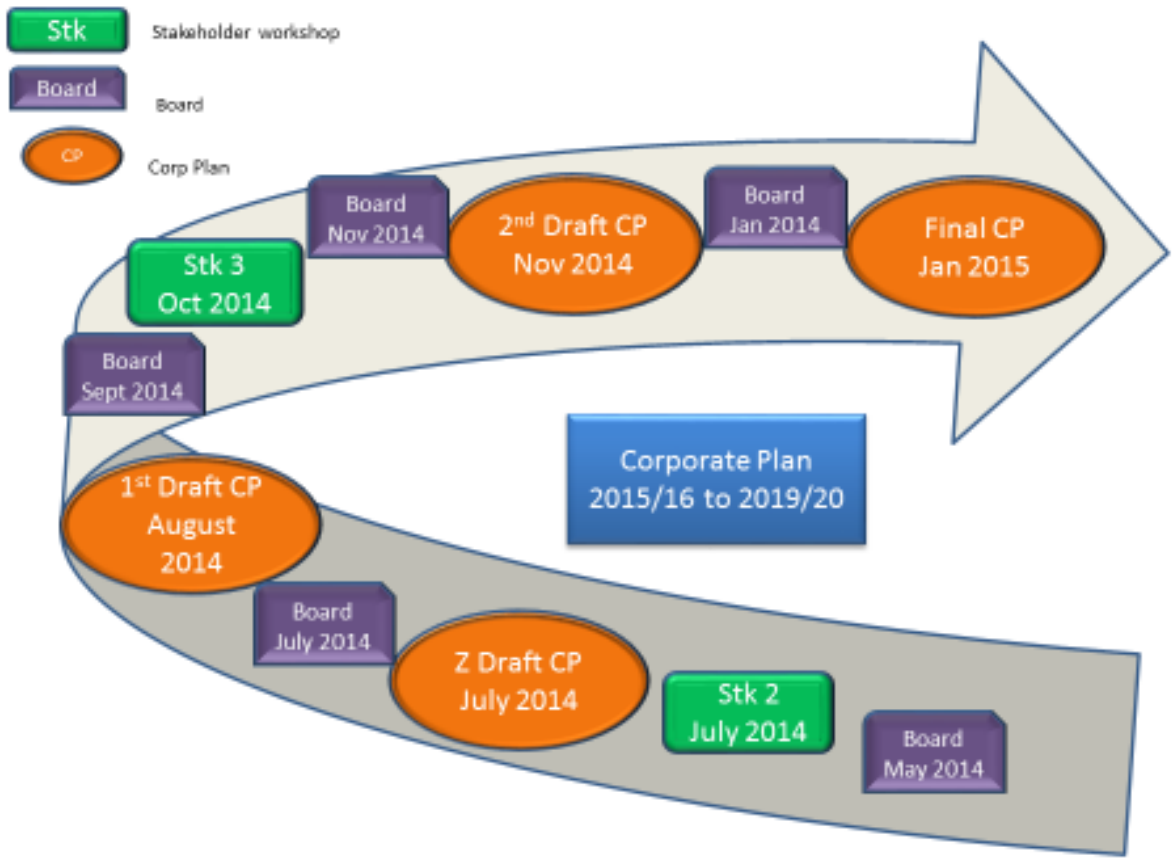



***Figure 3. Corporate planning timeline***

## 4. STRATEGIC OUTCOME-ORIENTED GOALS OF THE INSTITUTION

Section 7 outlines the strategic intent of the WRC over the period 2015/16 – 2019/20. This comprises of the WRC's contribution to achieving several Government Outcomes, the National Development Plan (NDP) objectives, as well as five strategic outcome-oriented goals, which are based on the operationalization of the WRC Knowledge Tree.

### 4.1 Contributing towards achieving Government Outcomes and NDP objectives

As a national public agency, the WRC actively strives to support the Government of South Africa in achieving its strategic outcomes, with particular reference to the NDP objectives as well as the Corporate Plan (Annual Performance Plan) of the DWS and the performance agreement of the Minister of Water and Sanitation.

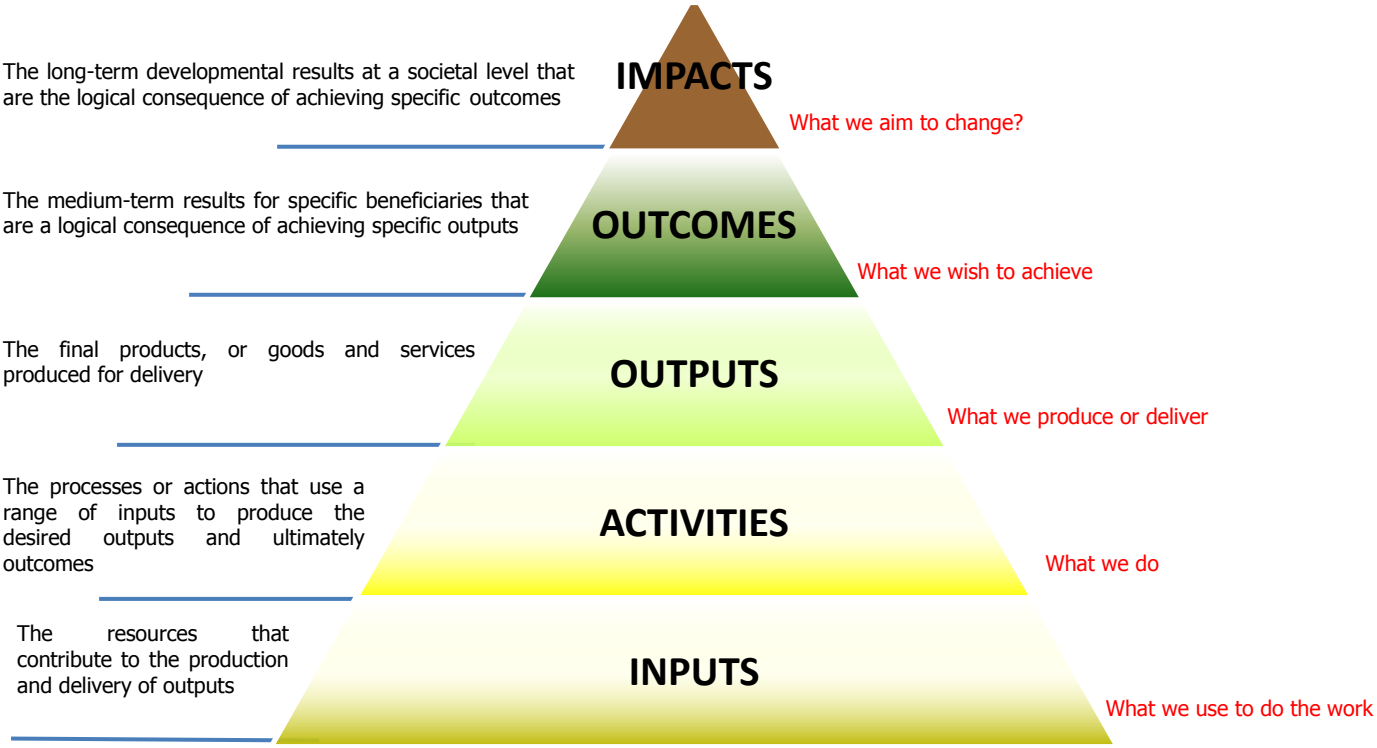



***Figure 4. Government Guide to Outcome Approach, May 2010 (Source:* www.thepresidency.gov.za)**

The WRC also applies the outcome-based approach developed by Government (Figure 4) and aims to support all Government Outcomes and Outputs through its research portfolio, with special emphasis given to Government Outcomes 6, 7, 9 and 10. Firstly, Outcome 6 addresses the need for an efficient, competitive and responsible economic infrastructure network. WRC-funded projects support water availability through examining and finding solutions for issues related to bulk water supply, and through supporting the development of appropriate regulations regarding water quantity, quality and usage. A second emphasis is Outcome 7, which focuses on vibrant, equitable and sustainable rural communities and food security for all. This is carried out through a number of projects addressing water utilisation in agriculture as well as projects focusing on informal settlements and peri-urban communities. Thirdly, Outcome 9 aims at establishing a responsive, accountable, effective and efficient local government system. The WRC supports this outcome through research focused on improving services, with special emphasis on the delivery of water and sanitation services. Finally, Outcome 10 addresses the protection and enhancement of the country's environmental assets and natural resources. The WRC work-plan is geared to the improvement of the quality and quantity of South Africa's water resources through both its research projects as well as its innovation and technology development activities. Examples include technologies and strategies to reduce water loss in distribution systems, better sanitation solutions and improved wastewater treatment.

***Table 1. Alignment with Government Outcomes and NDP objectives***

| WRC Strategic Outcome-Oriented Goal | | Alignment with Government Outcomes | Alignment with NDP objectives |
|---|---|---|---|
| **Strategic Outcome-Oriented Goal 1** | **Inform policy and decision-making** | | |
| | The WRC aims to commission appropriate evidence-based knowledge generated to guide decision-making, influencing the development of policy, practice or service provision, shaping legislation, altering behaviour, contributing to the understanding of policy issues, and reframing debates. Through the R&D that it commissions it also aims to inform decision-making at all levels within government but also in non-governmental arenas. WRC projects also aim to improve basic services, with special emphasis on delivery of water and sanitation services. | 1. Government Outcome 9: A responsive, accountable, effective and efficient local government system.<br>2. Government Outcome 12: An efficient, effective and development oriented public service and an empowered, fair and inclusive citizenship. | Building a capable and developmental state objectives: Chapter 13 |
| **Strategic Outcome-Oriented Goal 2** | **Develop new products and services for economic development** | | |
| | The WRC capitalises on those projects that have potential to develop new intellectual property or to introduce innovations which create new or improved technologies, products and services that can be used in the economy. Effectively, this is the WRC's contribution to job creation and economic development through water and sanitation science innovations. Additionally, WRC projects support water availability by finding solutions to problems related to bulk water supply and assisting the development of appropriate regulations regarding water quantity, quality, and usage. | 1. Government Outcome 4: Decent employment through inclusive economic growth.<br>2. Government Outcome 6: An efficient, competitive and responsive economic infrastructure network | Economy and employment objectives: Chapter 3<br>Economic infrastructure objectives: Chapter 4 |
| **Strategic Outcome-Oriented Goal 3** | **Enhance human capital development (HCD) in the water and science sectors** | | |
| | The WRC strives to have high student participation in its projects. Although the emphasis is on post-graduate degrees, inclusion of undergraduates has also been investigated. There is also a particular emphasis on previously-disadvantaged individuals (PDIs) and women. The WRC also aims to support institutional development through mentorship provided to new research leaders. | 1. Government Outcome 1: Improved quality of basic education.<br>2. Government Outcome 5: A skilled and capable workforce to support an inclusive growth path. | Improving education, training and innovation: Chapter 9 |
| **Strategic Outcome-Oriented Goal 4** | **Empower communities** | | |
| | The WRC places an emphasis on projects that: (a) include communities not only as end-users of research but as active participants in the research process from the project design phase; (b) have a direct | 1. Government Outcome 6: Vibrant, equitable and sustainable rural communities with food security | Environmental sustainability and resilience objectives: Chapter 5 |

| | | | |
|---|---|---|---|
| | impact on the livelihoods of communities through water-related interventions; and (c) build sufficient capacity to assist with the post-project sustainability of those interventions. Additionally, the WRC has projects addressing water utilisation in agriculture, as well as in informal settlements and peri-urban communities. The use of water by small-scale farmers (smallholders) and water allocation reform have been addressed. The WRC will continue to support the wise use of water for agriculture, and to reduce water demand from irrigation. | for all.<br>2. Government Outcome 7: Sustainable human settlements and improved quality of household life. | Inclusive rural economy objectives: Chapter 6<br>Transforming human settlements objectives: Chapter 8 |
| **Strategic Outcome-Oriented Goal 5** | **Promote transformation and redress** | | |
| | This goal focuses on growing PDI involvement/leadership in projects, as well as helping to promote socio-economic development through the reduction of poverty and inequality in South Africa, particularly of marginalised groups such as women and youth. | 1. Government Outcome 5: A skilled and capable workforce to support an inclusive growth path.<br>2. Government Outcome 11: Create a better South Africa and contribute to a better and safer Africa and World.<br>3. Government Outcome 12: An efficient, effective and development oriented public service and an empowered, fair and inclusive citizenship. | Improving education, training and innovation objectives: Chapter 9<br>Transforming human settlements objectives: Chapter 8<br>Building a capable and developmental state objectives: Chapter 13<br>Nation building and social cohesion objectives: Chapter 15 |
| **Strategic Outcome-Oriented Goal 6** | **Drive sustainable development solutions** | | |
| | The WRC prioritises those projects that provide sustainable development solutions that have had positive effects on the environment, economy and society, including: protection of water resources, optimal water use, equity between generations, equitable access, environmental integration and good governance. Additionally, this goal focuses on developing knowledge products that are fit-for-use to ensure the uptake of research. Examples include technologies and strategies to reduce water loss in distribution systems, better sanitation solutions and improved wastewater treatment. The WRC will continue to invest in studies on climate change and related energy issues. Biodiversity related to aquatic life and ensuring ecosystem and river health, as well as protection and restoration of wetlands, will continue to be supported. | 1. Government Outcome 7: Vibrant, equitable and sustainable rural communities with food security for all.<br>2. Government Outcome 8: Sustainable human settlements and improved quality of household life.<br>3. Government Outcome 10: Environmental assets and natural resources that are well protected and continually enhanced. | Environmental sustainability and resilience objectives: Chapter 5<br>Inclusive rural economy objectives: Chapter 6<br>Transforming human settlements objectives: Chapter 8 |

## 4.2 Alignment with DWS strategic objectives

Table 2 outlines the WRC's alignment with DWS strategic objectives.

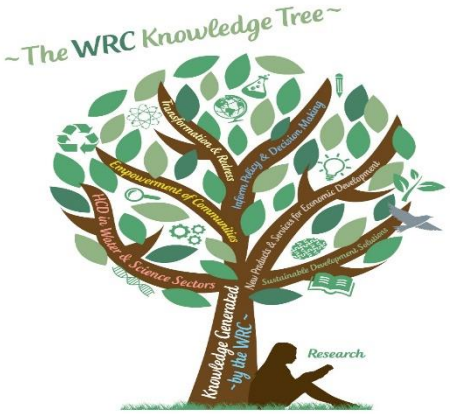
***Table 2. Alignment with DWS strategic objectives***

| DWS strategic objectives | WRC strategic objectives |
|---|---|
| **An efficient, effective and development oriented sector leader** | 1. To enhance the governance of water in South Africa through knowledge and practice derived through research.<br>2. To enhance human capital development through support of students supported in water research projects as well as the development of researchers.<br>3. To contribute to economic transformation by supporting SMMEs in the water research, development and innovation.<br>4. Enhance the diversity of project leadership as part of the broader national transformation project to promote the ongoing transformation of the water R&D sector<br>5. Achieve efficient and effective institutional governance including a good audit report<br>6. Enhance the relevance and presence of the WRC locally and globally by coordinating strategic local and international partnerships by establishing MOUs, knowledge-sharing agreements/understandings or strategic partnership agreements with knowledge-sharing institutions and/or strategic partners<br>7. Strengthen the WRC's strategic position regarding water research and development |
| **Equitable and sustainable water and sanitation services** | 1. To increase water knowledge on water and sanitation services by initiating new research projects<br>2. To provide the country with supportive knowledge via completed projects<br>3. To improve knowledge dissemination (number of final research reports and technical briefs published)<br>4. To promote the uptake and communication of WRC research in the form of manuals, guidelines, and other supporting materials produced<br>5. To engage the sector in knowledge-sharing events through public dialogues and workshops |
| **Protection of water across the value chain** | 1. To increase water science focusing on protection of water across the value chain by initiating new research projects<br>2. To provide the country with supportive knowledge via completed projects<br>3. To improve knowledge dissemination (number of final research reports and technical briefs published)<br>4. To promote the uptake and communication of WRC research in the form of manuals, guidelines, and other supporting materials produced<br>5. To engage the sector in knowledge-sharing events through public dialogues and workshops |

### 4.3 Achieving the six goals of the WRC 'Knowledge Tree'

In this, the WRC's third year of conceptualising and developing the WRC Knowledge Tree, the WRC can boast a diverse portfolio of research projects, all geared towards investment in the 'multiplier effect'. In addition to the knowledge products and publications from the WRC research portfolio, the WRC is using that knowledge to inform policy and decision-making, contribute to sustainable development solutions, develop products and services for the economy, actively contribute to human capital development, directly empower communities, and enable the national transformation project.

Each of the Knowledge Tree strategic outcome-oriented goals provides a specific priority categorisation for the WRC's projects and activities. Each has its own kind of contribution to the Government Outcomes, either directly or indirectly. The goals are not mutually exclusive. For example, a 'new product' may be a 'sustainable development solution' that 'empowers communities' and 'informs policy and decision making'.




The guiding principle is that every WRC project will strive to achieve as many of the WRC Knowledge Tree outcomes as reasonably possible. This applies within the project, to post-project actions, and to follow-on projects.

***Table 3. The WRC's Strategic Outcome-Oriented Goals***

| Strategic Outcome-oriented Goal 1 | Inform policy and decision-making |
|---|---|
| **Goal statement** | The WRC will reinforce its efforts to commission appropriate research projects to actively inform both policy development by Government partners and decision-making by all parties in the water sector. Particular effort will be made to: a) provide appropriate evidence-based information to guide decision-making, b) effectively communicate scientific findings to decision-makers, c) provide advisory services to parliamentary portfolio committees, the shareholder department and other decision-making bodies, and d) provide a platform for dialogue on various issues involving the policy landscape. |
| **Examples** | • **WR2012.** The Water Resources of South Africa 2012 study (WR2012), currently underway, serves as the cornerstone of baseline national water resource assessment and planning for South Africa. The objective of the study is to assist decision-makers at all levels of Government to make informed choices about all policies concerning South Africa's water resources.<br>• **Strengthening South Africa's climate change armoury**. Several studies underway are shedding light on the degree to which climate change poses new challenges to water resource managers in South Africa. Study results are showing an increase in the year-to-year variability of hydrological responses into the future, often a quite substantial |

| Strategic Outcome-oriented Goal 1 | Inform policy and decision-making |
|---|---|
| | increase, especially when inter-annual variability is expressed in absolute terms by the standard deviation. |

| Strategic Outcome-Oriented Goal 2 | Develop new products and services for economic development |
|---|---|
| **Goal statement** | The WRC will continue to capitalise on those projects that have potential to develop new intellectual property or to introduce innovations which create new or improved technologies, products and services to be used in the economy. |
| **Examples** | • **DST strategic partnership.** A strategic partnership between the WRC and DST has been established and collaborative work is underway. |

| Strategic Outcome-Oriented Goal 3 | Enhance human capital development (HCD) |
|---|---|
| **Goal statement** | The WRC will strive for high student participation in its projects, as well as partnering with higher education institutions (HEIs) to grow capacity in new and emerging disciplines, e.g., biomimicry. |
| **Examples** | • **Student participation.** All WRC projects are encouraged to have a component of student participation where possible.<br>• **Supporting new PDI project leaders.** A special programme of short-term projects is planned to encourage and empower previously-disadvantaged individuals to be project leaders.<br>• **The WRC Empowerment Fund.** The WRC and DWS have partnered to implement the WRC Empowerment Fund to capacitate emerging project leaders and also help develop various capacities for CMAs. |

| Strategic Outcome-Oriented Goal 4 | Empower communities |
|---|---|
| **Goal statement** | The WRC and its partners will increase emphasis on projects that (a) have a direct impact on the lives and livelihoods of communities through water-related interventions, and (b) build sufficient capacity to assist with the post-project sustainability of those interventions. |
| **Examples** | • **Community-focused activities.** Current and future research encompasses water-use skills development of women to reduce rural poverty, further training and knowledge transfer in water use for homestead gardening, and optimisation of entrepreneurial development paths for irrigated smallholder farming.<br>• **Improved governance and practical rural development.** New projects will inform improved governance models and practical implementation of rural development projects around the productive use of water. There is also a focus on developing recommendations and guidelines for the functioning of local water management institutions. |

| Strategic Outcome-Oriented Goal 5 | Promote transformation and redress |
|---|---|
| **Goal statement** | This five-year Corporate Plan has transformation and redress as a central driver, both within the organisation as well as in the project portfolio. The goal is necessarily cross-cutting in that it drives the 'human capital development' and 'empowerment of communities' goals. |
| **Examples** | • **Project focus.** Continued diversification of the WRC portfolio is planned in terms of project leadership, student participation, institutional participation, project |

| Strategic Outcome-Oriented Goal 5 | Promote transformation and redress |
|---|---|
| | selection, and project site selection. |

| Strategic Outcome-Oriented Goal 6 | Drive sustainable development solutions |
|---|---|
| **Goal statement** | Sustainable development will remain a core principle driving all WRC projects and activities. Specific focus is placed on sustainable development *solutions*. |
| **Examples** | • **Protection of water resources.** A specific highlight is an interactive vulnerability map and preliminary screening-level monitoring protocol to assess the potential environmental impact of hydraulic fracturing activities on groundwater.<br>• **Optimal water use.** The above-mentioned projects on water utilisation in agriculture address this directly. Another project will focus on simplifying decision making around groundwater use by basing it on aquifer yield, infrastructure costs, and treatment costs.<br>• **Equity between generations.** A significant initiative focuses on empowering the implementation of the National Climate Change Response Strategy.<br>• **Current equitable access.** There is considerable emphasis on supporting the provision of safe drinking water. Projects have been wide-ranging, from improving our understanding of the concept of free basic water to transfer of knowledge to communities relating to rainwater harvesting.<br>• **Environmental integration.** The WRC Lighthouses, by their very nature, epitomise the WRC's acknowledgement of the need for integrated approaches. In addition, the focus of the WRC on the water–energy–food nexus also acknowledges the complexity of some of the core water-related problems being faced today. |

In terms of the achievement of the above-mentioned strategic outcome-oriented goals depicted by the WRC Knowledge Tree, the WRC manages a multi-year portfolio of projects numbering approximately 300 at any time.

**Table 4. Baseline summary for strategic outcome-oriented goals**

| INDICATOR | 2013 (FOR PROJECTS STARTING IN 2014/15) | 2014 (FOR PROJECTS STARTING IN 2015/16) |
|---|---|---|
| **TOTAL NUMBER OF PROJECTS APPROVED** | **98** | **81** |
| **TOTAL VALUE OF PROJECTS OVER CYCLE** | **R119 699 766** | **R130 247 457** |
| **TOTAL BUDGET (1ST YEAR)** | **R37 229 185** | **R38 756 546** |
| **NUMBER OF PDI PROJECT LEADERS** | **53 (54%)** | **45 (56%)** |
| **NUMBER OF STUDENTS (DISTINCT) IN PROPOSALS** | **247** | **315** |
| **HDI PARTICIPATION (CONTRACTING ORG - LEAD)** | **13 (13.3%)** | **12 (15%)** |
| **SMME LEADS** | **28 (29%)** | **19 (23%)** |
| **FEMALE PROJECT LEADERS** | **33.7%** | **37%** |
| **NUMBER OF PROJECTS WITH INTERNATIONAL COLLABORATION** | **18 (18%)** | **8 (10%)** |

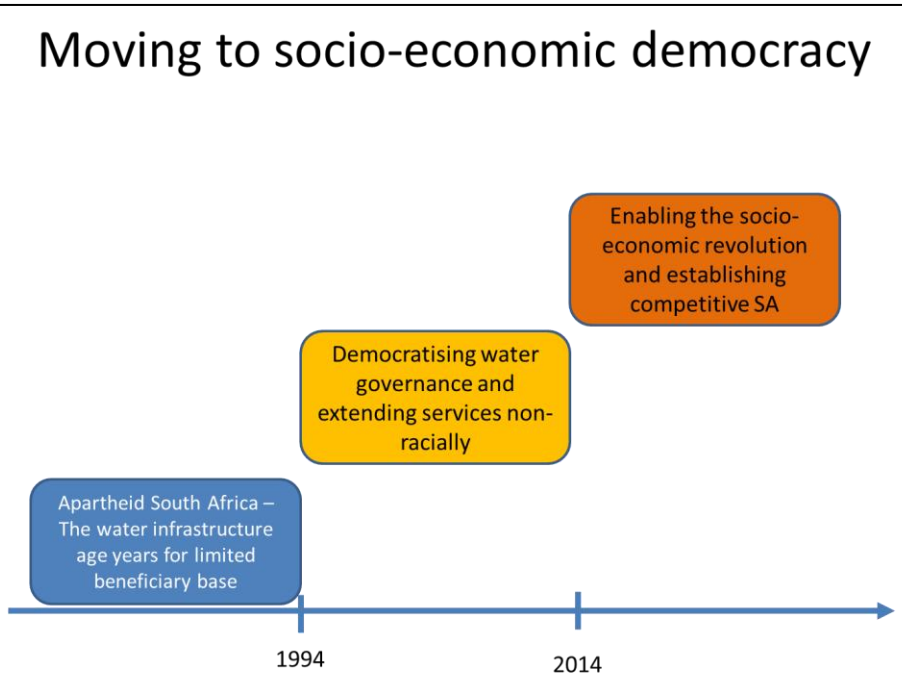
# PART B: STRATEGIC EMPHASES

Within the Government Outcomes and the WRC Knowledge Tree goals, the next five years will place special emphasis on a series of elements that aim to further strengthen the overall profile, relevance and effectiveness of the WRC.

These elements cut across the various units of the WRC and include the following key emphases.

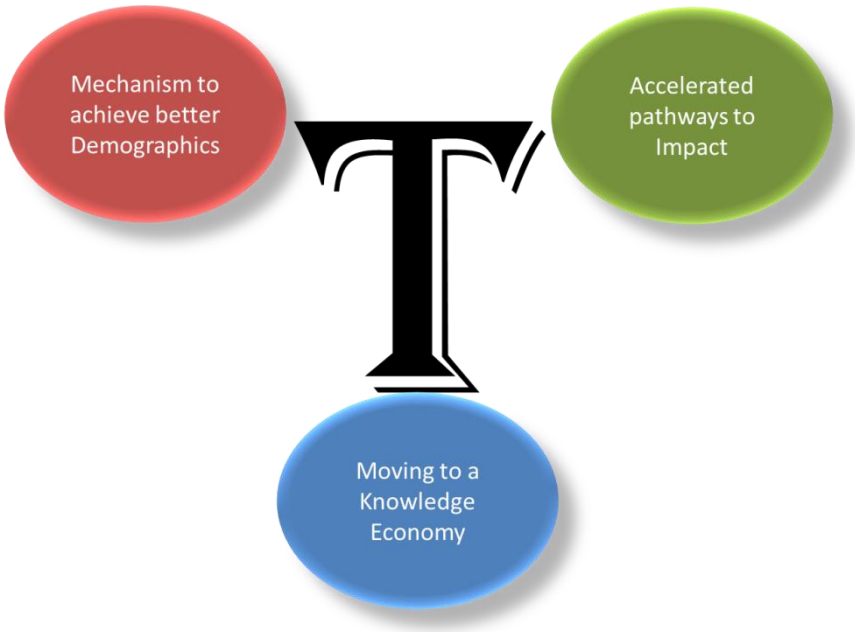
## 5. WATER RESEARCH AND DEVELOPMENT DRIVING NATIONAL SOCIO-ECONOMIC TRANSFORMATION

The first administration of the third decade of South Africa's democracy has made the notion of a 'radical socio-economic transformation' the centre-piece of its five-year strategy. In the water and sanitation sector this translates to achieving universal access to sustainable water and sanitation services in South Africa while maintaining or where possible enhancing the integrity of our water resources, both surface and groundwater. Water security remains not only the key to a good quality of life for all in South Africa both today and tomorrow, but also to South Africa's economic future and international competitiveness.




*A representation of three phases of water development in South Africa.*

Phase 1 is the Apartheid years until 1994, when the larger foci were in the realm of water resource development (dam development and inter-basin transfers) with the obvious bias to prioritising the servicing of White South Africa and reinforcing the separate development philosophy of the Apartheid government. Phase 2 represents the first 20 years of democracy, key features of which were the development of a new governance model for water, moving away from the riparian doctrine toward a national custodianship as well as the quest for universal access to services in order to address the Apartheid legacy of differential citizenship based on race. This phase made many gains in entrenching the new political democracy and many of the political institutions as well as the policy environment sought to effect the political transformation of the system. Extension of access to water services has been a hallmark, but this has not achieved the sustainability parameters and progress with sanitation did not share the same momentum. Phase 3 seeks to effect a real and tangible socio-economic democracy characterised by the growth of the South African economy on the back of a better water-security outlook while concomitantly ensuring the pathway to universal access to sustainable water and sanitation services in South Africa. Water should also be a catalyst to economic inclusion and participation.




*The three components of transformation in water research and development.*

The first component of transformation is to increase the diversity of participation in WRC projects. This includes higher numbers of research leaders who are previously disadvantaged individuals

(PDI), more PDI students supported in WRC projects, and higher levels of enterprise development – all in the frame of WRC project leadership, and, where possible, enterprise development in WRC projects. In the second dimension there shall be a concerted effort to create innovative pathways to accelerate impact on the ground. This will include both new project design as well as new projects. The third critical dimension is to contribute to the further transformation of South Africa's largely resource-based economy into the desired knowledge-based economy envisaged in the National Development Plan.

This seeks to build on the successes in the 2013/14 financial year in which the WRC reached its highest levels of project leader representation from previously disadvantaged groups, with greater than 50% of new project leaders coming from the PDI group. At the same time we managed to have 22% of projects led by SMMEs and have had record participation of HDIs in the projects portfolio. The crowning achievement in this domain has been the greater than 70% representation of students in WRC projects from the PDI group. The general consensus from the community of practice is that the value-add of this injection of diversity is already having a positive impact on the overall portfolio.

The transformation agenda is also reflected in the greater representation of community-empowering activities as well as the larger contributions of science to inform policy and decision-making. The latter has been particularly important in the frame of the Water Policy Review and the finalization of the 2nd National Water Resource Strategy. The performance report will show a high achievement index, not only in the six focus areas of the WRC Knowledge Tree, but in all areas of the Annual Performance Plan.

This period has also seen a dramatic increase in the WRC Dialogues, as this is rapidly becoming the platform of choice for stakeholders across the board to find one another when addressing some of the highly complex 'wicked' problems of our time. These have included shale gas harvesting through fracking, non-revenue water and acid mine drainage challenges.

This was all achieved on the back of a strong partnership with a highly productive South African water research and development community of practice. South Africa managed to improve its position to 18th in the world in 2013, in terms of published papers in ISI-listed peer-reviewed journals, contributing a little over 1.61% of the global share of papers in the water resources domain. The WRC is proud to have supported this progress.

The 2014/15 baseline will be built upon in the five-year strategy 2015/16 – 2019/20.

# 6. THE NATIONAL RESEARCH, DEVELOPMENT AND INNOVATION (RDI) FRAMEWORK

## 6.1 What is a Research and Innovation (R&I) Framework?

An R&I Framework is the structural support upon which to build a thriving array of R&D activities that will enable water-related work to be world-class and lead South Africa into a future in which water research is relevant, timely, implementable, and implemented. The benefits of a co-ordinated R&I national plan include: improved global economic performance (and specifically the economic competitiveness of South Africa), increasing the effectiveness of public services and policy, and enhancing quality of life and public health.

The aim of this framework is therefore to ensure South Africa's R&I capacities are aligned nationally with future industry and community needs, to initiate collaboration that strengthens South Africa's position in international markets, and to ensure that R&I delivery is both more efficient and effective.

## 6.2 Why do we need a Water R&I Framework?

The strategies provided by Government recognize that the water sector can provide opportunities for job creation and economic development, and the solution of problems related to water supply and water quality, efficiency of use and the treatment of water and wastewater, which are critical to South Africa's sustainable economic development and competitiveness.

The country's ability to develop and implement these solutions – from policy through research, technology development and implementation – requires the activities of the various actors in the value chain for water to be united by clear focus and direction, and coordinated more effectively.

The water industries cluster is recognised by Government as one that provides opportunities for job creation and socioeconomic development, particularly in areas of water treatment and wastewater beneficiation. A national framework is required to provide a scaffold around which to build research for innovation in the water and wastewater sectors of South Africa.

The R&I Framework is required in support of the NWRS 2. The absence of a cohesive vision of R&I activities relating to water research and development creates fragmentation and duplication of effort, and poor returns on investment. The R&I Framework is based on the recognition that Government, research organisations, academia, NGOs and industry, working with other users of water, need to provide the evidence to support effective decision-making, joined-up policies, and a co-ordinated coherent approach to the development and dissemination of new knowledge, technologies and skills.

The intention of the Water R&I Framework is to highlight key water research and innovation priorities and mechanisms to ensure better coherence and co-ordination of different public-funding schemes for water research and innovation.

*Our vision is*: **South Africa achieves world-leading water research & innovation whilst enhancing environmental and social sustainability through all stakeholders working together to maximise benefits from R&I.**

### 6.3 Aim

This Water R&I framework aims to achieve our vision through facilitating an R&I model that will result in:

- More effective delivery of R&I outcomes for water-related industries
- Seeking to maximise water productivity and adapt to decreasing availability of water
- Better utilization of available R&I funds, facilities and capabilities relevant to water use, especially through enhanced collaboration between R&I providers
- Increased capability of water managers and users to help deliver transformations in the way that water is used in agriculture, industry and society
- Effective networks of R&I provider groups which can retain and build capability and deliver leading-edge R&I relevant to industry
- An effective organising framework for R&I that provides greater national and regional coordination of investment and service delivery, enhanced cross-commodity coordination, and improved linkages between water-using sectors

The intended framework for the next 10 years and beyond will direct, guide and manage more effectively the research, technical development and innovation activity, including development of the necessary skills and capacities, and will enable performance improvements in the delivery of water resources and services, in order to realise benefit at the level of the individual, community, society, industry and the economy.

### 6.4 What will the Water R&I Framework contain?

The contents of the Water R&I Framework will include:

- An overall vision on which to focus our water research and innovation
- Agreed high-level goals, cutting across the traditional research boundaries, that might be addressed through research and innovation
- A list of, and justification for, prioritised research areas, together with an indication of desired outcomes and impacts, based in part on the direction of excellent existing research capability, partnerships and initiatives
- The roles of all agencies, how they are aligned in the water and/or innovation space, and how their existing or planned work could address shared interests.

The framework will enable the creation of one or more five- to ten-year plans for research prioritisation and investment, industrial design and development, and commercialisation and/or non-profit implementation of the products of research. The whole will be focused for maximum beneficial socio-economic impact, thereby providing a demonstrable contribution to society and the economy, of benefit to individuals, organisations and the nation. Such impacts can be *instrumental* (i.e. influencing the development of policy, practice or service provision, shaping legislation, altering behaviour), *conceptual* (contributing to the understanding of policy issues, reframing debates), or *capacity building* (through organisational and personal skill development).

The envisaged scaffold to support this impact is the following:

1. Ensure an ongoing process of prioritisation of R&I on water use and management by end users and other stakeholders. Care will be taken to include all relevant spheres of governance as well as informal networks.
2. Reverse the decline in funding for water R&I.
3. Improve coordination and collaboration in R&I to improve effectiveness and economic efficiency:
    a. Lead processes for improved coordination between R&I provider agencies.
    b. Support improved coordination between R&I investors.
    c. Identify and lead the establishment of high-priority cross-sector R&I programmes.
4. With regional R&D:
    a. Facilitate R&I programmes with linked national and regional components.
    b. Facilitate development and use of enabling technologies (e.g. collaboration tools and spaces) to link across national, regional and local scales.
    c. Enhance international engagement to gain more national benefit from overseas research.
5. Enhance knowledge transfer, extension and practice change:
    a. Support user-led innovation and practice change,
    b. Lead an annual research, extension and practice-change forum.
    c. Encourage accreditation for private consultants/advisors to improve skill levels.
    d. Trial a knowledge brokering service for government.
    e. Lead reverse engineering and customise exploration (e.g. the Sanitation Innovation Challenge aimed at mobilising innovative sanitation technologies and solutions).
    f. Expand the WRC Knowledge to Action Suite, including investing in pilots and demonstrators such as the WRC is doing in the field of acid mine drainage.
    g. Invest in plug-and-play solutions as well as improving the accessibility of solutions.
6. Enhance necessary capacity building through:
    a. Build new research cadres and capability.
    b. Expand participation in Centres of Excellence and Research Chairs.
7. Reduce transactional costs in cross-sector R&I:
    a. Contribute to implementation projects that seek to reduce R&I transaction costs, e.g., by streamlining IP and legal agreements.

b. Monitor and analyse transaction costs in water R&I programmes and projects.

8. Encourage investors and providers to work together to maintain essential R&I capability.
    a. Monitor the national capability required for high-priority water R&I and help facilitate its maintenance or development.
9. Action this strategy and, in doing so, provide national leadership and support for R&I on water:
    a. Establish a national water R&I coordination committee.
    b. Appoint a coordinator of water R&I at the national level.

The framework will be progressively implemented through a national water R&I coordination committee. Initial emphasis will be on implementing national water R&I fora, implementing a process for ongoing national prioritisation of R&I on water, inclusive of all stakeholders, and the establishing of national programmes of water R&I with sustainable funding arrangements. The major-support-link national roles for water provide a basis for provision of R&I through national programmes and a roadmap for collaboration.

The WRC will further support this process by developing a robust geo-political analysis portfolio, moulding the water behaviours thrust and investing in water economics development as a discipline.

## 7. THE WRC LIGHTHOUSES

The construct of the WRC Lighthouse is a strategic developmental tool that will be further developed and implemented in this five-year planning cycle to direct research in key areas identified by the WRC. These Lighthouses are flagship programmes, and are trans-disciplinary, multi-KSA and inter-institutional mega-projects that will examine priority water issues across the innovation value chain. The WRC will actively seek to direct key projects into these programmatic areas. In the 2014/15 financial year, the WRC finalised work plans for each of the Lighthouses. New Lighthouses, such as the development of a Lighthouse focusing on water and ICT will be considered, while others such as the Lighthouse on Climate Change are moving into their second phase.

### 7.1 Water Sensitive Design

The purpose of this lighthouse is to develop a critical mass of knowledge for the adoption of more integrated planning using the water-sensitive design (settlements) lens for urban, peri-urban and rural environments. In South Africa, WSD is defined as management of the country's water resources through the integration of various disciplines of engineering, social, economic and environmental sciences, whilst

recognizing water as a scarce, finite and vulnerable resource and an economic good. Water and water-sensitive design are seen as enablers which could move South African institutions closer to meeting the developmental goals as set out in the National Development Plan and the objectives of the Water for Growth and Development Strategy, National Water Resource Strategy and Climate Change Strategy. This pioneering integrated design paradigm shift for South Africa will require a societal openness to: embracing a water-sensitive design vision as part of its broader developmental vision, adapting planning processes, re-organizing planning departments, absorbing research and guiding new research, adopting new technologies and adapting old technologies, reviewing and applying new policy and legislation, building capacity (skills, competencies and judgment) and initiating demonstrators for technology transfer with partners and stakeholders.

In 2014 the WRC released the framework document, entitled 'Water Sensitive Urban Design (WSUD) for South Africa: Framework and Guidelines' which promotes a cyclic approach to planning of water services for communities and with communities, in a holistic and resource-efficient manner. The report has taken the water management transition states paradigm proposed by Brown et al. (2009), which was based on a developed world, and framed the design principles within the context of South Africa's transition to water sensitive cities and settlements: two histories, one future'.

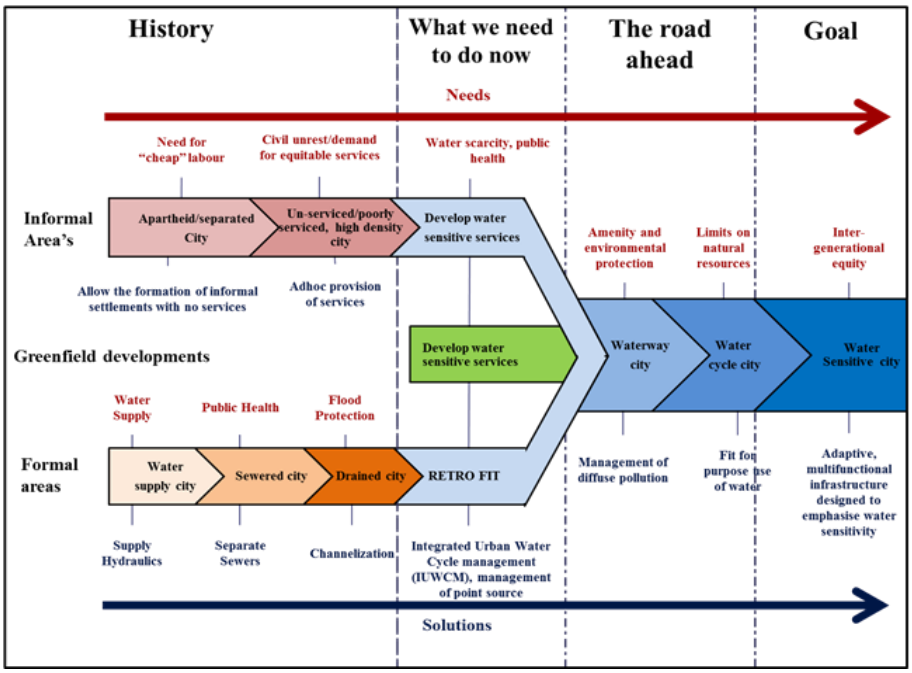



***Figure 6. SA's transition to water sensitive cities: Two histories, one future (adapted from Brown et al., 2009 – WRC Report No. TT 588)***

Analyses of local authorities (LAs) show that the concept of WSUD has recently been included in a number of local- and national-level policies in South Africa. The study found that in many cases it was as a direct result of members of the LA motivating for it with the intention of using these

policies as leverage for change within their (municipal) environments. Whilst the initial intention was to use the well-known and widely-accepted Australian term of WSUD in the development of a framework for the South African context, as a result of extensive discussion with stakeholders from the relevant professions, the term was split into three components to be considered in an integrated manner, with the ultimate goal being the achievement of water-sensitive settlements (WSSs).

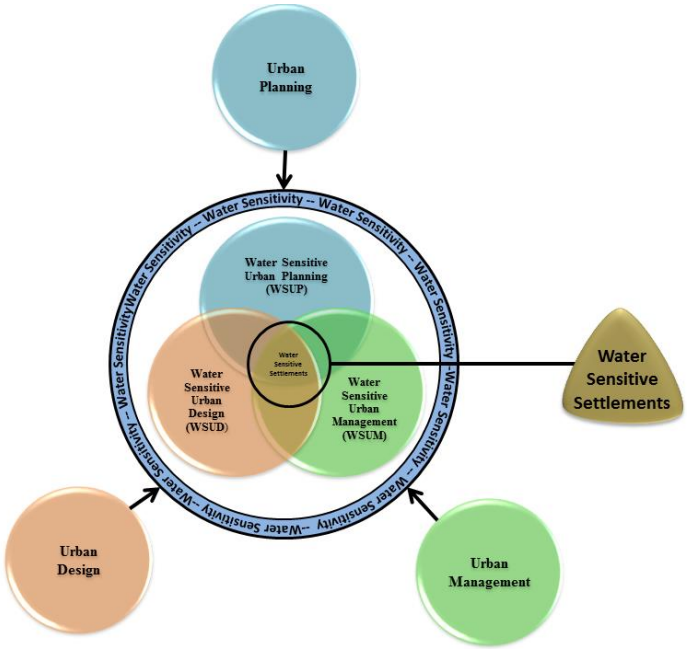



***Figure 7. The integration of WSUD, WSUP and WSUM towards WSS (WRC TT588)***

This important framework document builds on the initial stormwater research which resulted in South Africa's first Sustainable Urban Drainage Guideline. The WRC has tagged 14 projects in the current cycle which build knowledge in various relevant technical areas, ranging from energy generation and efficiency to new technologies and approaches that support 'new' water, resource efficiency, beneficiation and holistic integration of technologies. Finally, the WRC recognizes that investing in the social component of this field is critical to effecting change and ensuring relevant innovation. The WRC has invested in a five-year Community of Practice Programme, which started in 2014 and is aimed at developing human resource capital and expertise in this area through discussion platforms, workshops, dialogues, conferences and co-funded research projects.

## 7.2 Climate Change

The WRC Climate Change Lighthouse entails collaborative research on priority water-related climate issues, with partnerships forged along the innovation value-chain to enhance water R&D

nationally and globally. This Lighthouse will, inter alia, benefit from related project outcomes across the WRC's key strategic areas and leverage resources as well as expertise externally. It will conduct a foresight exercise for the WRC which should inform core business. It is expected that climate change as a cross-cutting water management challenge will need to be taken into account horizontally across all sectors and vertically across various scales, from local to regional and global levels. Some water resource managers view climate change as a phenomenon which should be projected to most likely occur in the too distant future or never. However, the current frequent incidence and accelerated intensity of extreme events as well as observed trends in temperature and non-linear variations in rainfall to runoff ratios signify the onset of an already changing climate. Tea farmers in Kenya and wine makers in the Western Cape, for example, have expressed concern about future temperature scenarios or trends in which temperatures are projected to increase beyond optimal levels, thus potentially impacting negatively on their business.

***The 15-year vision for the Climate Change Lighthouse***

Considering water as a constraint and opportunity to sustainable growth and development under a changing climate, the research outcomes (latest credible science) will be mainstreamed into water-related policy practice as well as responses to developmental and adaptation needs.

***The five-year plan***

The envisaged Climate Change Lighthouse will consider relevant previous and current work conducted both internally (i.e. within the WRC) and externally (outside the organisation), identify gaps, and make up for this shortfall where feasible. A stakeholder workshop will be held to develop a comprehensive medium- to long-term climate change research agenda and strategic plan of action. A systematic review of the methodology for collating information will then be undertaken to assess the current status of knowledge, through a short-term project. Some of the key/high-priority issues include enhanced access to good data; research on water-relevant information required to formulate robust messages (e.g. mountain hydro-climatology); use of competing lines of evidence; enabling the uptake of available scientific information; support to policy review and development; climate change and ecosystem services; and assessing current adaptive capacity (stress testing, early warning systems, national planning, disaster response, institutional capacity, infrastructure maintenance, risk and vulnerability assessments, etc.).

***Key considerations***

Alignment to the National Climate Change Response Policy and Strategy and potential partnership or collaboration with related programmes (e.g. climate change response strategies for various sectors) must be ensured. Other important themes requiring attention are: economics of climate change, socio-economic aspects, the climate–agriculture nexus, and mitigation action within the water sector. Application of existing knowledge in a chosen area will be considered to test the effectiveness of the developed tools aimed at increasing resilience to climate change of communities and various economic sectors.

***Operational modality of the Climate Change Lighthouse***

A systematic review of methodology for collating information, developing tools, and application of knowledge has been completed. As a result, the WRC will now promote the application of existing knowledge and tools for adaption and mitigation in a real-life situation in South Africa. To realise tangible outcomes, the WRC, through this Lighthouse, intends to seek various partners with interests in the application of climate knowledge to empower vulnerable communities and sectors.

## 7.3 Water–Energy–Food Security

The Water–Energy–Food nexus has become a buzz-phrase in sustainability circles as the interconnections between these three vital commodities is increasingly recognised. In the past, research on the production of these three goods and services has largely been in isolation. Recognition of the fact that water, energy and food production and consumption are inextricably interlinked has given rise to a growing need for integrated natural resource management. It is well documented that energy needs require water, often in large quantities or volumes, for fuel production, mining, hydropower and power plant cooling. Energy is also needed for pumping, treatment, and distribution of water, and also for collection, treatment and discharge of wastewater.

As outlined in the National Water Resource Strategy 2, irrigated agriculture is the single largest user of water in South Africa, with more than 60% of our surface and groundwater resources allocated to irrigated agriculture, which produced only 25–30% of GDP. Irrigated agriculture is also expected to contribute significantly towards poverty alleviation in the country through job creation, increased economic activity in rural areas and sustainable natural resource management. Sector policies regarding water, energy and food/agriculture are intertwined, particularly in their trade-offs. Currently, the WRC has 22 ongoing projects across all four KSAs addressing the Water–Energy–Food Security Lighthouse.

Some examples are as follows:

(i) Improving livestock carrying capacity with rainwater harvesting and conservation on grasslands, for extensive and/or intensive livestock production and biogas generation from manure in rural areas of South Africa.

(ii) Water use of cropping systems adapted to bio-climatic regions in South Africa and suitable for bio-fuel production.
(iii) The optimisation of electricity and water use for sustainable management of irrigation farming systems.
(iv) Water–Energy in the context of climate change: investigating trade-offs between water use efficiency and renewable energy options for South Africa.

A recently-completed project in KSA 3 focused on hydroelectricity generation in the supply of water through pressurised conduits, with promising results. It has therefore been suggested that the project team extend this approach to providing off-grid electricity to rural communities.

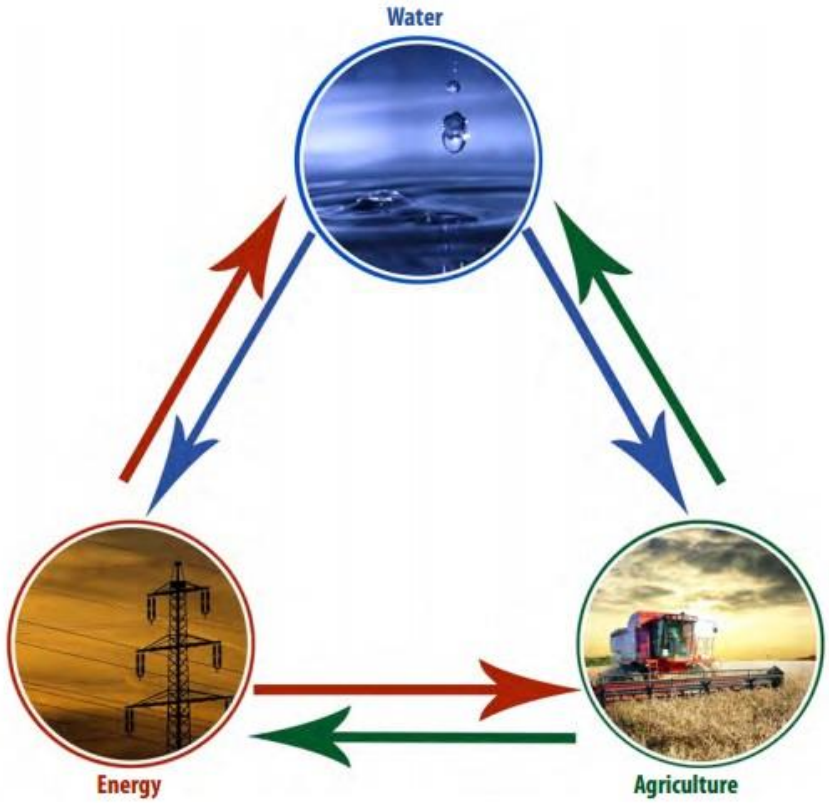



***Figure 8. The Water–Energy–Food nexus. Source: (Team analysis)***

Two dialogues focusing on Water–Energy–Food Security took place in the 2014/15 financial year. The first was held during the 22nd International Congress on Irrigation and Drainage, in Korea in September 2014. The second dialogue took place during the South African National Committee on Irrigation and Drainage Symposium at the University of Pretoria in November 2014. These dialogues helped to facilitate broader discussion and stakeholder buy-in on the Water–Energy–Food Security research agenda.

Lastly, the impacts of unconventional gas development on environmental, food and energy security will be investigated. While unconventional gas development may have a potentially negative impact on environmental security, if not properly managed, it could also potentially make South Africa more energy-secure (if the gas resources exist).

### 7.4 The Green Village (GV): A Partnership Programme

The WRC formally initiated the Green Village (GV), as one of the five lighthouse programmes aimed at innovation, and integrating and implementing researched knowledge in relatively complex pilot studies. The goal of the GV programme is to demonstrate that the fragmented, silo-based research products that are aimed at bettering the livelihoods of marginalized societies can respond better to addressing the basic needs if an integrated approach to implementation is followed. The GV programme proposes to roll out technologies developed over decades of research at the scale of entire villages in rural under-developed areas of the country, with the aim of creating jobs and self-sufficient communities. It therefore contributes towards meeting the basic needs in selected poor rural communities, including job creation, particularly for the youth, improving health, and building ecosystem resilience through rehabilitation and natural resource management, as applicable.

The participation of committed stakeholders, in terms of both in-kind support and co-funding, is essential for the success of the programme. The Department of Trade and Industry (DTI), through the Employment Creation Fund (ECF), is seen as one of the important partners in the programme. The GV business case refers to the establishment of infrastructure and the implementation of three Green Villages located in three of the 24 district municipalities earmarked by Government as deserving impoverished rural communities in the first phase of the programme (3–5 years), and subsequent extension to all 24 districts in the follow-up phases (3–15 years).

The estimated total budget requested from the ECF for the first phase of implementation (5 years) is R87 768 423 (excluding VAT) or R292 561.00 per household. An estimated total amount of R52 932 150 is allocated towards job creation and procurement of goods and installations, while the balance is the research budget for testing the large-scale roll-out, estimated at R34 836 273 (5 years). The largest cost is envisaged for the first year due to the large investment in infrastructure and equipment (R43 016 292), followed by costs of R10 million from Year 2 to Year 5. An estimated R25 million which did not form part of the request will be provided by WRC, WWF, DEA (DBSA/Green Fund) and SANBI, through current funding in the uMngeni Basin and planned green options research.

The GV programme proposes employment for an estimated 244 persons, including support to 96 students and research staff. Forty-eight jobs are short-term (weekly or monthly) and 100 jobs are long-term (1 year to permanent). The jobs created will imply training of employees in the installation, maintenance and provision of community services related to green technologies. In total, 300 households at 3 pilot sites will be supported by the action in the first 3–5 years, with extension to 24 districts in the medium- to long-term (10–15 years). The pilot sites were selected through an informed process, based on previous research done at these sites, in order to minimize the risk of lack of uptake of the technologies, while ensuring post-project sustainability.

Despite this project largely focusing on the implementation of off-grid rural livelihood improvement strategies, it is envisaged that job creation will form an integral part of this process and will continue to become more prevalent in future roll-outs (15-year plan). With respect to direct planned and budgeted employment within the Green Village proposal, 244 jobs will be created and/or supported. Although these jobs have varied life expectancies, the envisaged continuation of the project into a 15-year plan would secure their longevity – creating further opportunities for existing up-skilled beneficiaries and especially community entrepreneurs. The project will accommodate 49 951 man-days across the project lifetime (equivalent to 192 permanent jobs for one year).

Employment of economic multiplier and sector dataset models reveal further impact and benefit to the local and national economy. Estimates reveal an economy-wide impact of R277 million from an initial increase of R90 million final demand. Furthermore, it is estimated that 277 direct, 88 indirect, and 195 induced jobs will be supported by the increase of R90 million final demand, resulting in an additional 560 jobs.

The GV business case also responds to the four outcomes of the Economic Sectors and Employment Cluster (ESEC). The GV programme proposes to enhance inclusive growth and create jobs through the implementation of innovative green options in off-grid rural areas (addressing Government Outcome 4), train communities in the installation and maintenance of green technologies (Government Outcome 5), create equitable and sustainable rural communities and food security (Government Outcome 7), and promote conservation and sustainable use of ecosystem services, thereby reducing the costs of these services (Government Outcome 10).

The innovative green technologies considered in this programme emanated mainly from research previously funded by the WRC, such as biogas digesters, sanitation pit latrines, rainwater harvesting installations, off-grid alternative energy systems, water and waste recycling, sustainable use of ecosystem services, improved land and water management for self-sustained agriculture, and others. The programme includes a large number of stakeholders in the form of Government departments, community organizations, academic institutions and research councils, local Government and tribal authorities, small and large businesses, international organizations, NGOs and schools. It gives the opportunity for integration of resources and budgets by different line departments and to add value to actions that are already taking place. Most of these

stakeholders have already been engaged through dialogues or workshops, as well as community interviews at local level.

The GV programme implements a simple yet robust management structure to facilitate efficient and effective communication throughout the project. The programme will be coordinated by a project manager and supervised by the project champion (Research Manager). The project champion interacts with Government departments and co-funding organizations through the National Management Committee. The GV programme includes two main actions, namely, research (to test the large-scale roll-out of green technologies) and implementation (installation and maintenance of green-technology equipment). Research is executed by academic and research institutions, whilst sub-contractors are engaged for implementation. The project manager fulfils a coordinating role and provides the liaison between the various districts, research teams, sub-contractors and project champions. The quality control is driven through a steering committee according to the model adopted by the WRC, and the National Management Committee.

It is envisaged that such a large-scale programme can ignite small businesses and enterprises, increase their size over time and render them self-sufficient upon termination of the project. During the first phase of the project (5 years), an exit strategy will be developed in order to ensure sustainability of jobs after the duration of the project. It is envisaged that the core of the exit strategy will be capacity building and skills training, embedding a sense of community ownership, and gaining the institutional support of line departments and local municipalities, as well as community organizations, through signing of binding partnership agreements.

### 7.5 Freshwater Governance

Water governance involves the mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their rights, meet their obligations and mediate their differences (UNDP 1997). Governance is a multi-level, multi-sectoral dynamic process of a socio-ecological complex system involving continuous learning and the ability to adapt effectively to unpredicted outcomes of water management. It is not the responsibility of office bearers alone.

Water governance is enabled through legal reforms, organisational alignment and coordination, adequate resourcing and agentised participation of all stakeholders. It can be defined by the political, economic and administrative systems that are in place and which

directly or indirectly affect the use, development and management of water resources and the delivery of water services at different levels of society. Importantly, the water sector is part of broader social, political and economic developments and is thus also affected by decisions outside of the water sector.

The aim of this Lighthouse is to create robust dialogue platforms to define and frame the level and context of issues in the local and international debates relating to water governance. It is aimed at supporting all WRC KSAs and Lighthouses, bearing in mind the amorphous nature of governance. As a value add, horizon scanning will be conducted for different aspects of governance to identify the risk of a lack of good governance, and to raise the level of engagement and discussion between multi- and trans-disciplinary researchers at local and international levels as well as between researchers, civil society and policy makers. The ultimate aim is to mobilise research partnerships between Lighthouses to develop a comprehensive research programme covering all aspects of governance.

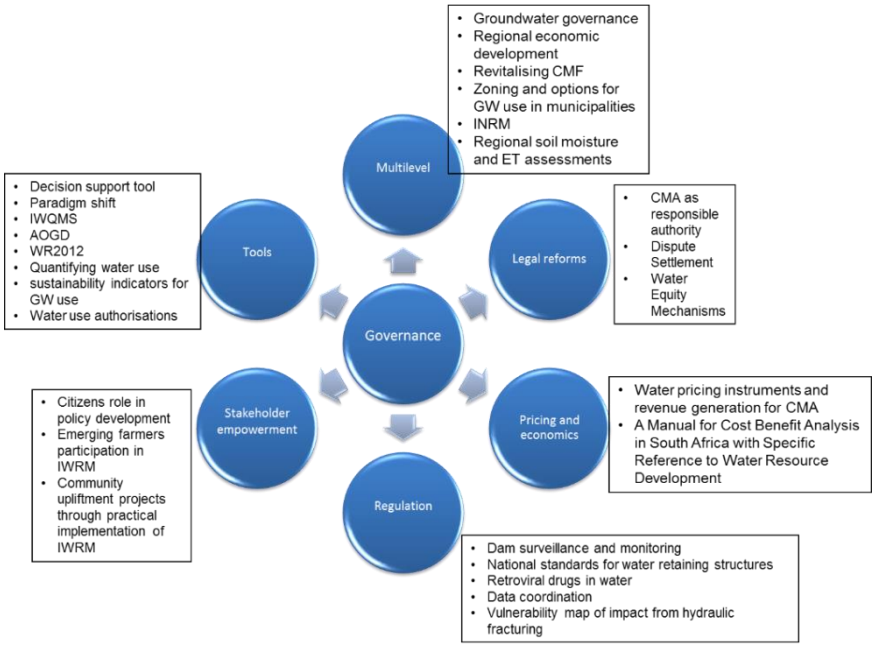



***Figure 9. Key elements of the Freshwater Governance Lighthouse***

This Lighthouse has defined the scope and context of governance based on the engagement of some 500 participants, including researchers, practitioners from the public and private spheres, and civil society, at the 2012 Freshwater Governance Conference. Local and international participants were drawn from national, regional, provincial and also very local scales. The main findings of this engagement were shared with the South African Parliament and have had an impact through a number of project thrusts visible in the current cycle and in follow-on cycles. The main recommendations emanating from this conference will inform the future focus of this Lighthouse and will also yield a book publication focused on thematic areas.

To date this Lighthouse has been active in providing a discussion platform for various issues: from equity in water allocations to promoting the lessons learnt from existing CMAs, unpacking leadership and impact, gender and water, constitutional provisions and inconsistencies, as well as providing the tools for better establishing the institutional memory relating to South Africa's water policy and act.


***Figure 10. Multi-level policy and legal frameworks***

Specific areas within this domain have been identified to be challenging for all WRC KSAs as well as all Lighthouses. These areas, as reflected in the diagram below, are as follows: developing a better understanding of the role of the state versus decentralised organisations; oversight responsibilities of the custodian as well as overall government accountability mechanisms; and horizontally and vertically effecting robust democracy in decision making, with a special focus on the poorer sectors of communities and the mechanisms for their voices to be heard when decisions are being made at all levels. Closely linked to the latter is better understanding, articulating and creating the mechanisms through which rights and obligations of citizens can be clearly designed around water, based on the legal provisions afforded. The dynamic nature of the public administration demonstrates a challenge for the continuity of implementation plans, which are probably strongly upheld by a few internal technical practitioners who require research support. These role players are referred to in literature as 'policy entrepreneurs'. These individuals can be identified and supported through research tools to effect implementation of legal provisions within their environments. In such a way this Lighthouse gradually moves from

the discussion, collective influence and advocacy phase to dedicated activities aimed at showing impact on the ground, and relating predominantly to implementation gaps.

## 8. THE WRC FUNDING STRATEGY

Unlike many other public research funding entities and science councils, the WRC is financed primarily through the water research levy (WRL) which is currently collected and received from the Department of Water and Sanitation (DWS), Rand Water and Umgeni Water. The levy is currently the primary income source for the WRC, contributing about 86% of the total income, with the remainder coming from leverage income (10%) and other income (4%).

Noting the increasing demand for R&D funding and other WRC services in South Africa's water sector, the WRC needs to explore ways of increasing its funding streams. Some of the current realities for the WRC are:

- Inadequate R&D funding – the WRC can currently only fund 1 out of every 3 proposals that are recommended by the peer-review process
- A highly productive but very small community of practice – limited support for emerging researchers (historically disadvantaged researchers)
- Limited support for capacity building (student support)
- Research currently limited to basic and applied research; limited scope for innovation support
- Low levels of R&D participation by most players in the water sector
- Low uptake/implementation of research outcomes (including technology development, piloting and demonstration)

Given these challenges, one of the special emphases in this MTEF period is to substantially increase the resources available for water R&D in South Africa through a revised funding strategy. The following mechanisms are being engaged:

1. Exploring the feasibility of securing a dedicated Parliamentary Grant for the WRC as enabled by the Water Research Act.
2. Exploring the diversification of funding through new and increased resourced partnerships with the public and private sectors as well as foundations and donor agencies, including foreign direct investment (FDI). Public–private partnerships (PPP) will be explored through formal (MoU/MoA) arrangements.
3. Providing directed support to the R&D community to better enable our collective ability to be more successful in gaining access to international competitive funds for water R&D.

In terms of the planned interventions in these three domains, the WRC has firstly identified the Parliamentary Grant as one of the most viable mechanisms that would enable it to deliver on its expanding mandate without losing its autonomy in determining the research agenda. The first actions on this issue are to develop a business case for accessing Parliamentary Grants and to develop a roadmap for such an application that clearly articulates the most appropriate use and distribution of said funds, i.e., funding for development research (as opposed to basic & applied research), and/or funding for research prepared for scaling up projects, service delivery and community empowerment.

The second mechanism – an expansion of leverage funds – is articulated in the WRC's Business Development Strategy that outlines the priority sources of external funding over the next five years.

The third mechanism – better accessing international competitive funds for water R&D is articulated in the WRC's International Strategy.

## 9. INFORMATION MANAGEMENT

The focus on information management (IM) in this iteration of the WRC's five-year planning cycle builds on the previous year's focus on the WRC Knowledge Management Model.

### 9.1 What is IM in the WRC context?

IM refers to:

- The acquisition, organisation, control, dissemination and use of information relevant to the WRC's operations (roll-out and implementation; R&D; hi-tech scientific services; science-based advice)
- The value, quality, ownership, use and security of information in the context of organizational performance
- Developing a common understanding about how information systems at the WRC can increase (or how it limits) our productivity, and how it can facilitate reporting and decision-making
- Evaluating how well the WRC collects and manages information from one or more sources and distributes that information to one or more audiences
- How do we better enable the WRC Knowledge Management Model?

### 9.2 IM focus areas

Within the WRC context, the key IM focus areas include (See Figure 11):

a. How we manage information within a project

b. How the WRC manages project information

c. How well we manage the reinforcement of information

d. How the WRC is presented

e. Hardware and software considerations

f. Information use

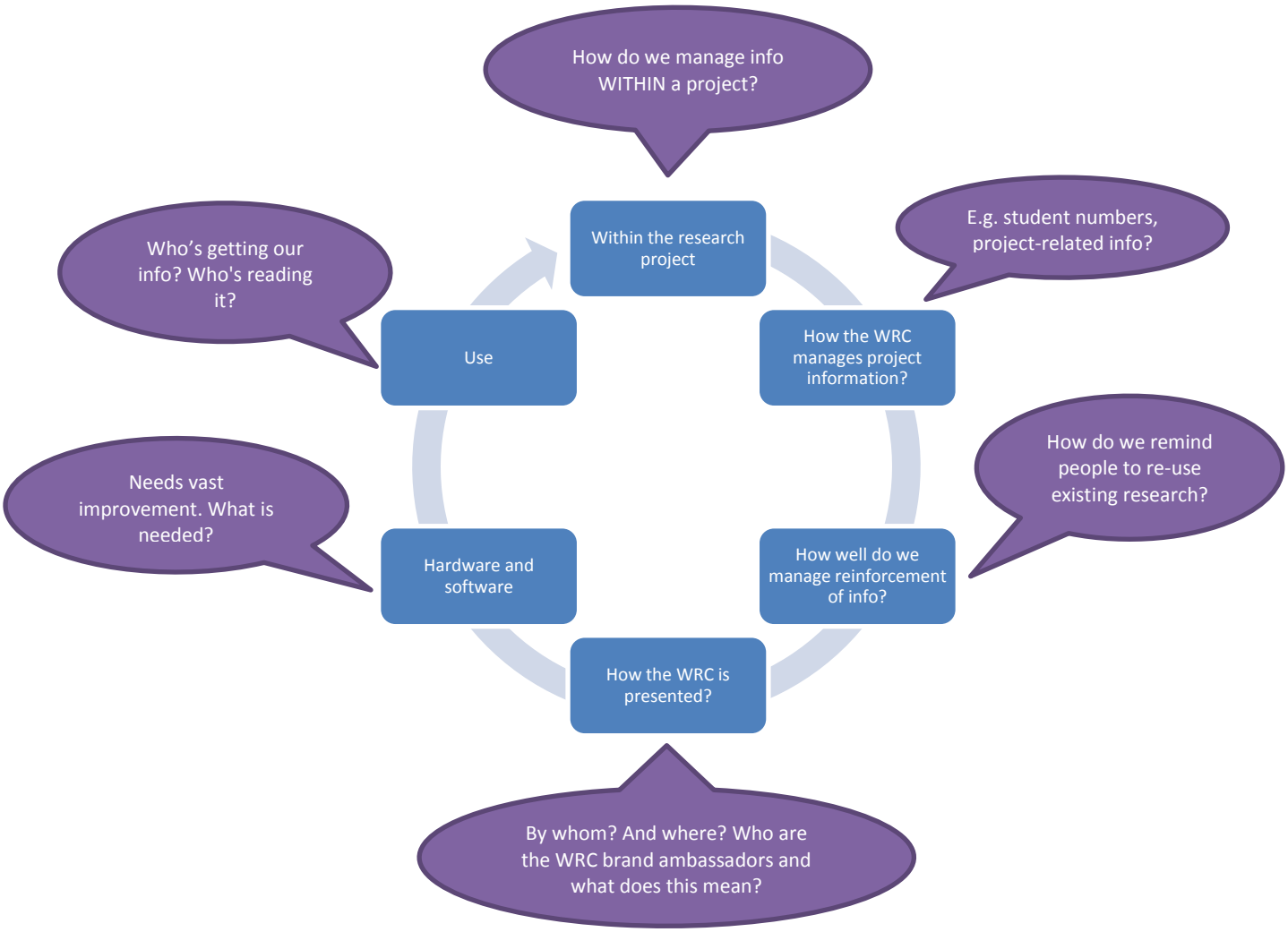



***Figure 11. IM Focus Areas***

Given the magnitude of information management improvements for a knowledge-based institution such as the WRC, several big projects and 'quick wins' have been identified to form the primary work-plan.

## 9.3 Big projects

a. Website improvement – the WRC website will be upgraded and improved in the 2015/16 financial year.

b. Fund Management System (FMS) improvement – the FMS will be re-evaluated to interrogate its usefulness given the evolving mandate of the WRC.

c. Centralised filing system – in order to improve document control, the WRC will explore the benefits and costs of a centralised filing (electronic and physical) system.

d. Raw data management – the water sector is in need of a centralised raw data management facility. The WRC will investigate how it can support other processes in this regard. A dialogue on the water and sanitation sector's primary data needs will be planned in 2014/15 to inform the WRC's long-term strategy on this.

e. Reorientation of project leaders to build transdisciplinary teams if research is to look at the full extent of knowledge dissemination, impact and uptake – the WRC will look at how it can promote transdisciplinary teams that include knowledge dissemination and/or uptake practitioners that focus on the dissemination and accessibility of the knowledge generated from WRC projects.

## 9.4 Quick wins

a. Better mileage out of existing information – this includes but is not limited to the following interventions:

- Develop a tactical plan for targeted information sharing to specific audiences. This includes, for example, developing a variety of briefs in addition to policy, ministerial and technical briefs, most notably, municipal, civil society and business briefs. This plan would also include an analysis and greater emphasis on the kind of knowledge/information needed by 'Ma-Dlamini', and how to get it to her.

- Improve the WRC stakeholder engagement map and stakeholder engagement workflow (how the WRC responds to media crises, water crises, etc.).

- Establish better entry points to engaging with municipalities.

b. Develop a Water Research Directory – this will comprise of a 'Who's Who' database, searchable on the WRC website, of all water professionals working in the water sector.

c. Recognition system for reference group members – in order to recognise the efforts of reference group members and to incentivise their participation in WRC reference groups, the WRC will develop a recognition system.

d. FMS improvements – a number of FMS enhancements are planned to improve internal operations that include:

- Implementation of an overdue deliverable notification system
- The integration of FMS with other WRC systems
- FMS training for all staff users

e. Improve post-project printing workflow.

f. Develop a report distribution protocol.

# 10. RESEARCH IMPACT AND INTERVENTION

## 10.1 What does 'impact and intervention' mean?

Research impact has been defined at the WRC as 'the demonstrable contribution that excellent research makes to society and the economy'. Research impact encompasses all the ways that research-related products and skills benefit individuals, organisations and nations. These include: improved global economic performance (and specifically the economic competitiveness of South Africa), increasing the effectiveness of public services and policy, and enhancing quality of life and public health. A defining characteristic of impact is that it must be *demonstrable*. It is not enough just to focus on activities and outputs that promote research impact, such as organising a conference or publishing a report. We must be able to provide evidence of research impact, for example, that it has been taken up and used by policy makers and practitioners, and has led to improvements in service delivery or business. Above all, research must be of the highest quality: we cannot have impact without excellence.

## 10.2 Why make an impact?

The primary reason for the renewed focus on achieving impact is that, as a public entity, we form part of a government that strives to improve the lives of its citizens. As such, we have a role to play in achieving government objectives. Additionally, we are increasing our emphasis on the need for evidence of economic and social returns from our investment in research. Demonstrable impact helps to verify that research is important – that it is worth investing in and using. Evaluating our impact also enables us to see what works and why. These lessons can then be implemented both by the WRC and our future researchers.

High-quality research has the potential to enhance social and economic wellbeing across all sections of society. By ensuring that decisions on policy and practice are informed by evidence, research can help to:

- Improve the effectiveness and sustainability of public, private and third sector organisations
- Improve social welfare and cohesion
- Increase economic prosperity, wealth, and job creation
- Enhance cultural enrichment and quality of life

To maximise the impact of our research, we need to engage with our key user groups. This can provide substantial benefits for the quality of our own research, including:

- *Feedback* to help shape our research agenda and improve methodologies
- *Relevance* , ensuring our research is meaningful, timely and useful
- *Human capacity development*, recruiting participants, for example, for Reference Groups or surveys
- *Recognition*, developing new skills and raising our profile

We aim to achieve maximised research impact, and this can include socioeconomic impact, academic impact, or both. Socioeconomic impact is the demonstrable contribution that excellent research makes to society and the economy, of benefit to individuals, organisations and the nation. Academic impact is the contribution that excellent research makes to advances across and within disciplines, including significant advances in understanding, method, theory, and application. The impact of research can be *instrumental* (i.e. influencing the development of policy, practice or service provision, shaping legislation, altering behaviour), *conceptual* (contributing to the understanding of policy issues, reframing debates), or *capacity building* (through organisational and personal skill development).

To plan impact effectively we need to:

- Identify our key partners and stakeholders, for example, other researchers, public sector, business/industry
- Identify how they will benefit from our research – types of impact might include: improving social welfare and/or public services, influencing policy, contributing to industrial competitiveness
- Identify how we will ensure they have the opportunity to benefit, for example, through organising public events, conferences, interaction with the media, sharing of intellectual property

### 10.3 Maximising impact

Several key factors are vital for generating impact. These include:

- Excellent leadership and research management support
- Portfolios of research activity that build good reputations with research users

- Established partnerships with research users and other stakeholders
- Involving potential users at all stages of the research, including working with user groups
- Well-planned public engagement and knowledge exchange platforms, including the use of product strategies which tailor communication products to the needs of users
- Understanding and targeting barriers to and enablers of uptake

The environment in which we communicate our messages has a bearing on uptake and impact. If we try to promote our findings at a time when policy makers or practitioners are not open to such ideas, this reduces the scope for impact. However, if our communication is timed to coincide with the development of relevant policy issues then it will stand a better chance of making an impact. It is therefore essential to maintain communication and engagement with research users. For example, an awareness of policy and practice debates and initiatives will help us to time the communication of our work most effectively to achieve the best end results.

The extent to which the content of our research fits with the context in which it is disseminated will have a bearing on its capacity to generate impact. Building ongoing relationships with our research users is key to ensuring that any research communication is relevant as well as timely.

### 10.4 What the WRC expects

The WRC requires the researchers we fund to consider the potential scientific and socioeconomic impact of their research. We do not expect them to be able to predict the impact of their research; however, by considering impact from the outset, we expect them to describe in their proposals who could potentially benefit from the project, and to explain how they can increase the chances of potential beneficiaries benefiting from their proposed work.

### 10.5 The proposal stage

All proposers are required to complete a section describing their plans for Knowledge Dissemination and Research Uptake. The WRC template and guidelines for writing proposals give guidance on how proposers should set out the potential impact of their work as part of their application for research funding. This will form part of the peer review and proposal assessment process. When composing their proposals, we expect that our researchers will have considered the potential academic and socioeconomic impacts of their research.

The WRC funds excellent research: the principal criterion of review is scientific and/or technical quality. We expect our portfolio to include a diverse range of research encompassing, amongst other things, work based on single disciplines, research which combines disciplinary approaches, research focused on advancing scientific theory, and research aimed principally at developing practical applications. As part of this portfolio, we encourage research applications which demonstrate innovation and potential impact.

Feedback received in the July 2014 stakeholder engagement session emphasised the need for WRC research projects to address inter-disciplinary needs for knowledge in the sector, tailored to entities so that it will be far more attractive and easier for the entities to engage in uptake.

### 10.6 During and post-project stages

For each WRC-funded project, we ask the following questions:

- What are the likely *outcomes* of this research?
- *Who* will benefit from this research?
- *How* will they benefit from this research?
- How can we *involve potential beneficiaries* in this research?
- How will we *know* if it has made a difference?

A typical set of interventions to maximise uptake and impact of a project might include: building awareness of the project among one or more defined audiences, securing the commitment of a defined group of stakeholders to the project aims, influencing specific policies or policymakers, and encouraging participation of other researchers or research users, especially in taking the research products beyond the mandate and scope of WRC activities (e.g. commercialising new products and processes).

Public engagement involves activities that bring the WRC or its researchers and the public together. It is more than inviting an audience and presenting research – effective public engagement is two-way communication, with the researchers listening to and learning from participants. Activities can range from engaging people with science concepts through staging debates to involving key stakeholders in shaping research priorities and directions. Public engagement can build trust and understanding between the research community and a wide range of groups, from policy makers to schoolchildren.

A key pillar of the WRC research process, the WRC reference group, also needs to be reviewed and evaluated with respect to impact and uptake interventions. While the WRC reference group system is a strong mechanism to broaden the knowledge about WRC research by using a wider stakeholder group, current reference groups experience a lack of commitment/support from experts in the field. The WRC will work to review and strengthen this mechanism by incentivising involvement in reference groups, and developing clear ToR (terms of reference) for reference group members.

### 10.7 Assessing research impact

Determining the impact of research is not a straightforward task. Policy and service development is not a linear process, and decisions are rarely taken on the basis of research evidence alone. This makes it difficult to identify the role that an individual piece of research has played. The

timing of evaluation also presents challenges. An evaluation occurring too soon after the research ends may mean that any impact has yet to fully develop; too late, and the impact may no longer be traceable as people involved have moved on. We are exploring new methods for assessing research impact on policy and practice.

The only way to answer the question, 'were our activities successful?' is to build in impact assessment from the beginning of each project. Effective assessment is about *improvement*. It offers an opportunity to demonstrate how well the interventions worked but also to identify areas that need to be improved. It should also explore the entire portfolio – from the early planning stages through to final delivery.

Good impact assessment needs a clear set of objectives. The usual starting point is to evaluate the activities of each project, as laid out at the proposal stage. This will help determine if the project achieved what it set out to achieve. We also wish to evaluate other, broader issues: For example, have there been any unexpected outcomes, whether positive or negative? Has the research changed any of the participants (audience and researchers)?

The assessment might explore how the project could be improved or seek to identify any aspects that were particularly effective. This learning can be very useful for other researchers undertaking public engagement – knowing what works (and what doesn't) can save time and improve practice generally.

The WRC's own assessment of the uptake and impact of WRC-funded research as an entire portfolio might also stimulate research into public engagement. For example, it might identify which types of engagement activities work well for particular audiences and new ways to engage with audiences that are difficult to reach.

### 10.8 Measurements

**Media relations:** Press cuttings, statistics and achievements can be circulated to key people (for example, funders, government audiences) on a regular basis to help keep the issue in the spotlight. We can measure the number of press releases we have issued and the take-up rates. These can be broken down by media type, for example, local, national and trade press and broadcast media. Newsclips will collate these statistics automatically and send the WRC relevant press cuttings, which can be analysed according to how effective we have been in getting our key messages across or by how positive, negative or neutral the coverage has been.

**Events evaluation:** Event evaluation is important because we can establish whether we have met our objectives for the event, get feedback from our audience on their opinions of how the event was organised and whether their needs were met (this will help us to decide how to take forward our future programme), and thus help to identify areas where improvements can be made for future events. Delegates can be given an evaluation form. The Chair should remind

people to fill in their form before closing at the end of the day, and staff should be on hand to pick up the forms on the delegates' way out. Alternatively, a clearly marked box for the return of the forms should be made available from exit points. Evaluation forms should be collated and analysed within a week of the event.

**Brand recognition:** The WRC has its own brand, and WRC programmes which revolve around uptake and impact, such as the Water Technologies Demonstration Programme (WADER), will themselves be uniquely branded. Once our brand is in place, we will need to build in some simple evaluation measures to make sure it is applied consistently. Common problems include inconsistent application of the brand and identity guidelines, and development of sub-brands and mini-logos. It is worth carrying out regular checks to see if the WRC brand is being applied consistently. Techniques to use include:

- A regular survey of all visual material. Does it all look as though it comes from the same organisation? Can we isolate where breaches of the brand guidelines are occurring?
- Reviewing electronic communications regularly for user-friendliness, design and compliance with official guidelines.
- 'Mystery shopping': visiting or telephoning key sites, sitting in on presentations and other spot checks on the use of the brand guidelines in practice. What does it feel like to have contact with our organisation? It is conveying a consistent brand?

Impact assessment can be carried out internally or by an external consultant. Conducting our own assessment gives us direct access to participants' responses. This can give us a deeper insight into how the interventions are working. It also allows us the flexibility to modify the assessment. If confidentiality is an issue, then internal assessment may be the best option. External assessment offers a measure of independence which can add weight to the validity of the assessment. It also allows us to bring in specific skills and resources which may not be available in the WRC team.

We are exploring new methods for assessing the impact of the research we fund on policymakers and practitioners, in order to demonstrate a broader contribution to society and the economy. This forms part of the new strategic emphasis on impact assessment alongside our international review. As part of this initiative, we will commission a series of impact case studies aimed at identifying the impacts from WRC research, and testing evaluation approaches.

# PART C: STRATEGIC OBJECTIVES

This section covers the objectives identified to achieve the WRC's strategic outcome-oriented goals outlined in Section 8. The strategic objectives that have been identified are related to and discussed within the context of the approved budget and programme structure referred to as the WRC's Key Strategic Areas (KSAs). Table 5 summarises the WRC's strategic objectives, which are expanded upon in each KSA. These objectives are met through the building of relevant knowledge as depicted in Figure 12.

***Table 5. The WRC's Strategic Objectives[1]***

| STRATEGIC OBJECTIVE | DESCRIPTION OF STRATEGIC OBJECTIVE |
|---|---|
| To enhance knowledge across the water knowledge and innovation cycle | Initiate new research projects |
| | Finalise projects |
| | Communicate scientific findings and WRC-generated knowledge |
| To support human capacity building in the water sector | Encourage participation of students in WRC research projects |
| | Encourage public engagement through workshops, dialogues and other water-related events |
| | Encourage participation of PDI as project leaders |
| | Increase participation of women as project leaders |
| | Encourage participation of HDIs as lead organisations in WRC research projects |
| To develop new products and services (new innovations) | Encourage development of innovations, and new products and services |
| | Strive to take existing WRC products and services to more advanced stages of development |
| To support community empowerment | Increase the number of community-based research projects |
| | Support SMME's in water-related R&D domains |
| To support transformation and redress | Involve and support PDIs in WRC research projects |
| | Promote research that supports the reduction of poverty and inequality, and the reallocation of water |
| To develop sustainable solutions | Ensure that WRC research contributes to sustainable solutions for the water sector |
| | Promote the uptake and communication of WRC research in the form of manuals, guideline documentation and other supporting materials |
| To inform policy and decision making | Support policy makers with research-based knowledge |
| | Improve the tactical dissemination and targeting of policy and ministerial briefs and engagement around prioritised issues |

[1] The WRC's Annual Performance Plan provides a more comprehensive list of institutional Key Performance Areas (KPAs) along with baseline information.

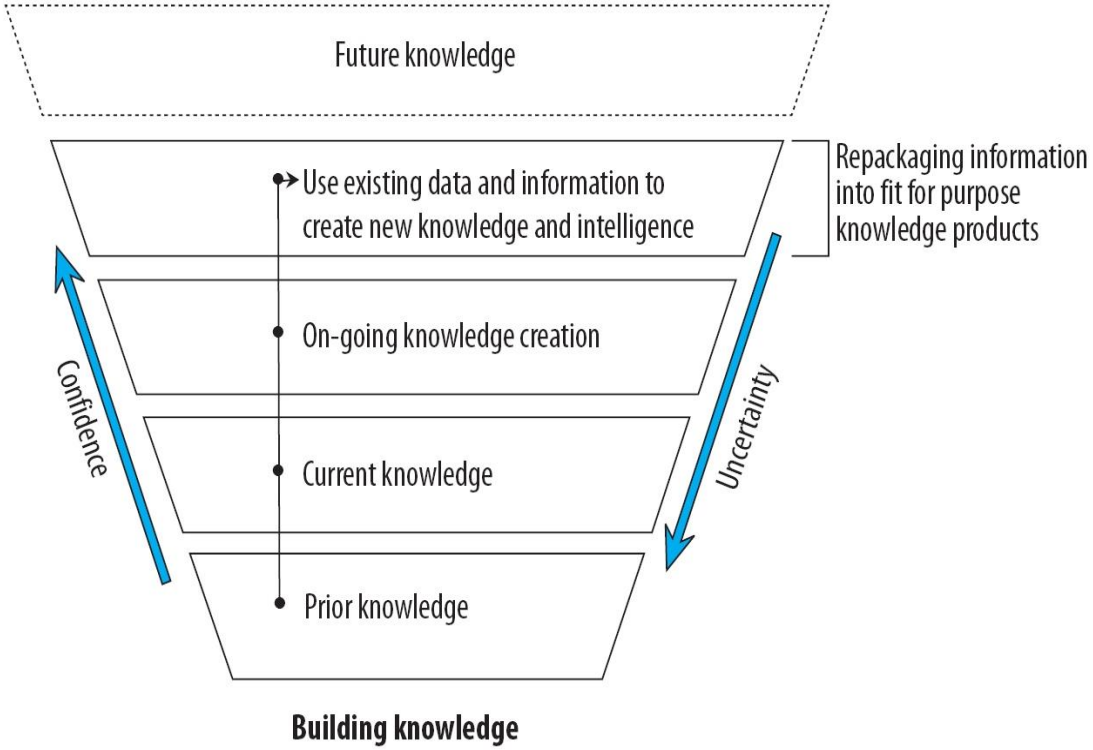



***Figure 12. Building relevant knowledge which feeds into the WRC Knowledge Tree and WRC Lighthouses***

## 11. KSA 1: WATER RESOURCE MANAGEMENT

**Scope**

Fundamental global challenges, such as climate change, population growth and urbanisation, continue to affect the management of water resources. The results of these drivers are clear pressure manifestations, such as demand far exceeding available freshwater resources, increased competition between sectors, and deteriorating water quality. In many areas of the country dwindling water supplies, lengthening droughts, poor water quality, and rising demand for water are creating increased risks for water managers and industrialists alike.

The health of rivers and aquifers is under pressure from economic activities and a changing climate. Water is necessary for drinking, sustaining goods and services of ecosystems, food production, and industrial activities for economic growth; water resources are also the receptor of our waste products. Diffuse pollution from agriculture, and point sources of pollution from current industries and old abandoned mines, continue to pose serious threats to our water resources. Land-use activities affect the chemical and ecological status of rivers, dams and groundwater resources as well as available soil sediment water resources (green water). The functioning of the soil–sediment–water system and the links between quality, quantity and land-use activities require a more nuanced approach to water management.

Over the past four years, the focus of this KSA has been on better understanding the drivers, pressures, state of the resources, impacts and responses by society within a systems view of socio-ecological complexity. This focus will continue, albeit with an added risk lens. An additional focus will be applied to knowing and understanding, targeting and managing the risks in, for example, water quality, water planning, water allocation, shale gas exploration, water security, large infrastructure, asset management, information systems, enforcement and compliance, wastewater discharge risks to water bodies, etc.

The emphasis on risk stems from the realisation that there is relatively adequate knowledge of the problems faced and their respective characterisations. What is missing is engagement of the decision makers in taking up this knowledge and applying it in managing these problems. It is believed that when these issues are shared from a risk perspective, knowledge transfer can be more targeted, the need for specific knowledge clearer to the decision maker, and action prompted more readily. The envisaged approach will evolve gradually, from first characterisation of the risks and identifying the boundary conditions, and will apply as guiding principles the adoption of a participatory approach within an adaptive paradigm.

Further, there will be an increased focus on the 42 years of existing research outputs that need to be used in assessing risks and identifying adequate mitigation approaches aimed at targeted outcomes and impact. Over the next five years, research outputs, coupled with enhancing the understanding of characterised risks through targeted communication per sector, and robust dialogues and other stakeholder engagement mechanisms, should result in the desired outcomes and impact.

The term risk refers to all agents or sources that may inhibit the achievement of the three cardinal principles contained in the National Water Act, i.e., social equity, ecological sustainability and efficiency of interventions, at the scale of catchments and at the operational level. Risk management is therefore embedded in the wider context of balancing social, environmental and economic aspects aiming at sustainability. It requires the creation and evaluation of options for initiating or changing human activities or structures with the objective of increasing the overall benefit to human society and preventing harm to humans and what they value. Managing uncertainty is an inherent part of risk management which should be a continuing adaptive process so that risks can be re-evaluated at given intervals.

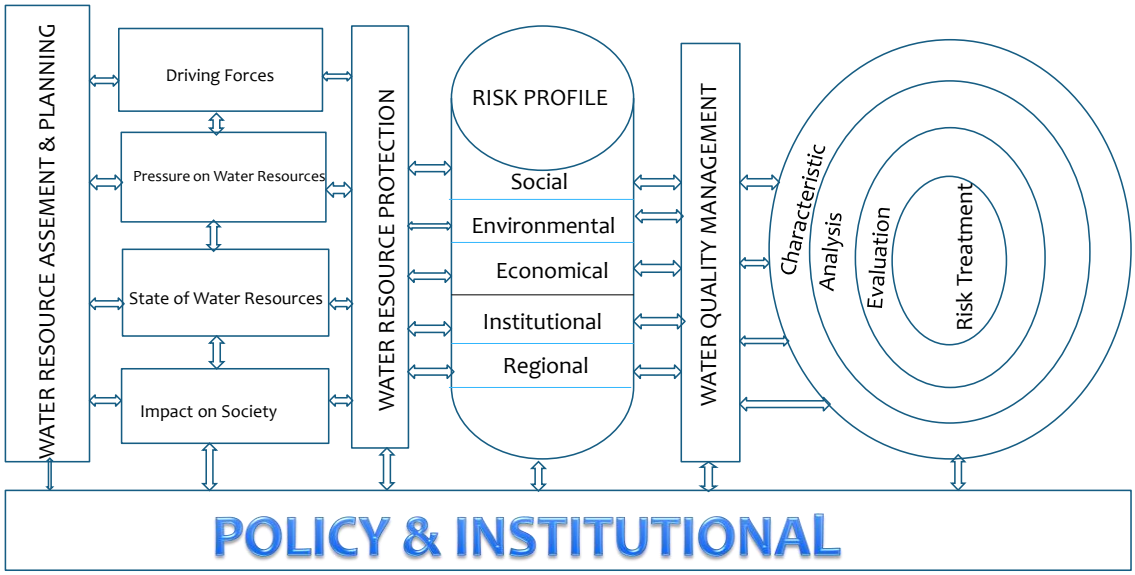



***Figure 13. KSA 1 Portfolio Framework***

Risk identification, analysis and evaluation will be conducted within all thrusts to establish the risk, building on the numerous investigations of the state of water resources and the pressures exerted upon them. Risk mitigation and/or treatment will comprise policy and societal responses, developed in a participatory fashion with feedback loops for adaptive responses.

This KSA will use and support the knowledge base for addressing the above risks through four thrusts as defined in the above diagram. Climate change and climatic variability will be integrated into the different programmes of the respective thrusts.

Because of this broad scope, all of the WRC Knowledge Tree goals are strongly and directly, as well as indirectly, served by this KSA. Previous research will inform the research agenda for the next five years. Integration, transdisciplinarity, synthesis, adaptive management, absorptive capacity, and requisite level of simplicity will be the principles that will guide the future research approach. Emerging research areas are around water security and trade-offs between water, food, energy and the environment, the need for an equity framework and revised tenure systems for water, complete value chain assessments, from water resources to raw water supply, tap water supply, wastewater treatment and back to freshwater systems or the coast. This should create stronger links with KSAs 2, 3 and 4 through most of the defined WRC flagship programmes.

## KSA 1 Strategic Objectives

The WRC's strategic objectives for KSA 1 are indicated in Table 6.

***Table 6. KSA 1 Strategic Objectives***

| STRATEGIC OBJECTIVE | DESCRIPTION OF STRATEGIC OBJECTIVE |
|---|---|
| **To establish better freshwater governance aimed at facilitating equitable, productive and sustainable use of water resources among all users** | Water governance reforms have had a fair chance of implementation thus far. The focus of this objective will gradually shift in the next five years from the 'what' to the 'how', and to evaluation of progress. Typical areas related to water management reforms and the related governance aspects that will be covered include: governance at the national level, water sector legal frameworks and broader institutional arrangements, transparency and accountability, civil society participation and the equitable provision of access and services. |
| **To develop a deeper scientific understanding of the hydrological cycle (and inter-linkages) in order to promote systematic water assessment and planning** | This thrust focuses on developing a scientific understanding of the hydrological cycle (and inter-linkages) in order to promote systematic water assessment and planning. This thrust will promote better understanding of the variability of the quantity and quality of water available for use and development (relying on the water quality thrust below) as well as the climatic changes and variability that can pose risks to development. Recent changes in national water resource infrastructure management, awareness of the poor state of the aged water resource infrastructure and increased knowledge of water resource planning needs are expected to receive attention, through the support of competent and sustainable solutions. Sound water resource assessment and planning can only be achieved with reasonably accurate and consistently recorded and processed data and information. |
| **To consolidate the vast amount of existing water quality–related research outputs in priority domains and to transfer this knowledge whilst being alert to emerging issues** | There is a need to consolidate the preceding 40 years of water quality work in order to determine the state of the science in South Africa, specifically with regard to the main pollutants from industry, mining, agriculture and domestic use. It is also important to link these aspects with other KSAs to determine if there are available solutions which can be used in pilot studies and to remediate poor water quality. The inclusion of citizen science in projects such as miniSASS in schools and Adopt-a-River in communities will go a long way toward the improvement of water resources in the country. Emerging issues and existing pollutants require enhancement of the current monitoring framework based on scientific research. The basic monitoring requirements should be identified and linked to the DWS data management requirements. Models can be developed and scenarios can be run based on the available data to determine the risk to users, the environment and law enforcers and compliance agencies. |
| **To contribute research towards a reliable supply of good quality water for the health, and environmental, social and economic wellbeing of the country** | While the previous objective looks mainly at the quality of the water within our systems, this objective focuses on protecting water resources, by reducing the quantity of harmful materials reaching water resources, within a broader framework for all uses. Broadly, research in this thrust focuses on the generation of knowledge and understanding of catchment processes, climate change and variability, and land use activities that influence the quality and quantity, negatively or positively, of the water resources. |

## 12. KSA 2: WATER-LINKED ECOSYSTEMS

**Scope**

Stakeholders and communities require an environment that is safe to live in and water resources that are safe for consumption. Therefore, the WRC, through this KSA, will continue to generate knowledge and develop tools or technologies that assist society and managers to sustainably use water and associated resources while at the same time advancing the protection of these critical resources. The products of this research portfolio are used to ensure that everybody in South Africa can experience a safe environment to live in and safe food and drinking water. This KSA has been at the forefront of funding fundamental research that has established the causal effect of human activities on water quality and aquatic ecosystem health, and has worked with different stakeholders to disseminate and transfer research outputs to policy makers and water resource managers. The KSA will use the 2015/16 financial year to consolidate its implementation of the strategy initiated in 2013/14. Several programmes and research projects are already promoting the sustainable use of ecosystem services and causing society realise the value of their natural (ecological) infrastructure.

The implementation of the KSA strategy, which reflects the mission and objectives of the WRC, adequately address a wider scope of R&D issues relating to water and ecosystems. The portfolio addresses five key issues that are important in managing and utilising water resources and ecosystems: our environment that constantly changes (ecosystems and global change), the process, function and structure driving ecological systems (ecosystem processes), management tools and frameworks that we can use to benefit from aquatic ecosystems (ecosystem management), the sustainable utilisation of our natural infrastructure (ecosystem utilisation), and the means to correct degraded water resources or the whole environment so that they can provide ecosystem services needed by the society (rehabilitation and remediation).

The 2015/16 research strategy has been crafted to support and advance the key objectives articulated in the WRC Knowledge Tree, national legislation, national strategies and priorities and Government Outcomes, South Africa's international obligations, new scientific trends, and other stakeholders' views and needs. The KSA needs to extend more of its R&D output to the broader South African society, in order to capacitate all stakeholders in making knowledge-based decisions that encourage protection and sustainable use of ecosystems. The KSA will continue its focus on exploring different avenues and opportunities that R&D outputs provide in the market for ecosystem goods and services (natural capital). The WRC Knowledge Tree advocates for the production of new products and services and the promotion of sustainable solutions from R&D. To advance these objectives, the KSA will assist researchers and communities to utilise the WRC's R&D outputs to create new products and services and thus create new markets and industries. This is important in South Africa and Africa because there are natural resources in our ecosystems that are factors of endowment that through research and development can be used to create new jobs and markets. This thrust will continue to play an important role in supporting programmes geared towards rural development and livelihoods. Through this thrust the WRC will

continue to work with green businesses and other such initiatives to support their bottom line and to improve their sustainability index (profitability, social and environmental aspects). This will be enhanced by the implementation of the WRC's Green Village Lighthouse, which is being led by this KSA.

The KSA programmes and initiatives support sustainable development principles as stated in the National Strategy for Sustainable Development (NSSD1). The sustainable development principles are enshrined in the South African Constitution and advocate a whole-system approach. According to those principles, natural resources must be used sustainably, socio-economic systems should be included since they are dependent on ecosystems, and basic human needs must be met to ensure that resources necessary for long-term survival are not destroyed for short-term gain.

Among other thrusts, the KSA will continue to implement the R&D thrust on Ecosystems and Global Change (Thrust 5) which was introduced in the 2013/14 financial year. This thrust will complement the WRC's Climate Change Lighthouse, which is led by this KSA. The projects supported in this thrust enable the KSA to apply knowledge from climate and global change studies to the planning and management of water resources. This research output will provide an analysis of the trade-offs resulting from either development or protection options that affect specific ecosystems or water resources. The KSA will continue to encourage scenario development studies that focus on prediction and understanding of the consequences of decisions that are taken with respect to specific aquatic ecosystems. For instance, it is not yet fully understood what the consequences will be if a water resource (river) class is upgraded or downgraded; this requires a thorough analytical process guided by societal, economic, and environmental needs, for South Africa and SADC. To enhance our knowledge in this area, the WRC has partnered with the DWS to initiate a directed project in this area, which will start in April 2015. The KSA will continue to support projects that address challenges relating to population dynamics (such as migration), climate change (adaptation and mitigation), and determination of ecological thresholds, especially for rare and sensitive ecosystems in South Africa and Africa. The National Freshwater Ecosystem Protected Area (NFEPA) atlas produced by the WRC has indicated some of the key ecological points that South Africa should protect, or utilise with caution, to ensure sustainability.

The coastline (including estuaries) and its ecosystems are a unique part of our environment that support many human activities relative to its limited area. Coastal ecosystems also hold great economic value, with coastal goods and services estimated to contribute 35% of South Africa's GDP. In order for coastal economic and social opportunities to be maximised, while conserving coastal resources, development needs to be ecologically, socially and economically sustainable. The coastal and estuarine ecosystem must be viewed as a whole system and managed as such. Research on this critical ecosystem has not been conducted in coordination with research on the broader landscape in South Africa, whereas such a coordinated effort is needed to realise integrated water resource management and attain sustainable development. While many

countries have been generating coordinated knowledge about their various ecosystems for years, the WRC and other institutions have, for some time, concentrated on advancing our understanding of the impact of catchment management on the estuarine aquatic environment only. WRC-funded research has enabled DWS to successfully conduct ecological Reserve determination studies (quality and quantity) for many estuaries in South Africa, and most of the estuaries have been assigned an ecological class, which is required for the evaluation and granting of water use licences.

The KSA will continue to use directed calls to guide researchers into all key priority research areas. A limited open call for proposals will also be published in the upcoming research cycles. The envisaged ratio of directed to undirected projects will be 55%:45% and will be revised each year in accordance with the progress made in addressing the priority areas.

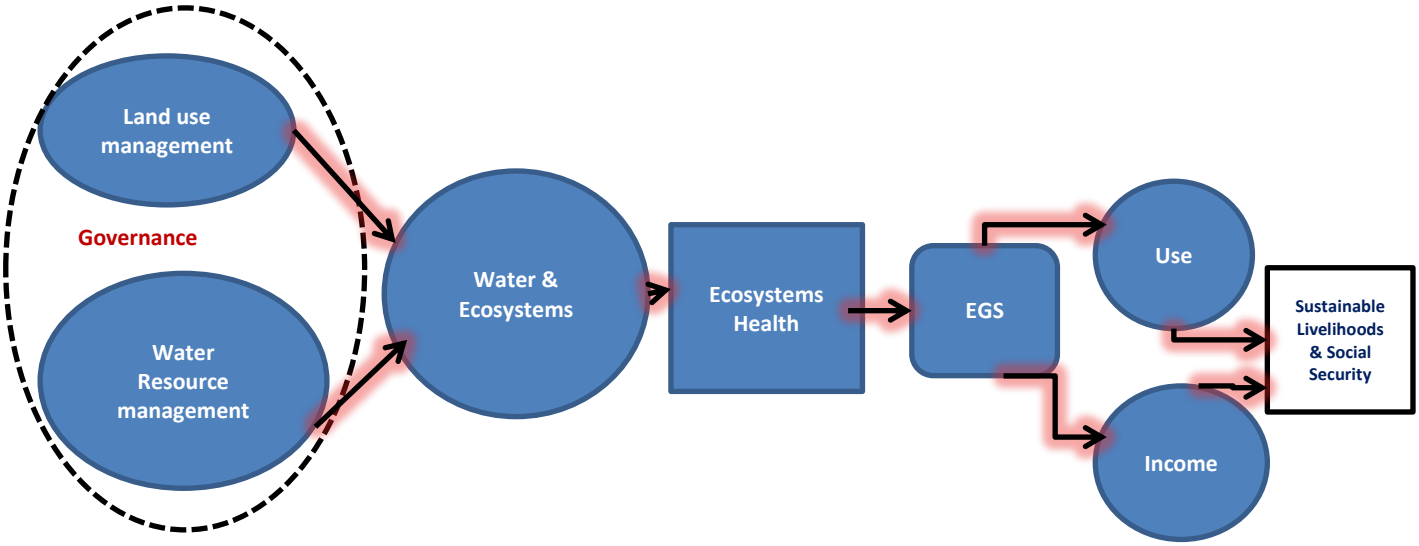



***Figure 14. Illustration of the key factors that ensure delivery of aquatic ecosystem services***

The KSA will continue to promote the participation of PDI, women, disabled persons and youth in R&D projects. The KSA's interventions will be undertaken to promote transformation and redress in our society, to empower communities, to enhance human capacity development, and to ensure that there is sustainable development in the country. The following interventions that are congruent with the WRC strategic objectives will be used:

- Action research that capacitates women, the disabled and youth as key role-players in the research projects
- Identification and support of community R&D initiatives that advance suitable water resource (ecosystem) utilisation
- Special projects that support post-doctoral students, especially in historically-disadvantaged universities (with an interest in water research and ecosystem management)
- Joint partnerships between communities, local and national Government and corporate business to advance sustainable ecosystem use and development

- R&D SMME support

The WRC Lighthouses will be used by the KSA as a vehicle for knowledge dissemination and transfer, most notably, the Green Village Lighthouse and the Climate Change Lighthouse.

### KSA 2 Strategic Objectives

The WRC's institutional strategic objectives for KSA 2 are indicated in Table 7.

***Table 7. KSA 2 Strategic Objectives***

| STRATEGIC OBJECTIVE | DESCRIPTION OF OBJECTIVE |
|---|---|
| To enhance the knowledge on healthy ecosystems and preserve biodiversity | Initiate new research projects addressing use and protection of aquatic ecosystems in a sustainable manner. Students at MSc and PhD level will be involved in the research projects to ensure that a new cohort of researchers is produced. Policy and management is influenced through partnerships with DWS and DEA in project implementation and by producing ministerial, policy, and technical briefs. Conferences and dialogues are used to share and disseminate knowledge. |
| To generate knowledge that informs ecosystem management and the implementation of policy and legislation | |
| To support the social and economic requirements of society from ecosystems | |
| To generate innovative approaches that can be used in rehabilitation and restoration of ecosystems | |
| To develop innovations and knowledge that demonstrate the actual value of ecosystems and support to people's livelihoods | |
| To improve understanding of the connectivity between land, water, atmosphere and people | |

## 13. KSA 3: WATER USE AND WASTE MANAGEMENT

### Scope

The Water Use and Waste Management KSA consists of six thrusts which focus on water use and waste management across the domestic and industrial (including mining) water sectors. The strategic emphasis of KSA 3 is to enable effective water services institutions; provision of basic water supply and sanitation for improved quality of life and poverty alleviation (water value chain); protection of water resources; and reliable and equitable supply of water for sustainable socio-economic development. Some of the key factors that influence and impact KSA 3 projects are urbanisation, industrialisation, economic growth, human capacity development, and market drivers for new technologies.

The KSA is divided into six thrusts to meet the sectoral and WRC five-year strategy needs. The prioritised research areas which support Government Outcomes (6, 7, 9 and 9) and the WRC Knowledge Tree outcomes are:

- Improvement of water services institutions – institutional realignment
- Infrastructure – operations and maintenance, and capacity and skills
- Water quality – emerging pollutants, with special reference to their magnification during water reuse
- Financial sustainability of water services – cost recovery (tariffs, subsidy and financing)
- Climate change – preparedness and resilience of water services
- Water services landscape – informal areas and rural systems
- Industrial – brines, acid mine drainage and desalination
- Water–energy(–food) nexus (renewable energy and energy efficiency)
- Beneficiation – integrated technology use for water, energy, nutrient, and product recovery, and an industrial ecology approach to waste and water
- Water security – reclamation, 'new' water, direct potable reuse
- New developments (especially in Thrusts 2, 4 and 5) and their path to the marketplace

Considering the emerging challenges, research in this KSA will continue to focus on greater innovation and development of cutting-edge technologies to respond to the issues of poor water and wastewater treatment works operation and maintenance, competency and capacity constraints, direct water reuse, energy efficiency, climate change constraints, and emerging contaminants in drinking water quality. The KSA will also continue to engage with its sector partners to understand and navigate the market drivers and brakes that determine the uptake of innovative technologies and know-how, such as long market-entry times, Government support, increasing confidence and reducing uncertainty through demonstration, minimising barriers to entry, and engaging with the early adopters of new technologies. The adoption and commercialisation of water sector technologies appears to follow a typical S-curve (Figure 15). The KSA supports promising and leading-edge technologies up to the pilot stage and then partners with relevant organisations such as DST (directly and via its entity the Technology Innovation Agency (TIA)), entrepreneurs and local government to demonstrate applicability which leads to adoption in time. Special projects in progress in this regard include 'A gap analysis of technologies, techniques and capacity for the water and wastewater (domestic and industrial) sector in South Africa' and 'A national Water R&D and innovation roadmap for South Africa', both of which are designed to lead the water research community into a closer, more impactful relationship with the end users of WRC knowledge products.

The KSA continues to support projects which contribute to policy and decision-making within the water services domain. It builds on knowledge gained to provide guidance on a framework for sanitation governance and decision support tools for wastewater risk evaluations, and seeks to influence policy by supporting research into the social, institutional and economic implications of water reclamation. KSA 3 supports several technology-based solutions which range from 'blue

sky' research to applied research aimed at developing innovative processes and technologies for water and wastewater treatment and reuse. These projects specifically contribute to WRC Knowledge Tree outcomes of sustainable development solutions and products and services for economic development. Solutions linked to the recovery of salts from brine using eutectic freeze crystallisation are at the application stage and the KSA has engaged with sectoral and other research partners to take this project to the demonstration and commercialisation stages. Furthermore, the sustained WRC support of the BioSURE™ unit treatment process for mine-water appears to be close to the commercialisation stage. The Knowledge Tree outcomes of human capital development, transformation and redress, and empowerment of communities are evaluated for relevance within each project and strongly supported where applicable. The KSA strives to maintain active research programmes at key universities and research institutions so that basic and applied research can provide leading-edge technologies and an appropriate and diverse expert pool to meet future water sector needs.

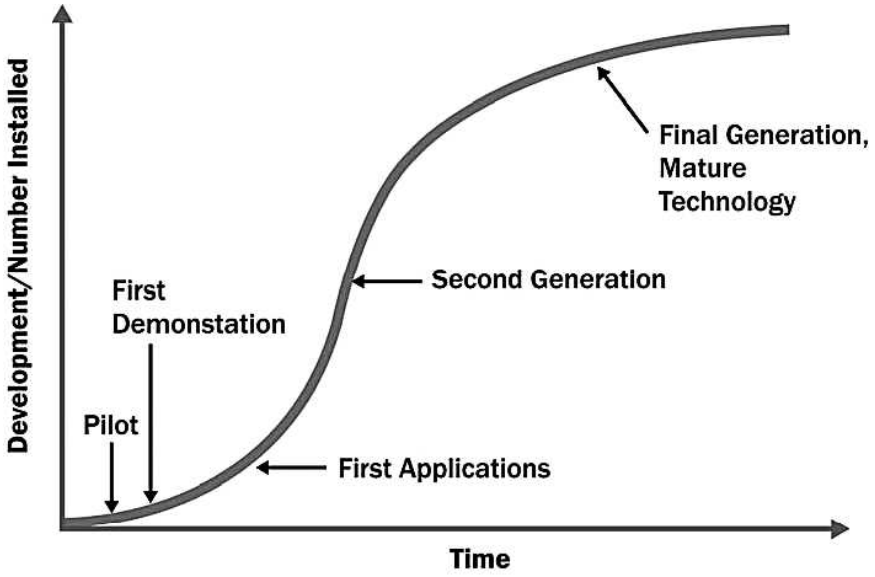



***Figure 15. S-curve for life cycle of new process introduction showing development and cumulative number of installations versus time (Source: Parker, 2011)***

The KSA supports projects that are strongly linked to the WRC Lighthouses. The adaptive climate change technologies and approaches for local government are a component that feeds into the Water-Sensitive Design and Climate Change Lighthouses, while several projects in Thrust 1 relate to the Freshwater Governance Lighthouse. Research continues on projects that integrate agriculture and, hence, food security in designing low-cost sanitation technologies in social housing schemes, thereby closing the water and nutrient loop. This fits into the Water–Energy–Food Security Lighthouse and in time will be relevant for integration into the Green Village, as will a major new activity within KSA 3: the Sanitation Research Fund for Africa (SRFA). The SRFA is supported by 2.5 million USD from the Bill & Melinda Gates Foundation and currently contains a set of 10 projects investigating topics such as wastewater sludge handling and beneficiation, and pit latrine characterisation. The WRC has added 18 000 USD to the fund and the contracts have

been placed in seven African countries (Ethiopia, Kenya, Malawi, RSA, Uganda, Zambia, and Zimbabwe).

## KSA 3 Strategic Objectives

The WRC's institutional strategic objectives for KSA 3 are indicated in Table 8.

***Table 8. KSA 3 Strategic Objectives***

| STRATEGIC OBJECTIVE | DESCRIPTION OF STRATEGIC OBJECTIVE |
|---|---|
| To support the efficient functioning of water service institutions and their viability in order to sustain water services in rural and urban areas | The focus is to address strategic research aspects related to policy issues, institutional reform, regulation, infrastructure management, operations and maintenance, sanitation (stormwater, sewerage and on-site sanitation), water-related competencies and capacity required for the strengthening of water institutions (water service providers, water service authorities, water boards, national departments) in providing sustainable water services. |
| To develop innovative technologies, processes and procedures that address aspects related to bulk water supply, water treatment technology, distribution and water quality | The provision and supply of affordable and reliable water, of sufficient quality and quantity for domestic and economic (industrial/commercial and mining) activities, remain continuous challenges. Linked to water supply is the all-important aspect of the protection of human health. |
| To develop technologies and systems that optimise the full wastewater and sanitation services chain in the municipal (domestic) sector | The need for innovative technologies and solutions is recognised as we prepare for the future – achieving more stringent effluent discharge standards, developing acceptable non-waterborne sewerage solutions, reliable treatment of ever-increasing high-strength domestic wastewater, and informing future policy. |
| To quantify water use and waste production, predict impacts (risks) over the short-, medium- and long-term, and develop and apply methods of prevention, minimisation, reuse, recycle, recovery and beneficiation with the aim to provide appropriate, innovative and integrated solutions for water efficiency and waste management for industries | |
| To provide appropriate, innovative and integrated solutions to water use and waste management in the mining sector | Future operations will almost exclusively take place in water-scarce regions (e.g. Waterberg, Eastern Limb) and their development will require reallocation of already stretched resources through, e.g., improved water demand and water conservation management. Additional priorities will include brine handling, biological sulphur compound transformation and aversion of future impacts. |

## 14. KSA4: WATER UTILISATION IN AGRICULTURE

**Scope**

The strategic focus of KSA 4 is on **increasing the system of knowledge for efficient use of water for production of food, forage, fibre, and fuel crops; improving food security, reducing poverty and increasing the wealth of people dependent on water-based agriculture; and ensuring sustainable water resource use.** The requirements of present and future generations of subsistence, emergent and commercial farmers are addressed through creation and application of water-efficient production technologies, practices, models and information systems within the following five interrelated sub-sectors of agriculture:

- Irrigated agriculture
- Rain-fed agriculture
- Woodlands and forestry
- Grasslands and livestock watering
- Aquaculture and fisheries

The challenge for applied research is contributing to finding sustainable solutions for water use in agriculture, with priority given to innovative new products which support economic development and inform decision-making for private business and public policies. In the process of undertaking these research projects, the composition of research teams endeavours to increase representivity of Black and female researchers; post-graduate students are trained to improve the expertise of human capital and encourage young scientists to choose a career in water research, while on-farm and participatory action research leads to empowerment of individuals and groups in rural communities.

Accordingly, within the next five-year planning cycle, a holistic systems approach will continue to be followed for knowledge generation and dissemination to enable people to utilise water in a sustainable way for food production and improved livelihoods (See Figure 16). Research projects will be managed within the innovation cycle to ensure that scientific research is applicable and socially beneficial. Key issues being addressed are the productivity of water use for crops and livestock, poverty reduction and wealth creation in rural areas to reduce income inequalities, and prevention of resource degradation. These efforts are aligned with the Vision for 2030 of the National Development Plan; the Outputs for Outcomes 7 and 10 in the Programme of Action announced by the Presidency; the Green Paper on National Strategic Planning; the National Water Resource Strategy 2; the DAFF Integrated Growth and Development Plan; the National Agricultural Research and Development Strategy; and NEPAD's Comprehensive Africa Agricultural Development Programme. In addition reports published in 2013 by the FAO and Save the Children are considered, which emphasise that food production is essential to achieve better nutrition for improved human and economic performance.

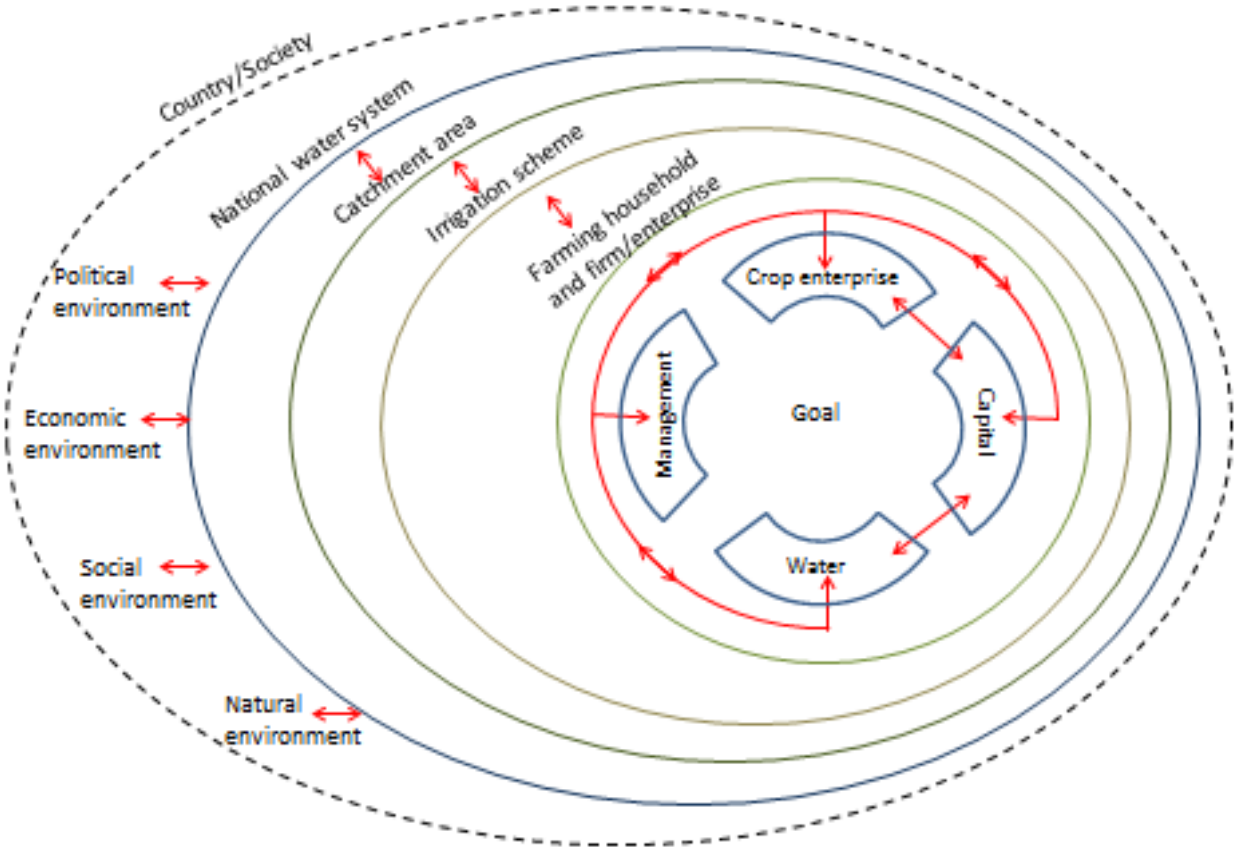



***Figure 16. Schematic representation of the national water system with interrelated sub-systems from farming to irrigation scheme to catchment level (Source: Backeberg, 2000)***

Work will continue to fill knowledge gaps that exist in the utilisation of water in agriculture, in accordance with the following key priorities of the research portfolio:

- Increasing the productivity of rainwater and irrigation water for crop and livestock production
- Uplifting rural economies through commercial food production and reducing income inequalities
- Quantifying the water footprint in food value chains
- Eradicating hunger and reducing poverty
- Improving food security, nutrition and health
- Generating alternative sources of renewable energy
- Preventing soil and water degradation and pollution
- Adapting farming systems to climate change

This KSA will strive to achieve a balance between projects in irrigated and rain-fed agriculture, agro-forestry and aquaculture, to promote farmer involvement in poor rural communities through participatory action research, and to take research projects further toward practical application of results with technology transfer activities. Building on the baseline of completed projects, the

priority themes previously approved for research starting in 2015/16 are as follows: determining the water footprint of selected fibre and fuel crops; water use of strategic biofuel crops; water use of agro-forestry systems for food, forage and/or fuel production; evaluation of the water use and nutritional productivity of food crops in the diet of the rural poor; contribution of inland freshwater fisheries to rural livelihoods; up-scaling of rainwater harvesting and conservation (RWH&C) to croplands and rangelands for food production and renewable fuel generation; modelling of irrigation farming profitability with curtailment of authorised water use; management guidelines for control of salinization with precision farming; seamless near-forecasting of rainfall for effective agricultural water management; and non-point source (NPS) pollution management from field to catchment scale.

Based on a stakeholder consultation workshop held in July 2014, the following priority themes are recommended for research proposals of projects as from 2016/17: water use for food and nutrition security at the start-up stages of food value chains, supporting gender relations and early childhood development of poor households in rural and peri-urban areas; water use of selected sub-tropical fruit orchards; ultra-violet (UV) treatment of irrigation water to ensure food safety; regulations for application of winery wastewater as a resource for irrigation; rain-fed water use and entrepreneurial development for establishing small farming businesses, employment creation for youth and poverty reduction; assessment of the effectiveness of policies and strategies for water governance in the case of smallholder irrigation farming; and scenario development of future prospects for management of limited and declining quality agricultural water, increasing urbanisation of food consumers, higher energy costs and volatile food prices as influenced by changing climate, policies and economic circumstances. In addition the Department of Environmental Affairs requested initiation of a research project on increased water availability with changes in land use.

**The output of most of these projects will mainly contribute to the WRC Lighthouses on Water–Energy–Food Security, the Green Village, Climate Change and Freshwater Governance.**

### KSA 4 Strategic Objectives

In execution of the WRC's mandate and functions, the strategic objectives for research on and development of Water Utilisation in Agriculture are indicated in Table 9.

***Table 9. KSA 4 Strategic Objectives***

| STRATEGIC OBJECTIVE | DESCRIPTION OF STRATEGIC OBJECTIVE |
|---|---|
| To increase the biological, technical and economic efficiency and productivity of water use | The primary objective is to increase national and household food security, improve livelihoods of people and increase efficient growth as well as equitable distribution of wealth on a farming, community and national level. |

| STRATEGIC OBJECTIVE | DESCRIPTION OF STRATEGIC OBJECTIVE |
|---|---|
| To reduce poverty through water based agricultural activities | The major challenge is to produce more food with the same or less water. This requires empowerment and capacity building for all farmers, especially women, with knowledge and practical skills for correct investment, marketing, production and financing decisions and actions. In this process hunger must be eradicated, poverty reduced, new small farming businesses established and existing profitable farming enterprises maintained. Over the long term sustainable agricultural activities and employment opportunities in rural and urban areas must be achieved, which implies obtaining benefits for people who are presently using water for food production, without compromising future benefits in food value chains. |
| To increase profitability of water-based farming systems | |
| To ensure sustainable water resource use through protection, restoration and reclamation activities | |

## 15. KSA 5: KNOWLEDGE DISSEMINATION, MARKETING AND COMMUNICATIONS

### Scope

This KSA provides strategic direction to the international cooperation, communication, marketing and branding goals of the WRC. Additionally, it supports the management of research projects, enhances innovation and provides the tools and processes for protecting technological developments. It also links the WRC's financial processes with technical fund management, while providing the necessary dissemination function to relevant stakeholders of research outputs and impact, and strategically positions the WRC within the local and international water sectors through its marketing and branding initiatives.

The strategic focus for KSA 5 in this planning cycle is to proactively coordinate the WRC's marketing and communications functions with an emphasis on research uptake and knowledge dissemination. It will also aim to expand the research-on-research portfolio, and strengthen the social science and humanities portfolio of the WRC.

The KSA 5 vision for the five-year planning cycle can be summarised as the following:

- To coordinate and steer the development of the WRC's strategy using proactive planning processes that are fully integrated into the WRC
- To contribute toward the development and coordinated implementation of the strategic direction of the WRC
- To coordinate research uptake and knowledge dissemination processes
- To drive communication of the WRC's impact and brand with an appropriately skilled team

## KSA 5 functions, responsibilities and structure

The main functions within KSA 5 include the following:

1. Knowledge Dissemination and Uptake
    a. Communications Works Engine
        (1) Media and press engagement
        (2) Water Wheel
        (3) Win-SA
        (4) Water SA
        (5) New dissemination platforms
        (6) Knowledge extension
        (7) Web development and maintenance
    b. Marketing
    c. Events & Exhibitions
    d. Digital Records Management
        (1) Archival development
        (2) Post-printing workflow (quality control, publications)

2. Business Systems Management
    a. FMS management
    b. FMS compliance support
    c. Content management
    d. Relationship management

3. Research Coordination Support
    a. Strengthen the WRC social research portfolio
    b. Coordinate the WRC's foresight programme
    c. Provide research coordination support to the WRC's strategic planning process

## KSA 5 Strategic Objectives

In the execution of the WRC's mandate and functions, the objectives for KSA 5 are as follows (Table 10).

***Table 10. KSA 5 Strategic Objectives***

| STRATEGIC OBJECTIVE | DESCRIPTION OF STRATEGIC OBJECTIVE |
|---|---|
| To improve knowledge uptake with the aim to increase implementation | This strategic objective will comprise of the development and implementation of the WRC's Communication Strategy in order to: enhance sector involvement in the WRC research process; strengthen awareness of the mandate and role of the WRC in the South African water sector; establish working relationships with industry, decision makers and key stakeholders; strengthen relationships through formal memoranda of understanding; provide knowledge in a format that is fit-for-use; |

| STRATEGIC OBJECTIVE | DESCRIPTION OF STRATEGIC OBJECTIVE |
|---|---|
| | deliver multimedia presentations to inform various target groups about the WRC and its accomplishments, to mention but a few. |
| To position the WRC as a premier knowledge resource for all water-related issues, locally and internationally, in order to enhance effective uptake of research | To ensure that the WRC remains at the forefront of knowledge creation, dissemination and uptake, this implies the coordination of strategic local, continental and international partnerships, and the facilitation of dialogues which render the WRC a significant international player and a recognised asset to South Africa. It also implies the increase in the credibility and relevance of the WRC locally and globally through the sharing and dissemination of relevant knowledge in the water sector and within the WRC, and the development of knowledge-sharing mechanisms/instruments to support the objectives of the WRC in terms of uptake of research. |
| To effectively manage the WRC research cycle for more efficient knowledge management | This strategic objective ensures that the WRC promotes the effective transfer of information and technology through up-scaling and demonstration as well as the coordination of the research funding cycle and the provision of effective tools, systems and procedures to support the core business of the WRC. Using the words of the DST's 10 year innovation plan, it serves as an enabler to address the 'innovation chasm' between research results and socio-economic outcomes. It also includes the management of intellectual property. Given that this is a relatively new strategic objective for the WRC, the focus in the next financial year will be on mobilising the sector and strategic partners to become involved in this initiative. This will include securing co-funding and assessing the feasibility of a water technology convergence centre. |
| To provide strategic research advice related to the water sector, R&D capacity, knowledge flow and ultimate impact | Provide strategic research advice related to the water sector, R&D capacity, knowledge flow and ultimate impact. |

## 16. RISK MANAGEMENT

The WRC's risk management framework is made up of a risk assessment which identifies internal and external risks to the WRC and details an implementation plan for their mitigation. Executive management and the Board undertake the risk assessment annually in November, facilitated by the internal auditors. After completion of the assessment and approval by the Board, quarterly reviews of the document evaluate the progress against the plan and identify any new risks.

The WRC Board and management team identified 14 risks as outlined in Table 11 below.

***Table 11. Summary of WRC Risk Register***

| Risk name | Link to strategic objective |
|---|---|
| Institutional human capital deficit | To support human capacity building in the water sector |
| Financial sustainability | Financial sustainability & corporate wellbeing<br>To develop new products and services (new innovations)<br>To develop sustainable solutions |
| Insufficient uptake of research | To enhance knowledge across the water knowledge and innovation cycle<br>To develop sustainable solutions<br>To inform policy and decision making |
| Constraints in keeping up with changes and trends in water research | To develop new products and services (new innovations)<br>To support community empowerment<br>To enhance knowledge across the water knowledge and innovation cycle |
| Inadequate availability, continuity and growth of adequate research expertise | To enhance knowledge across the water knowledge and innovation cycle<br>To support human capacity building in the water sector<br>To support community empowerment |
| Inadequate financial system supporting operations | Financial sustainability & corporate well being |
| Inadequate ability to deal with complexity of research issues and challenges | To enhance knowledge across the water knowledge and innovation cycle<br>To support human capacity building in the water sector<br>To support community empowerment |
| Profile of the WRC within SADC, Africa and Global | To develop sustainable solutions<br>Financial sustainability & corporate well being |
| Business interruption / disaster | Financial sustainability & corporate well being |
| Fraud and corruption | Financial sustainability & corporate well being |
| Potential for biased/compromised science | To develop new products and services (new innovations) |
| Losing competitive edge | To enhance knowledge across the water knowledge and innovation cycle |
| Poor quality or compromised researched outputs | To enhance knowledge across the water knowledge and innovation cycle<br>To develop sustainable solutions<br>To inform policy and decision making |
| Non-compliance to Acts, Regulations, legislation, policies and procedures | Financial sustainability & corporate well-being<br>To inform policy and decision making |

## 17. BUDGET AND FINANCIAL STRATEGY

The revised budget for 2014/15 increased by R33.2 mil (13.5%) in total. This is due primarily to a more successful leverage strategy. The revised budget is based on the income realized in the last financial year, actual income received to date and income estimates for the year. The WRC anticipates an increase of R0.8mil in Water Research Levies, which is due to higher levies received in 2013/14. The revised budget shows an increase of R34.4mil in Leverage Income which is mainly due to the Blue/Green Drop, DST Gates, DST GBS, Catchment Management Agencies support and Acqueau projects. The revised budget reflects a decrease of R0.6mil in other income, which is due to the non-realization of management fees applicable to certain leverage funded projects.

Fixed Costs in total have increased by R0.2mil (5.2%) from the original budget and adjustments were effected to support the increased leverage funded projects. Running Costs in total have increased marginally by R24k (0.2%) from the original and Human Resource (HR) Costs have increased by R1.5mil (3.4%) due to the appointment of new staff to support the increased leverage funded projects. The funding for these posts was built into the contract budgets. Investment in research as indicated in Total Research Funding costs has increased by R28.8mil (15.6%), which is mainly due to the Catchment Management Agencies support, Blue/Green Drop, DST Gates, DST GBS and Acqueau projects. The budget also reflects the WRC commitment to improve its internal processes that support its core process of knowledge creation, sharing, dissemination and transfer. Capital expenditure has increased by R2.6mil which is for the purchase of IT equipment (funded partially from the savings in the software budget for 2013/14), the virtualization of servers as well as the upgrade to the WRC website.

The budget for 2015/16 increases by R30.9 mil (11.0%) in total from the revised budget for 2014/15. The budget for 2015/16 reflects a 5.6% (R10.3mil) growth in the Water Research Levy Income which is related to inflation whereas the Leverage Income has increased by 22.4% (R16.9mil). This increase in the Leverage Income results from FetWater (phase III) project (DWS), DST Gates and DST GBS projects in which the WRC acts as implementing agent. It is anticipated that there will be an increase of R3.6mil in the transfer of unspent committed funds. The levy effective from July 2015 will be submitted as a proposal to the Minister and will reflect in part the overall raw water tariff increases.

The largest portion of the budget increase (80.9%) will be invested in Research & Development Funding which will then grow by R25.0 mil (year-on-year growth of 11.7% ). The other 19.1% will be absorbed by increases for fixed costs, running costs and human resources. A year-on-year of 4.3% is reflected for Fixed Costs, 4.9% for Running Costs and an increase of 15.7% for Human Resource Costs. This includes funding for two new posts to enable the WRC to meet its expanded objectives in the domains of Impact and Innovation as well as a financial management post. The ratio of the organization's investment in research & development funding forms 76.5% of the Total Income when measuring the R&D budget.

The goal is to replicate these increases in the 2016/17 year and the subsequent years through two primary funding streams. These are an increase in Leverage funding as well as the application for a Parliamentary Grant as allowed for in the Water Research Act, with the support of the DWS.

The following tables (Tables 12–15) outline expenditure trends in the WRC's budget and how these can be expected to evolve over the five-year period. Tables 12–15 are subject to Ministerial approval.

***Table 12. Summary of five-year budget plan***

| | BUDGET YEAR | | | | | | |
|---|---|---|---|---|---|---|---|
| **DESCRIPTION** | **Original 2014/15 (R)** | **Revised 2014/15 (R)** | **2015/16 (R)** | **2016/17 (R)** | **2017/18 (R)** | **2018/19 (R)** | **2019/20 (R)** |
| **Levies** | 183 698 571 | 184 491 671 | 194 798 304 | 205 512 262 | 216 198 873 | 227 441 185 | 238 813 244 |
| **Interest Received** | 5 610 000 | 5 610 000 | 5 722 200 | 5 836 644 | 5 953 377 | 6 072 444 | 6 193 893 |
| **Leverage** | 41 041 286 | 75 409 837 | 92 318 690 | 29 467 426 | 30 722 080 | 20 968 417 | 21 591 490 |
| **Other** | 1 284 484 | 572 359 | 587 710 | 597 408 | 607 467 | 617 901 | 624 080 |
| **Transfer of Unspent Committed Project Funds** | 15 500 000 | 14 297 483 | 17 907 147 | 17 089 061 | 17 061 688 | 15 700 000 | 15 700 000 |
| **TOTAL INCOME** | **247 134 341** | **280,381 350** | **311,334 051** | **258 502 801** | **270,543 484** | **270 799 947** | **282 922 707** |
| **Fixed Costs** | 4 318 599 | 4 544 599 | 4 741 855 | 4 757 678 | 4 994 400 | 5 227 022 | 5 488 373 |
| **Running Costs** | 9 853 049 | 9 877 599 | 10 364 127 | 9 808 783 | 10 325 454 | 9 408 414 | 9 831 792 |
| **Human Resource Costs** | 44 967 762 | 46 496 819 | 53 784 247 | 53 466 585 | 56 263 398 | 57 637 658 | 61 095 917 |
| **Research & Development Funding** | 184 448 764 | 213 256 167 | 238 270 576 | 186 938 977 | 195 264 098 | 194 657 150 | 202 443 436 |
| **Corporate Expenditure** | 2 630 699 | 2 630 699 | 2 761 155 | 2 898 083 | 3 041 805 | 3 192 657 | 3 352 290 |
| **Capital Expenditure** | 915 468 | 3 575 468 | 1 412 091 | 632 695 | 654 330 | 677 047 | 710 899 |
| **TOTAL EXPENDITURE** | **247 134 341** | **280 381 350** | **311 334 051** | **258 502 801** | **270 543 484** | **270 799 947** | **282 922 707** |

***Table 13. Financial Indicators for the five-year budget plan***

| | BUDGET YEAR | | | | | | |
|---|---|---|---|---|---|---|---|
| **DESCRIPTION** | **Original 2014/15** | **Revised 2014/15** | **2015/16** | **2016/17** | **2017/18** | **2018/19** | **2019/20** |
| **INCOME** | | | | | | | |
| **Growth in Total Income** | | 13.5% | 11.0% | -17.0% | 4.7% | 0.1% | 4.4% |
| **Growth in Levies** | | 0.4% | 5.6% | 5.5% | 5.2% | 5.2% | 5.0% |
| **Other** | | | | | | | |
| **Fixed costs as % of total expenditure** | 1.7% | 1.6% | 1.5% | 1.8% | 1.8% | 1.9% | 1.9% |
| **Running costs as % of total expenditure** | 4.0% | 3.5% | 3.3% | 3.8% | 3.8% | 3.5% | 3.5% |
| **HR costs as % of total expenditure** | 18.2% | 16.6% | 17.3% | 20.7% | 20.8% | 21.3% | 21.6% |
| **Other costs as % of total expenditure** | 1.4% | 2.2% | 1.3% | 1.4% | 1.4% | 1.4% | 1.4% |
| **Research Ratio** | 74.6% | 76.1% | 76.5% | 72.3% | 72.2% | 71.9% | 71.6% |

***Table 14. Research & Development Funding per Key Strategic Area***

| | WATER RESOURCE MANAGEMENT KSA1 (R) | WATER LINKED ECOSYSTEM KSA2 (R) | WATER USE AND WASTE MANAGEMENT KSA3 (R) | WATER UTILIZATION IN AGRICULTURE KSA4 (R) | KNOWLEDGE DISSEMINATION KSA5 (R) | EMPOWERMENT FUND (R) | OTHER LEVERAGE FUNDED PROJECTS * (R) | TOTAL (R) |
|---|---|---|---|---|---|---|---|---|
| **2014/15 - Original** | 44 180 190 | 24 692 192 | 48 833 520 | 36 135 326 | 7 576 082 | 5 000 000 | 18 031 454 | 184 448 763 |
| **2014/15 - Revised** | 45 055 336 | 24 692 192 | 47 826 621 | 35 235 326 | 9 320 828 | 2 300 000 | 48 825 863 | 213 256 166 |
| **2015/16** | 48 785 320 | 26 880 338 | 50 216 350 | 37 446 197 | 7 796 221 | 2 700 000 | 64 446 151 | 238 270 577 |
| **2016/17** | 50 856 576 | 28 336 673 | 52 443 672 | 39 304 593 | 8 024 298 | 0 | 7 973 165 | 186 938 977 |
| **2017/18** | 53 028 554 | 29 875 967 | 54 186 259 | 41 264 094 | 8 260 613 | 0 | 8 648 610 | 195 264 098 |
| **2018/19** | 55 306 205 | 31 502 961 | 56 012 287 | 43 330 225 | 8 505 474 | 0 | 0 | 194 657 151 |
| **2019/20** | 57 518 453 | 32 763 079 | 58 252 778 | 45 063 434 | 8 845 693 | 0 | 0 | 202 443 437 |

** This represents the FetWater, Bill & Melinda Gates Foundation, Blue/Green Drop, DST GATES, DST GBS and Acqueau leverage-funded projects.*

***Table 15. Research & Development Funding in % terms per Key Strategic Area***

| | WATER RESOURCE MANAGEMENT KSA1 | WATER LINKED ECOSYSTEM KSA2 | WATER USE AND WASTE MANAGEMENT KSA3 | WATER UTILIZATION IN AGRICULTURE KSA4 |
|---|---|---|---|---|
| **2014/15 - Original** | 29% | 16% | 32% | 23% |
| **2014/15 - Revised** | 29% | 16% | 31% | 23% |
| **2015/16** | 30% | 16% | 31% | 23% |
| **2016/17** | 30% | 17% | 31% | 23% |
| **2017/18** | 30% | 17% | 30% | 23% |
| **2018/19** | 30% | 17% | 30% | 23% |
| **2019/20** | 30% | 17% | 30% | 23% |

# APPENDIX 1: KEY PERFORMANCE INDICATORS MULTI-YEAR PERFORMANCE PLAN

The WRC value proposition is to contribute to South Africa's increased water security in order to improve the quality of life of our people as well as improve South Africa's international competitiveness through water R&D. Further, in accordance with our core principles, i.e., investment in the multiplier effect, research concentration, diversification of research philosophy, and increased partnerships, the WRC portfolio is designed to get more out of each project than it has done in the past.

In spite of the fact that real scientific inflation in greater than 20%, due to South Africa's reliance on imported scientific equipment and consumables, the WRC manages to fund more than 90 new projects each year. While the projected numbers in the later years of this planning time frame, are relatively static, e.g., the number of new projects, because of the limitation of resources, our design parameters will ensure that we have increased research productivity, outputs and outcomes from each of the projects as compared to previous years. In addition, while the WRC is working towards guaranteeing a minimum number of students participating in our research projects each year, at predominantly PhD and Masters levels, the WRC, together with its research leaders and partners, will constantly be seeking opportunities to increase these numbers so that we can make a substantive contribution to dealing with the current shortage of high-level skills in the water and science sectors.

## Research Portfolio

| Objective | Indicator | Target 2012/13 | Target 2013/14 | Target 2014/15 | Target 2015/16 | Target 2016/17 | Target 2017/18 | Target 2018/19 |
|---|---|---|---|---|---|---|---|---|
| To enhance knowledge through new research | The number of new research projects initiated in the 2015/16 financial year | 78 | 65 | 95 | **81** | 80# | 80# | 80# |
| To complete and finalise research projects scheduled in the financial year | The number of research projects completed in the 2015/16 financial year | 80 | 75 | 70 | **85** | 85# | 85# | 85# |
| **2. Strategic Objective: To support human capacity building in the water sector** | | | | | | | | |
| To continuously accommodate students as active participants in WRC projects | The minimum number of students supported on WRC-funded research projects | 400 | 400 | 400 | **500** | 500 | 500 | 500 |
| **3. Strategic Objective: To support community empowerment** | | | | | | | | |
| To increase emphasis on projects that have a direct impact on the lives and livelihoods of communities through water-related interventions and build sufficient capacity to assist with the post-project sustainability of those interventions | The number of community based research projects initiated in the 2015/16 financial year. | Indicator not measured in 2012/13 | 20 | 20 | **9** | 10 | 10 | 10 |
| To enhance economic development in communities by supporting small, medium and micro enterprises (SMMEs) in the water research and development sector | The number of SMMEs as lead organisations in the research projects initiated in the 2015/16 financial year | Indicator not measured in 2012/13 | 22 | 26 | **19** | 20 | 20 | 20 |
| To focus on growing the involvement of previously disadvantaged individuals by increasing the number of project leaders from the designated groups | The number of project leaders from the designated group in research projects initiated in the 2015/16 financial year | Indicator not measured in 2012/13 | 35 | 50 | **45** | 50 | 50 | 51 |
| | Number of projects initiated in the 2015/16 financial year with Historically Disadvantaged Institutions as participating organisations in WRC projects | Indicator not measured in 2012/13 | 60 | 60 | **18** | 18 | 18 | 18 |

| Objective | Indicator | Target 2012/13 | Target 2013/14 | Target 2014/15 | Target 2015/16 | Target 2016/17 | Target 2017/18 | Target 2018/19 |
|---|---|---|---|---|---|---|---|---|
| To increase the number of new innovations/products and services produced from WRC research | The number of new innovations/products and services produced from WRC research in the 2015/16 financial year | 17 | 20 | 20 | **19** | 20 | 20 | 20 |
| | The number of new innovations, products and services that have been implemented/ demonstrated /piloted in the 2015/16 financial year | Indicator not measured in 2012/13 | Indicator not measured in 2012/13 | Indicator not measured in 2012/13 | **11** | 11 | 11 | 11 |
| To ensure that the WRC increasingly contributes to sustainable solutions for the water sector by creating knowledge products and events that disseminate knowledge produced from WRC research | The number of dialogues held in the 2015/16 financial year | Indicator not measured in 2012/13 | Included in the workshop indicator | Included in the workshop indicator | **15** | 15 | 15 | 15 |
| | The number of manuals and guidelines published in the 2015/16 financial year | Indicator not measured in 2012/13 | 18 | 18 | **26** | 26 | 26 | 26 |
| | The number of issues of *the Water Wheel* published in the 2015/16 financial year | 6 | 6 | 6 | **6** | 6 | 6 | 6 |
| | The number of issues of *Water SA* published in the 2015/16 financial year | 4 | 4 | 4 | **4** | 4 | 4 | 4 |
| | The number of conferences/workshops/summits held in partnership with other organisations | 20 | 8 | 25 | **19** | 20 | 20 | 20 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | or exclusively by the WRC in the 2015/16 financial year | | | | | | | |
| To support policy- and decision-makers with research-based knowledge | The number of policy briefs produced and distributed to relevant Government departments and other entities in the 2015/16 financial year | Indicator not measured in 2012/13 | 10* | 10 | **12** | 12 | 12 | 12 |
| | The number of ministerial briefs produced by the WRC and received by the Minister's Office in the 2015/16 financial year | Indicator not measured in 2012/13 | 10* | 10 | **12** | 12 | 12 | 12 |
| | The number of WIN-SA publications produced and distributed to relevant institutions and municipalities in the 2015/16 financial year | Indicator not measured in 2012/13 | 18 | 18 | **30** | 30 | 30 | 30 |

[#] This is accordance with the multiplier effect and the programmatic approach that dictates a smaller number of larger projects for optimum impact.

## Financial Portfolio

| 8. Strategic Objective: To improve financial practices, management and financial performance of the organization, simultaneously meeting the required accounting and auditing standards | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Objective** | **Indicator** | **Target 2012/13** | **Target 2013/14** | **Target 2014/15** | **Target 2015/16** | **Target 2016/17** | **Target 2017/18** | **Target 2018/19** |
| To maintain income growth | The total amount of leverage income for the 2015/16 financial year | Indicator not measured in 2012/13 | Indicator not measured in 2013/14 | 21million | **92.3 million** | 29.4millon | 30.7million | 20.9illion |
| | The total number of contracts initiated in the 2015/16 financial year with other organisations that increase leverage funding | Indicator not measured in 2012/13 | Indicator not measured in 2013/14 | Indicator not measured in 2014/15 | **11 contracts to be signed in the 2015/16 financial year** | | | |
| To improve the response to internal audit results | The percentage of internal audit queries fully addressed | All internal audit findings fully addressed | All internal audit findings fully addressed | All internal audit findings fully addressed | **All internal audit findings fully addressed** | All internal audit findings fully addressed | All internal audit findings fully addressed | All internal audit findings fully addressed |
| To improve the response to external audit results | The achievement of a unqualified audit report vs a qualified audit report | The WRC to achieve an unqualified audit report | The WRC to achieve an unqualified audit report | The WRC to achieve an unqualified audit report | **The WRC to achieve an unqualified audit report** | The WRC to achieve an unqualified audit report | The WRC to achieve an unqualified audit report | The WRC to achieve an unqualified audit report |
| | The percentage of external audit queries fully addressed | All external audit findings full addressed | All external audit findings full addressed | All external audit findings full addressed | **All external audit findings full addressed** | All external audit findings full addressed | All external audit findings full addressed | All external audit findings full addressed |

## Employee Portfolio

| | 9. Strategic Objective: To ensure organizational transformation and focus on the enhancement of effective leadership and improved level of employee competence | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Objective** | **Indicator** | **Target 2012/13** | **Target 2013/14** | **Target 2014/15** | **Target 2015/16** | **Target 2016/17** | **Target 2017/18** | **Target 2018/19** |
| To maintain a healthy staff diversity profile for the 2015/16 financial year | The percentage of employees from the designated groups | Indicator not measured in 2012/13 | 80% target maintained for the year (80% of total number of employees to be from the designated groups) | 80% target maintained for the year (80% of total number of employees to be from the designated groups) | **80% target maintained for the year (80% of total number of employees to be from the designated groups)** | 80% target maintained for the year (80% of total number of employees to be from the designated groups) | 80% target maintained for the year (80% of total number of employees to be from the designated groups) | 80% target maintained for the year (80% of total number of employees to be from the designated groups) |
| | The percentage of employees who are Black | Indicator not measured in 2012/13 | 66% target maintained for the year (66% of the total number of employees to be Black) | 66% target maintained for the year (66% of the total number of employees to be Black) | **66% target maintained for the year (66% of the total number of employees to be Black)** | 66% target maintained for the year (66% of the total number of employees to be Black) | 66% target maintained for the year (66% of the total number of employees to be Black) | 66% target maintained for the year (66% of the total number of employees to be Black) |
| | The percentage of employees who are female | Indicator not measured in 2012/13 | 56% target maintained for the year (56% of the total number of employees to be female) | 56% target maintained for the year (56% of the total number of employees to be female) | **56% target maintained for the year (56% of the total number of employees to be female)** | 56% target maintained for the year (56% of the total number of employees to be female) | 56% target maintained for the year (56% of the total number of employees to be female) | 56% target maintained for the year (56% of the total number of employees to be female) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| To Improve employee development and growth in the 2015/16 financial year | Completion of personal development plans (PDP) | Indicator not measured in 2012/13 | 32 | 60 | **60 PDPs completed** | 63 | 63 | 63 |
| | The number of training courses held in-house | 4 | 3 | 3 | **8 held in-house** | 9 | 9 | 9 |
| | The number of external training courses attended | 14 | 14 | 14 | **20 courses attended by WRC employees** | 20 | 20 | 20 |

## APPENDIX 2: LIST OF RESEARCH PROJECTS TO BE INITIATED IN THE 2015/16 FINANCIAL YEAR

| No | Proposal No. | KSA | Open /Directed | Research Manager | Project Title | Lead Organisation | Budget | Project Duration |
|---|---|---|---|---|---|---|---|---|

| No | Proposal No. | KSA | Open /Directed | Research Manager | Project Title | Lead Organisation | Budget | Project Duration |
|---|---|---|---|---|---|---|---|---|
| 1 | 1003786 | KSA 1 | OPEN | Mr Wandile Nomquphu | Ocean impact on southern African climate variability and water resources | University of Cape Town | 1 540 000 | 3 |
| 2 | 1003789 | KSA 1 | OPEN | Dr Jennifer Molwantwa | EONEMP: The integration of earth observation into the National Eutrophication Monitoring Programme | University of Cape Town | 4 211 528 | 4 |
| 3 | 1003818 | KSA 1 | OPEN | Dr Shafick Adams | Sustainability of shallow groundwater utilization for small-holder irrigation in the Limpopo Province | CSIR (Council For Scientific and Industrial Research) | 2 727 800 | 3 |
| 4 | 1003828 | KSA 1 | Directed | Dr Jennifer Molwantwa | Pilot study and technology transfer of the Integrated Water Quality Management System (IWQMS) in the Breede-Overberg and an assessment of early warning systems for source water protection | Golder Associates Africa (Pty) Ltd | 1 500 000 | 2 |
| 5 | 1003840 | KSA 1 | OPEN | Dr Shafick Adams | Evidence oriented investigation to assess the necessity of purging or non-purging groundwater sampling in selected fractured and alluvial aquifer systems of South Africa | University of the Free State, IGS | 600 000 | 2 |
| 6 | 1003853 | KSA 1 | OPEN | Ms Eiman Karar | The path to successful water user associations in the NW dolomites | SLR Consulting (South Africa) (Pty) Ltd | 335 000 | 1 |
| 7 | 1003854 | KSA 1 | OPEN | Mr Wandile Nomquphu | Optimising the use of updated and additional products from the Nowcasting Satellite Application Facility to improve the Rapidly Developing Thunderstorms and Convective Rainfall Rate products | South African Weather Service | 500 000 | 2 |
| 8 | 1003858 | KSA 1 | Directed | Mr Wandile Nomquphu | Enhancement of the method to identify and delineate South Africa's water source areas, water towers, with specific focus on mountain groundwater systems | CSIR (Council for Scientific and Industrial Research) | 3 500 000 | 3 |
| 9 | 1003859 | KSA 1 | Directed | Dr Jennifer Molwantwa | Cholera monitoring and response guideline | University of Fort Hare | 1 260 000 | 3 |
| 10 | 1003866 | KSA 1 | OPEN | Mr Wandile Nomquphu | Constructing and developing a robust database of environmental, agricultural and socio-economic aspects prior to the Mzimvubu Water Project | University of Fort Hare | 2 000 000 | 3 |
| 11 | 1003867 | KSA 1 | Directed | Dr Shafick Adams | Characterisation and protection of potential deep aquifers in South Africa | University of the Free State, IGS | 1 000 000 | 2 |
| 12 | 1003870 | KSA 1 | Directed | Dr Jennifer Molwantwa | Revision of the 1996 South African Water Quality Guidelines – Development of risk-based approach for recreational water use | CSIR (Council for Scientific and Industrial Research) | 2 000 000 | 3 |
| 13 | 1003872 | KSA 1 | OPEN | Mr Wandile Nomquphu | Use of land surface models for seasonal hydrological forecasting in South Africa | University of Cape Town | 1 271 360 | 3 |
| 14 | 1003893 | KSA 1 | OPEN | Mr Wandile Nomquphu | Resetting the baseline land cover against which streamflow reduction activities and the hydrological impacts of land use change are assessed | University of KwaZulu-Natal | 2 500 000 | 3 |

| No | Proposal No. | KSA | Open /Directed | Research Manager | Project Title | Lead Organisation | Budget | Project Duration |
|---|---|---|---|---|---|---|---|---|
| 15 | 1003903 | KSA 1 | OPEN | Dr Jennifer Molwantwa | Development of novel fluorescent sensors for the screening of emerging chemical pollutants in water | University of Pretoria | 438 600 | 2 |
| 16 | 1003905 | KSA 1 | OPEN | Mr Wandile Nomquphu | Upstream-downstream hydrological linkages in the Limpopo River Basin | Council For Scientific and Industrial Research | 1 700 000 | 3 |
| 17 | 1003930 | KSA 1 | OPEN | Dr Jennifer Molwantwa | Geophysical delineation and monitoring of AMD in COH | CSIR (Council for Scientific and Industrial Research) | 720 240 | 2 |
| 18 | 1003936 | KSA 1 | OPEN | Dr Shafick Adams | Regional water sensitive urban design scenario planning for Cape Town using an urban (geo)hydrology model | DELTA-H (Pty) Ltd | 1 000 000 | 2 |
| 19 | 1003946 | KSA 1 | OPEN | Dr Shafick Adams | Integrated use of isotope tracers to understand the role of surface water groundwater interaction in salinisation of groundwater resources in arid and semi-arid environments in Southern Africa | University of Stellenbosch | 1 400 000 | 3 |
| 20 | 1003961 | KSA 1 | OPEN | Dr Shafick Adams | The impacts of commercial plantation forests on groundwater recharge and streamflow | CSIR (Council for Scientific and Industrial Research) | 1 605 960 | 3 |
| 21 | 1003973 | KSA 1 | Directed | Mr Wandile Nomquphu | Water accounts for South Africa | Prime Africa Consultants (previously CIC International) | 1 800 000 | 3 |
| 22 | 1003995 | KSA 1 | Directed | Dr Jennifer Molwantwa | Development and benchmarking of a decision support for aquatic toxicity testing: technology transfer and implementation of the toxicity testing guideline/technology | Rhodes University | 2 000 000 | 3 |
| 23 | 1004013 | KSA 1 | OPEN | Dr Jennifer Molwantwa | The development of portable immunoassays for the detection of enteric pathogen species for water quality monitoring | University of Johannesburg | 780 000 | 2 |
| 24 | 1004016 | KSA 1 | OPEN | Dr Shafick Adams | Training manual for groundwater resource management and groundwater governance for municipalities in South Africa | University of the Free State, IGS | 500 000 | 2 |
| 25 | 1004021 | KSA 1 | OPEN | Dr Jennifer Molwantwa | Extending functionality and knowledge transfer of the Water Quality Systems Assessment model | Rhodes University | 898 737 | 3 |
| 26 | 1004023 | KSA 1 | OPEN | Dr Jennifer Molwantwa | State-of-the-art cemetery guidelines: impacts of interments on water resources | University of Pretoria | 1 000 000 | 3 |
| 27 | 1004037 | KSA 1 | OPEN | Ms Eiman Karar | Implementation of Adaptive Operational Governance Dashboard (AOGD) for the Inkomati-Usuthu CMA | University of KwaZulu-Natal | 1 788 000 | 2 |
| 28 | 1004065 | KSA 1 | OPEN | Dr Jennifer Molwantwa | Development of a web-enabled mine water management vulnerability assessment tool to facilitate resource protection | Emanti Management | 854 160 | 2 |
| 29 | 1004094 | KSA 1 | Directed | Ms Eiman Karar | Assessment of implementation of the national water policy and framework for monitoring the extent of implementation of the NWA | Sustento Development Services | 1 000 000 | 3 |

| No | Proposal No. | KSA | Open /Directed | Research Manager | Project Title | Lead Organisation | Budget | Project Duration |
|---|---|---|---|---|---|---|---|---|
| 30 | 1004081 | KSA 1 | OPEN | Ms Eiman Karar | Towards sustainable economic development in water constrained catchments: tools to empower decision making | GreenCape | 2 059 672 | 3 |
| 31 | 1004104 | KSA 1 | OPEN | Dr Jennifer Molwantwa | Multi-array sensor technology for polycyclic aromatic hydrocarbons screening in wastewater | University of the Western Cape | 730 000 | 2 |
| 32 | 1004114 | KSA 1 | Directed | Ms Eiman Karar | A framework towards a comprehensive water licensing system | Pegasys Strategy and Development (Pty) Ltd | 1 000 000 | 2 |
| 33 | 1004122 | KSA 1 | OPEN | Dr Shafick Adams | The hydrogeology of Groundwater Region 39 | North-West University, Potchefstroom Campus | 400 000 | 2 |
| 34 | 1004125 | KSA 1 | OPEN | Mr Wandile Nomquphu | Predictability of hydroclimatic variability over eastern South Africa under climate change | CSIR (Council For Scientific and Industrial Research) | 1 257 000 | 3 |
| 35 | 1003829 | KSA 2 | OPEN | Dr Stanley Liphadzi | Development of a predictive management tool for Orange River blackfly outbreaks | Nick Rivers-Moore | 1 200 000 | 3 |
| 36 | 1003835 | KSA 2 | OPEN | Mr Bonani Madikizela | Tools for monitoring and quantifying instream restoration success following removal of alien invasive plants | University of Stellenbosch (Department of Conservation Ecology and Entomology ) | 1 000 000 | 3 |
| 37 | 1003914 | KSA 2 | OPEN | Mr Bonani Madikizela | Developing land type transfer functions for wetland distributions of urban areas | ARC Institute for Soil, Climate and Water – Soil Health and Remediation | 1 000 000 | 3 |
| 38 | 1003982 | KSA 2 | OPEN | Dr Stanley Liphadzi | The application of ecotoxicity and an activity analysis of salt management, to water resource protection and use (domestic, agriculture, mining and industry) | Rhodes University | 1 500 000 | 3 |
| 39 | 1004035 | KSA 2 | OPEN | Mr Bonani Madikizela | Refinement of the preliminary guideline for the determination of buffer zones for rivers, wetlands and estuaries | Institute of Natural Resources NPC | 398 600 | 2 |
| 40 | 1004043 | KSA 2 | OPEN | Dr Stanley Liphadzi | A new approach to strategic resource planning for South Africa's estuaries – shifting from an activity-based to a multi-sector paradigm | CSIR (Council for Scientific and Industrial Research) | 1 796 800 | 3 |
| 41 | 1004083 | KSA 2 | Directed | Dr Stanley Liphadzi | Development of a methodology and decision support system to determine appropriate protection levels of water resources using ecosystem services and socio-economic tools | Prime Africa Consultants (previously CIC International) | 2 000 000 | 3 |
| 42 | 1004124 | KSA 2 | OPEN | Dr Stanley Liphadzi | Long-term WRFChem modelling and verification of wet and dry acid deposition over South Africa and investigation of impact of power generation stack emission limits on acid deposition | EScience Associates (Pty) Ltd | 700 000 | 1 |
| 43 | 1003869 | KSA 3 | Directed | Dr Valerie Naidoo | Revision of Natsurv 13 – Water and wastewater management in the textile industry – Edition 2 | Cape Peninsula University of Technology | 900 000 | 2 |

| No | Proposal No. | KSA | Open /Directed | Research Manager | Project Title | Lead Organisation | Budget | Project Duration |
|---|---|---|---|---|---|---|---|---|
| 44 | 1003878 | KSA 3 | OPEN | Dr Nonhlanhla Kalebaila | Solar energy desalination | University of Pretoria | 500 000 | 2 |
| 45 | 1003885 | KSA 3 | OPEN | Dr Jo Burgess | Fate and behaviour of nano-$TiO_2$ nanoparticles in simulated textile wastewater | University of Johannesburg | 900 000 | 2 |
| 46 | 1003897 | KSA 3 | OPEN | Dr Valerie Naidoo | National survey of filamentous bacterial populations in activated sludge: identification and correlation with process parameters, wastewater treatment plant configuration, and geographical location | Cape Peninsula University of Technology | 1 500 000 | 3 |
| 47 | 1003899 | KSA 3 | OPEN | Dr Nonhlanhla Kalebaila | Assessing the impact of a mobile application in monitoring water consumption and leak detection at household level | University of Cape Town | 500 000 | 3 |
| 48 | 1003902 | KSA 3 | OPEN | Dr Valerie Naidoo | In-line rheometry for continuous and efficient polymer dosing control to optimise sludge dewatering | Cape Peninsula University of Technology | 860 000 | 2 |
| 49 | 1003904 | KSA 3 | Directed | Dr Valerie Naidoo | Revision of Natsurv 10 – Water and wastewater management in the tanning and leather finishing industry – Edition 2 | Chris Swartz Water Utilisation Engineers | 900 000 | 2 |
| 50 | 1003918 | KSA 3 | OPEN | Dr Nonhlanhla Kalebaila | Natural organic matter in the water treatment process (and cooling waters): treatability, removal and development of techniques for removal of disinfection by products in water | University of Johannesburg | 500 000 | 2 |
| 51 | 1003926 | KSA 3 | OPEN | Dr Nonhlanhla Kalebaila | Nanomembranes-hyperbranched polymer integrated system for water remediation | University of Johannesburg | 600 000 | 3 |
| 52 | 1003928 | KSA 3 | Directed | Dr Valerie Naidoo | Revision of Natsurv 11 – Water and wastewater management in the sugar industry – Edition 2 | Cape Peninsula University of Technology | 900 000 | 2 |
| 53 | 1003933 | KSA 3 | OPEN | Dr Valerie Naidoo | The development of wastewater anaerobic digestion for greater energy, water and nutrient recovery | University of Cape Town | 1 454 486 | 4 |
| 54 | 1003948 | KSA 3 | OPEN | Dr Valerie Naidoo | Endocrine disrupting compounds removal by wastewater treatment plants | Tshwane University of Technology | 550 000 | 3 |
| 55 | 1003950 | KSA 3 | Directed | Dr Jo Burgess | Pacques pilot and demonstration plant | Project Assignments SA (Pty) Ltd | 2 800 000 | 3 |
| 56 | 1003966 | KSA 3 | OPEN | Dr Valerie Naidoo | Energy and resource recovery from wastewater sludge – a review of appropriate emerging and established technologies for the South African industry | TruSense Consulting Services | 950 000 | 2 |
| 57 | 1003978 | KSA 3 | OPEN | Dr Nonhlanhla Kalebaila | Diversity and dynamics of the microbial population associated with drinking water distribution networks and their impact on drinking water quality | University of Pretoria | 900 000 | 3 |

| No | Proposal No. | KSA | Open /Directed | Research Manager | Project Title | Lead Organisation | Budget | Project Duration |
|---|---|---|---|---|---|---|---|---|
| 58 | 1003985 | KSA 3 | Directed | Mr Jay Bhagwan | Exploring opportunities for domestic-local investment in water and sanitation services – challenges and constraints | African Centre for a Green Economy (Africege) | 800 000 | 2 |
| 59 | 1004001 | KSA 3 | OPEN | Dr Nonhlanhla Kalebaila | Development and evaluation of a Donnan Dialysis process for the recovery and reuse of aluminium from potable water treatment residuals | University of Stellenbosch | 1 000 000 | 3 |
| 60 | 1004019 | KSA 3 | OPEN | Dr Jo Burgess | Shale water treatment | University of the Western Cape (SAIAMC) | 2 421 875 | 4 |
| 61 | 1004034 | KSA 3 | Directed | Dr Valerie Naidoo | Revision of Natsurv 9 – Water and wastewater management in the poultry industry – Edition 2 | VitaOne8 (Pty) Ltd | 900 000 | 2 |
| 62 | 1004047 | KSA 3 | Directed | Mr Jay Bhagwan | Review of urban sanitation in South Africa – challenges and constraints | PDG | 594 839 | 2 |
| 63 | 1004049 | KSA 3 | OPEN | Dr Valerie Naidoo | The contribution of WRC Research to sustainable municipal wastewater and sanitation services | Sarah Slabbert Associates | 750 000 | 3 |
| 64 | 1004068 | KSA 3 | OPEN | Dr Valerie Naidoo | Characterizing municipal wastewater sludge for sustainable beneficial agricultural use | University of Pretoria | 1 500 000 | 3 |
| 65 | 1004070 | KSA 3 | OPEN | Dr Valerie Naidoo | Design and operation of a wastewater sludge digestion full-scale plant with enhanced CHP generation | Water Group Holdings (Pty) Ltd | 550 000 | 2 |
| 66 | 1004082 | KSA 3 | Directed | Mr Jay Bhagwan | Developing innovative approaches to national allocations and transfers to local government, and its use | PDG | 652 800 | 2 |
| 67 | 1004096 | KSA 3 | Directed | Dr Jo Burgess | The ettengrite process demo | Miwatek | 2 800 000 | 3 |
| 68 | 1004099 | KSA 3 | Directed | Dr Jo Burgess | Reverse of osmosis demo | Miwatek | 2 800 000 | 3 |
| 69 | 1004109 | KSA 3 | OPEN | Dr Valerie Naidoo | Biomimicry wastewater treatment technology – monitoring & evaluation | Isidima Design and Development (Pty) Ltd | 500 000 | 2 |
| 70 | 1004123 | KSA 3 | Directed | Dr Jo Burgess | Electro-coagulation pilot and demonstration plant | TECROVEER | 2 800 000 | 3 |
| 71 | 1003796 | KSA 4 | OPEN | Dr Sylvester Mpandeli | Emerging contaminants (veterinary pharmaceuticals and hormones) from agriculture in water systems around Cape Town and Stellenbosch, Western Cape | Cape Peninsula University of Technology | 890 000 | 2 |
| 72 | 1003851 | KSA 4 | OPEN | Dr Gerhard Backeberg | Water use of crops and nutritional water productivity for food production, nutrition and health in poor rural communities | University of KwaZulu-Natal (PMB) | 4 000 000 | 5 |
| 73 | 1003957 | KSA 4 | OPEN | Dr Gerhard Backeberg | Long-run hydro-economic risk simulation optimisation of water curtailments | University of the Free State | 3 000 000 | 4 |
| 74 | 1003960 | KSA 4 | OPEN | Dr Sylvester Mpandeli | Quantifying and managing agricultural non-point source (NPS) nutrient pollution from field to catchment scale | University of Pretoria | 4 000 000 | 4 |

| No | Proposal No. | KSA | Open /Directed | Research Manager | Project Title | Lead Organisation | Budget | Project Duration |
|---|---|---|---|---|---|---|---|---|
| 75 | 1003988 | KSA 4 | OPEN | Dr Sylvester Mpandeli | Water use of agro-forestry systems for food, forage and/or biofuel production | Institute of Natural Resources NPC | 5 000 000 | 5 |
| 76 | 1003990 | KSA 4 | OPEN | Dr Gerhard Backeberg | Enhancing food security and nutrition of selected rural communities in Limpopo Province using high yielding and water use efficient grain legume varieties | University of Limpopo | 2 600 000 | 5 |
| 77 | 1004036 | KSA 4 | OPEN | Dr Sylvester Mpandeli | Water use of strategic biofuel crops | University of KwaZulu-Natal (PMB) | 4 000 000 | 5 |
| 78 | 1004038 | KSA 4 | OPEN | Dr Sylvester Mpandeli | Up-scaling of rainwater harvesting and conservation to croplands and rangelands for food and renewable fuel (biogas) production | ARC Institute for Soil, Climate & Water | 4 000 000 | 5 |
| 79 | 1004050 | KSA 4 | OPEN | Dr Gerhard Backeberg | Guidelines for technology transfer to manage irrigation induced salinity with precision agriculture | University of the Free State | 4 000 000 | 5 |
| 80 | 1004073 | KSA 4 | OPEN | Dr Sylvester Mpandeli | Integrated use of seasonal forecast for community preparedness to climate variability | University of Cape Town | 4 500 000 | 4 |
| 81 | 1004076 | KSA 4 | OPEN | Dr Gerhard Backeberg | Towards enhancing contributions of inland fisheries to rural livelihoods: An empirical assessment of freshwater fish stocks, fisheries potential, market value chains, governance and co-management arrangements | University of the Western Cape | 4 000 000 | 5 |

# 18. APPENDIX 3: WRC MATERIALITY FRAMEWORK IN TERMS OF TREASURY REGULATIONS 28.1.5

## 1 Definitions

| | | |
|---|---|---|
| Accounting Authority | - | Board of Directors |
| Executive Authority | - | Minister of Water and Sanitation |
| Entity | - | Water Research Commission |
| PFMA | - | Public Finance Management Act (Act 1 of 1999 as amended by Act 29 of 1999) |
| Treasury Regulations | - | Public Finance Management Act, 1999: amendment of Treasury Regulations in terms of section 76 as published in Government Gazette No. 7372 |

## 2 Introduction

In terms of Treasury Regulation 28.1.5, the accounting authority must develop and agree a framework of acceptable levels of materiality and significance with the relevant executive authority in consultation with the external auditors.

***Framework***

| **Fiduciary duties of the accounting authority (PFMA section 50)** | **Quantitative (Amount)** | **Qualitative (Nature)** |
|---|---|---|
| (1) The accounting authority must -<br><br>(c) On request, disclose to the executive authority responsible for that public entity or the legislature to which the public entity is accountable, all material facts, including those reasonably discoverable, which in any way influence the decisions or actions of the executive authority or that legislature. | Any fact discovered of which the amount exceeds the determined materiality figure as calculated in Annexure A. | 1. Any item or event of which specific disclosure is required by law.<br>2. Any fact discovered of which its omission or misstatement, in the Board's opinion, could influence the decisions or actions of the executive authority or legislature. |
| **Annual Report and Financial Statement (PFMA section 55)** | **Quantitative (Amount)** | **Qualitative (Nature)** |
| (2) The annual report and financial statements referred to in subsection (1) (d) must –<br><br>(a) Fairly present the state of affairs of the public entity, its business, its financial results, its performance against predetermined objectives and its financial position as at the end of the financial year concerned:<br>(b) Include particulars of –<br>i. Any material losses through criminal conduct and any irregular | 1. Losses through criminal conduct – any loss identified.<br>2. Losses through irregular / fruitless / wasteful expenditure – if the combined total exceeds the | Any identified loss through criminal conduct. |

| | | |
|---|---|---|
| expenditure and fruitless and wasteful expenditure that occurred during the financial year;<br>ii. Any criminal or disciplinary steps taken is a consequence of such losses or irregular expenditure or fruitless and wasteful expenditure;<br>iii. Any losses recovered or written off;<br>iv. Any financial assistance received from the state and commitments made by the state on its behalf; and<br>v. Any other matters that may be prescribed. | planning materiality figure used by the external auditors for the year under review. | |
| **Annual Report and Financial Statement (PFMA section 54)** | **Quantitative (Amount)** | **Qualitative (Nature)** |
| (2) Before a public entity concludes any of the following transactions, the accounting authority for the public entity must promptly and in writing inform the relevant treasury of the transaction and submit relevant particulars of the transaction to its executive authority for approval of the transaction:<br><br>(b) Participation in a significant partnership, | | Any participation, outside of the approved strategic plan and budget. |

| | | |
|---|---|---|
| trust, unincorporated joint venture or similar arrangement;<br>(c) Acquisition or disposal of a significant shareholding in a company;<br>(d) Acquisition or disposal of a significant asset;<br>(e) Commencement of cessation of a significant business activity. | Not applicable<br>Not applicable<br>Not applicable<br>Not applicable | Any acquisition or disposal, outside of the approved strategic plan and budget.<br>1. Any asset that would increase or decrease the overall operational functions of the WRC, outside of the approved strategic plan and budget.<br>2. Disposal of the major part of the assets of the WRC. Any business activity that would increase or decrease the overall operational functions of the WRC, outside of the approved strategic plan and budget. |

## 3 Authorisation

This framework has been approved by the Board on 26 January 2015.

……
Chairperson of the Board

Annexure A

1.1 Determination of Materiality

**5.1.1. Materiality Basis**

| | | 2013/14 Actual | |
|---|---|---|---|
| **Materiality bases** | **% Used** | **R** | **Materiality (R)** |
| Gross Income | **0.625%** | **R 205 166 997** | **R 1 282 294** |
| Gross Expenditure | **0.625%** | **R 205 347 816** | **R 1 283 424** |
| Total Assets | **1.250%** | **R 227 075 813** | **R 2 838 448** |
| Net Deficit for the Year | **6.250%** | **R – 180 819** | **R 11 301** |

**5.1.2. Materiality basis selected and the reasons therefore**

Gross income consists mainly of levies received from DWA, Rand Water and Umgeni Water. This has shown steady growth over the past three years. Gross expenditure can fluctuate for a variety of reasons and did not show consistency over the past three years. Net profit/(loss) is derived from gross income and gross expenditure.

Assets consist mainly of investments and cash, which are not operating assets of the WRC itself. The WRC is not a capital-intensive business. Therefore this would not be considered an appropriate basis for calculating materiality.

Because of the uneven pattern in gross expenditure and net profit/(loss), gross income is regarded as the most appropriate basis for the calculation of materiality.

### 5.1.3 Justification of percentage used

A moderate percentage was used based on planning done in prior year audits which had assessed risk as medium. The audited figures as at March 2014 have been used as this constitutes the most reliable, verifiable and objective information available to use.

### 5.1.4 Materiality figure

Thus the most appropriate indicator for the purposes of setting materiality is gross income. For this reason, materiality has been selected at 0.625% of gross income which amounts to R1 282 294. In the previous financial year, materiality was set at R1 221 947. This is considered consistent with the previous financial year.

# APPENDIX 4: WRC RISK REGISTER

| Link to strategic objective | Risk name | Root causes of the risk | Potential consequences of the risk | Potential Impact (worst-case scenario) | Likelihood of risk occurring if no controls are in place | Inherent risk exposure with no controls in place | Current business processes / controls in place to manage identified risks | Risk owner | Perceived control effectiveness | Priority due to residual risk exposure | Mitigating action plans to further address the residual risk exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| To support human capacity building in the water sector | Institutional human capital deficit | Rapid diversification of the portfolio (Expanded mandate to perform with current capacity)<br><br>Restriction on HR investment due to research ratio<br><br>Availability of certain skills bases in the country<br><br>Capability and capacity of current available systems | Missing opportunities<br><br>Performance in the new areas not as required | Critical | Almost certain | Extreme | Partnerships and collaboration with other organisations that have the capability<br><br>Interim capacity deployment on a project to project basis<br><br>Investment and exposure in training | CEO | Weak | Priority 1 | Restructuring and associated recruitment |

| Link to strategic objective | Risk name | Root causes of the risk | Potential consequences of the risk | Potential Impact (worst-case scenario) | Likelihood of risk occurring if no controls are in place | Inherent risk exposure with no controls in place | Current business processes / controls in place to manage identified risks | Risk owner | Perceived control effectiveness | Priority due to residual risk exposure | Mitigating action plans to further address the residual risk exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Financial sustainability & corporate wellbeing<br><br>To develop new products and services (new innovations)<br><br>To develop sustainable solutions | Financial sustainability | Limited income streams (insufficient funding and diversity of income)<br><br>Weaknesses in the administration of research levies<br><br>Competition from public and private sector<br><br>Levy increase is below research scientific average inflation<br><br>Lack of systems/capacity to manage diverse income streams | Reduction in research outputs<br><br>Negative impact on stakeholder trust relationships due to cash flow and funding challenges<br><br>Limited ability to grow the research portfolio<br><br>Reduction in level of levy income<br><br>Challenges in managing cash flow<br><br>Insufficient budget to implement the strategic plan and operation of WRC | Critical | Almost certain | Extreme | MOA (memorandum of agreement) of monthly payments with DWA<br><br>Escalation provisions for funding Governed by legislation, Government Gazette<br><br>Diversified levy agencies (DWS, RW and UW)<br><br>Significant leverage income to offset dependency<br><br>Regular interaction with shareholder (Department of Water and Sanitation) and stakeholders on funding issues<br><br>Strategy to further diversify funding<br><br>Prioritisation of available funds<br><br>Stretching of resources<br><br>Regular meetings with funders<br><br>Adherence to legislation (collection of income – WRA) | CFO | Satisfactory | Priority 2 | Development of a financing strategy |

| Link to strategic objective | Risk name | Root causes of the risk | Potential consequences of the risk | Potential Impact (worst-case scenario) | Likelihood of risk occurring if no controls are in place | Inherent risk exposure with no controls in place | Current business processes / controls in place to manage identified risks | Risk owner | Perceived control effectiveness | Priority due to residual risk exposure | Mitigating action plans to further address the residual risk exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| To enhance knowledge across the water knowledge and innovation cycle<br><br>To develop sustainable solutions<br><br>To inform policy and decision making | Insufficient uptake of research | Inadequate capability and mechanisms of end users of research output to implement research findings<br><br>Uptake institutions not clearly identified at beginning of research process and not involved in development of research questions and results<br><br>Inadequate communication and mechanisms to facilitate the uptake of research<br><br>Insufficient conversation between researchers across disciplines as well as researchers and the end users | Research done does not contribute effectively to improved water management or to improved development outcomes in the country<br><br>Inability to meet the strategic objectives of the WRC<br><br>Possible reduction in funding<br><br>Stakeholder needs not met | Critical | Likely | High | Involvement of end users in design and rollout of research projects<br><br>New partnerships for implementation (TIA, SASOL, SALGA)<br><br>Packaging of research to various stakeholders<br><br>Development of policy and ministerial briefs to influence decision making<br><br>Direct support for IP development and commercialisation<br><br>Development of manuals, guidelines and support tools for implementation<br><br>Incorporation of research uptake into WRC research proposal template<br><br>Inclusion of research impact and uptake interventions in WRC CP | CEO | Good | Priority 4 | Implementation of the knowledge management model Development and implementation of Business Development Strategy<br><br>Community development strategy and alignment with objectives |

| Link to strategic objective | Risk name | Root causes of the risk | Potential consequences of the risk | Potential Impact (worst-case scenario) | Likelihood of risk occurring if no controls are in place | Inherent risk exposure with no controls in place | Current business processes / controls in place to manage identified risks | Risk owner | Perceived control effectiveness | Priority due to residual risk exposure | Mitigating action plans to further address the residual risk exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| To develop new products and services (new innovations)<br><br>To support community empowerment<br><br>To enhance knowledge across the water knowledge and innovation cycle | Constraints in keeping up with changes and trends in water research | Limited engagement with the sector nationally and internationally<br><br>Lack of long-term planning<br><br>Inadequacy of funding<br><br>Insufficient researchers at cutting edge<br><br>Small size of the water research community of practice especially the HDI and PDI<br><br>Insufficient investment in research | Inappropriate research outputs<br><br>No or little new knowledge created<br><br>Reputational damage/ credibility decline<br><br>Poor uptake on implementation of results<br><br>Deterioration of stakeholder relationship<br><br>Inability of the country to take advantage of development | Critical | Likely | High | Capacity building – as part of research contracts and research prioritisation (including post docs)<br><br>Mechanism of WRC dialogues, symposiums, conferences to be at forefront of development<br><br>Engagement with research partners<br><br>Partnership to be at cutting edge of technology and research<br><br>Support publication and exposure of students and training material<br><br>Conference participation to enhance knowledge<br><br>Stakeholder involvement in research portfolio<br><br>Annual strategic review of research portfolio<br><br>Periodic institutional review of research portfolio<br><br>Engaging performance of researchers<br><br>Development programme for individuals<br><br>Implementation of new strategy<br><br>Increasing international partnerships and engagement | EMs | Good | Priority 4 | |

| Link to strategic objective | Risk name | Root causes of the risk | Potential consequences of the risk | Potential Impact (worst-case scenario) | Likelihood of risk occurring if no controls are in place | Inherent risk exposure with no controls in place | Current business processes / controls in place to manage identified risks | Risk owner | Perceived control effectiveness | Priority due to residual risk exposure | Mitigating action plans to further address the residual risk exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| To enhance knowledge across the water knowledge and innovation cycle<br><br>To support human capacity building in the water sector<br><br>To support community empowerment | Inadequate availability, continuity and growth of adequate research expertise | Low number of graduates and postgraduate production in SA<br><br>Limited career opportunity and large capacity needs of the economy for researchers and research not seen as a preferred career<br><br>Current culture within the sector not oriented towards research<br><br>Current funding model for HEI (higher education institutions) is inadequate<br><br>Competition between different research sectors<br><br>Lack of mega-projects | Poor research and inadequate research outputs to service the water sector<br><br>Harm to reputation<br><br>Inability to meet the strategic objectives of the WRC | Serious | Likely | Moderate | Capacity building – as part of research contracts and research prioritisation in particular postgraduate student support<br><br>Introduction of lighthouse<br><br>Engagement with research partners<br><br>Support publication and exposure of students and training material<br><br>Lobby for increased research funds through DWA and DST and other players<br><br>Marketing research careers (through schools, universities, etc.)<br><br>Rolling out of international strategy. | CEO | Satisfactory | Priority 4 | Strategy to attract and retain brilliant researchers |

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| Financial sustainability & corporate wellbeing | Inadequate financial systems supporting operations | Inadequate financial operating system<br><br>Inadequate monitoring capacity at various levels<br><br>Inadequate record management system supporting financial transactions<br><br>Inadequate staff capacity (financial) | Inadequate budgeting and monitoring, and reputational damage<br><br>Unfavourable audit opinion<br><br>Collapse of the financial management system<br><br>Lack of morale | Serious | Likely | Moderate | Operating financial system<br><br>New operating protocols for reconciliations<br><br>Levels of approvals and delegations<br><br>Secondary audits<br><br>Bolstering the monitoring capacity | CFO | Satisfactory | Priority 4 | Recruitment of additional financial suitable staff |

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| To enhance knowledge across the water knowledge and innovation cycle<br><br>To support human capacity building in the water sector<br><br>To support community empowerment | Inadequate ability to deal with complexity of research issues and challenges | Insufficient capacity across the research disciplines and institutions to train them<br><br>Insufficient number of appropriately supervised projects<br><br>Insufficient trans-disciplinary training and research opportunities<br><br>Lack of a multi-sectorial research coordination<br><br>Lack of collaboration between vested parties<br><br>Lack of strength in certain disciplines | Research outputs not dealing with the complexity and trans-disciplinary nature of water problems<br><br>Reputational damage<br><br>Not meeting stakeholders' needs<br><br>Duplication and research output deficiencies | Serious | Likely | Moderate | Implementation of the lighthouse programme to engage both complexity and trans-disciplinarity<br><br>Technical, policy and ministerial briefs to ensure faster exposure to research outcomes<br>Annual strategic review of research portfolio<br><br>Partnerships to facilitate implementation<br><br>Periodic institutional review of research portfolio<br><br>Development of the social science inter-disciplinarity programme<br><br>Implementation and monitoring of the Knowledge Tree objectives | EMs | Good | Priority 5 | |

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| To develop sustainable solutions<br><br>Financial sustainability & corporate wellbeing | Profile of the WRC within SADC, Africa and global | Insufficient interaction with the international community, especially other African countries<br><br>WRC management team and researchers funded by the WRC constrained to keep up to date with international research developments<br><br>Insufficient recognition of the WRC by research partners<br><br>Inadequate dissemination of research findings and marketing of WRC internationally<br><br>Limited financial instruments to support African research partnership<br><br>Perception of WRC as competition to donors<br><br>Budgetary constraints to promote the profile of the WRC | Loss of credibility in the international water research field<br><br>Reduction in ability to attract donor funding<br><br>Negative impact on possible partnerships with international or non–South African research institutions<br><br>Limited potential to lead on African solutions<br><br>Insufficient research output (output might not consider other relevant practices)<br><br>Difficult for WRC to penetrate African footprint | Serious | Likely | Moderate | Attendance of international conferences, etc.<br><br>Involvement in global-, African- and SADC-level projects<br><br>WRC international strategy implemented<br><br>Interaction with stakeholders on SADC, Africa and global involvement<br><br>Conducting SADC-wide projects with donor partners<br><br>Contracts in place with researchers to acknowledge the WRC | CEO | Good | Priority 5 | International Forum established to guide implementation of International Strategy<br><br>Funding/ Business Development Strategy in progress to improve access to internationally competitive funds. |

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| Financial sustainability & corporate wellbeing | Business interruption / disaster | Theft of computer hardware<br><br>Power and water supply failure<br><br>Fire, flood, hacking, negligence<br><br>IT viruses<br><br>Hacking into the WRC information system<br><br>Loss of hard-copy information<br><br>Poor security control (logical access and physical control)<br><br>Failure of support services (Eskom, Post Office) | Delays and disruptions in operations<br><br>Possible loss of life / injury on duty<br><br>Financial loss<br><br>Loss of research results (reports/ loss of knowledge base – intellectual property)<br><br>Harm to reputation<br><br>Possible rework resulting in increased cost<br><br>Legal implications | Critical | Possible | Moderate | Offsite backups of core systems and data, disaster recovery site and plans<br><br>Uninterrupted power supply<br><br>Anti-virus software (renewed annually and daily updates) and firewalls<br><br>Insurance<br><br>Emergency response teams<br><br>Evacuation plans and procedures<br><br>Fully-functional private network (van)<br><br>Logical and physical access controls<br><br>Fire-proof strong room for research contracts (offsite)<br><br>Digitisation of documentation<br><br>3G and cell-phone enablement<br><br>24-hour security with armed response<br><br>Outsource courier service provider<br><br>Annual simulation testing<br><br>Uninterrupted+L10 water and power supply | EM: CS | Good | Priority 5 | |

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| Financial sustainability & corporate wellbeing | Fraud and corruption | Ineffectiveness of fraud and corruption prevention systems<br><br>Possible unethical behaviour<br><br>Non-adherence to policy and procedures<br><br>Effectiveness of management oversight<br><br>Opportunists (bribes, corruption, collusion) | Financial loss<br><br>Operational inefficiencies<br><br>Harm to reputation<br><br>Inability to meet set performance delivery targets<br><br>Increased pressure from stakeholders<br><br>Loss of research results (reports/ loss of knowledge base – intellectual property) | Critical | Possible | Moderate | Financial and management (reconciliatory, supervisory, etc.) controls<br><br>Monitoring daily cash balance<br><br>Segregation of duties<br><br>Audit trails<br><br>Delegation of authority<br><br>Change controls<br><br>Fraud prevention plan implemented and work shopped annually<br><br>24-hour fraud hotline<br><br>Whistleblowing policy implemented<br><br>Code of Ethics | CFO | Good | Priority 5 | |

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| To develop new products and services (new innovations) | Potential for biased/compromised science | Decisions impacted by undue influence | Reputational damage<br><br>Implementation of wrong solutions | Critical | Possible | Moderate | Declaration of interests<br><br>Decision protocols<br><br>Contract Management<br><br>Reference group system<br><br>Anti- fraud measures | CEO | Good | Priority 5 | |
| To enhance knowledge across the water knowledge and innovation cycle | Losing competitive edge | External changes<br><br>Internal restructuring<br><br>Rapid growth | Reputational damage<br><br>Loss of leverage funding<br><br>Loss of research partnerships and collaborations | Serious | Possible | Low | Balanced strategy<br><br>Performance management system<br><br>Legislative mandate<br><br>Stakeholder engagements<br><br>Change management policies and procedures | EM: CS | Satisfactory | Priority 5 | Implementing a change management project (internal and external) |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| To enhance knowledge across the water knowledge and innovation cycle<br><br>To develop sustainable solutions<br><br>To inform policy and decision making | Poor quality or compromised researched outputs | Poor control mechanisms<br><br>Dishonest researchers | Harm to reputation<br><br>Uptake based on false research results<br><br>Loss of research results (reports/ loss of knowledge base - intellectual property) | Serious | Possible | Low | Reference group peer review system<br><br>Multiple approver procedure<br><br>Requirement for declaration of publications and intellectual property<br><br>Conference presentation for further technical peer review<br><br>Encourage peer-reviewed publication | EMs | Good | Priority 5 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Financial sustainability & corporate wellbeing<br><br>To inform policy and decision making | Non-compliance to Acts, Regulations, legislation, policies and procedures | Changes in legislation (not being monitored by the WRC as well as inability to adapt the rapid changes of legislation)<br><br>Internal capacity to meet compliance demands<br><br>Increasing compliance reporting burden<br><br>Insufficient knowledge of new applicable legislation | Possible charges against Accounting Officer and/or staff<br><br>Possible fines and litigation<br><br>Harm to reputation<br><br>Increased pressure from stakeholders<br><br>Qualified audit report<br><br>Loss of donor funding<br><br>Focus too much on compliance rather than strategic issues<br><br>Health and Safety liabilities resulting in possible injuries to staff / suspension of activities | Serious | Possible | Low | Good internal knowledge of the PFMA and other legislation and all regulations with regular internal audit of performance and compliance<br><br>Good relationship with Treasury and Auditor-General secures continuous updates<br><br>Ongoing training<br><br>Regular self assessment<br><br>Compliance is the responsibility of all Executive Managers<br><br>Dialogues with various stakeholders and with decision makers<br><br>Policy and ministerial briefs for decision making.<br><br>Policy research in the WRC portfolio Secondary auditing procedures<br><br>Appointment of a Compliance Manager<br><br>Appointment of Health and Safety representatives<br><br>Health and Safety awareness campaigns and reviews | EM: CS | Good | Priority 5 | |