WATER RESEARCH, DEVELOPMENT AND INNOVATION ROADMAP 2015 – 2025

Science and Technology Parliamentary Portfolio Committee

24 February 2016

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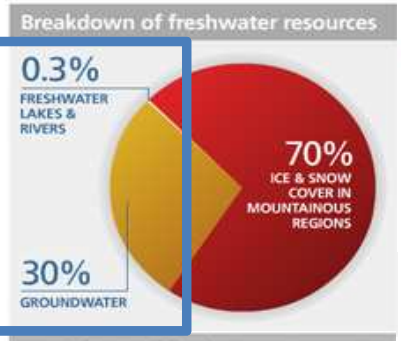
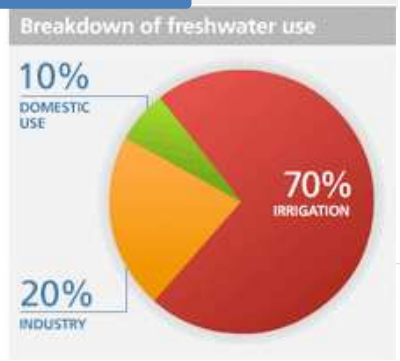
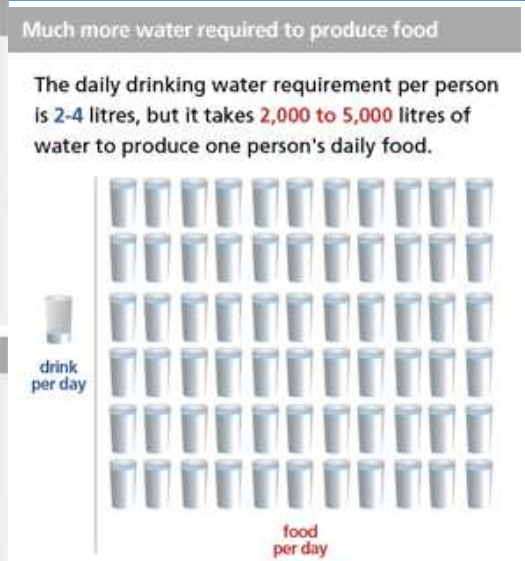
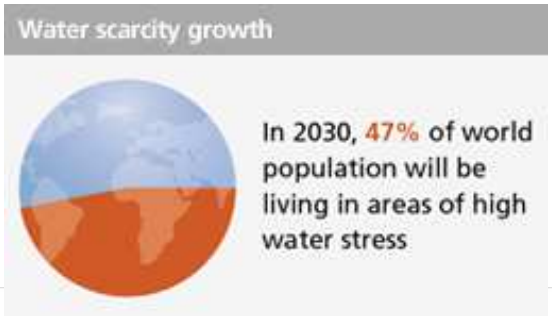
The Need – Global perspective

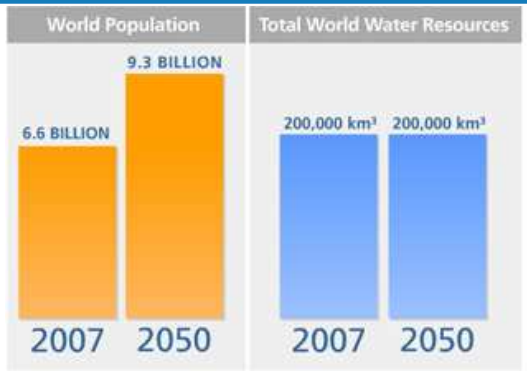
The Blue Planet









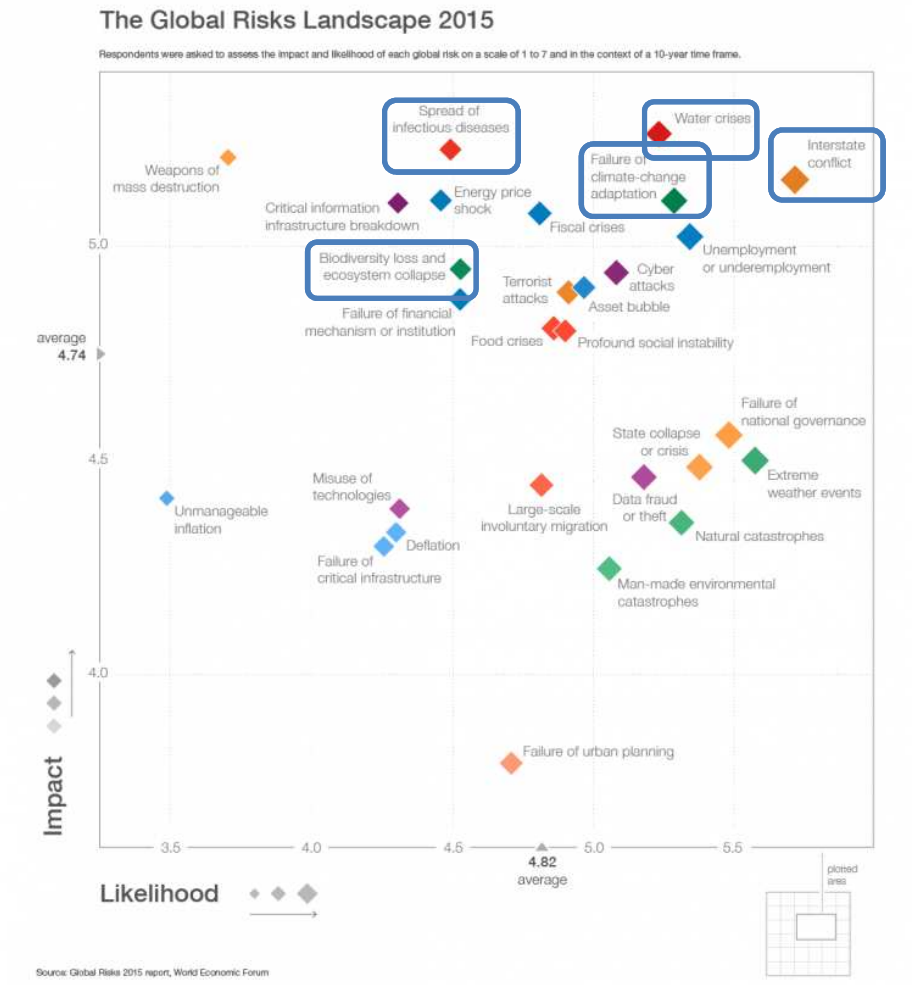


- Predicted increase in food demand of 70% by 2050

The Need – Global Perspective

World Economic Forum 2015 and 2016

- Water is #1 global risk



The Need – RSA perspective

- Municipalities
  - **Non-revenue water = 36% = R7.2 billion per annum**
- National Development Plan (NDP) – Vision 2030
  - Based on population and economic growth projections SA water **demand will outstrip supply by 17%**
  - **98% of SA water supplies fully allocated – No margin for error**
- Water RDI Roadmap responding to the need for:
  - Innovative solutions, technologies and processes
  - Highly skilled individuals
- Drought of the late 1960s resulted in the formation of the WRC
  - The Water RDI Roadmap has emerged timeously to address the current drought situation if implemented correctly

Why did we start this process?

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- A clear plan about what theWater RDI needs and opportunities and are to catalyse new partnerships, investments, and opportunities
- A signalling tool to the Water RDI Community
- A signalling tool to Water RDI Investors

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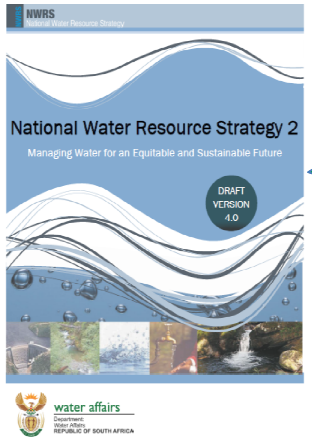

…to ensure that the latter's (WRC) research needs are known, and between the WRC and the Department of Science and Technology (DST) and the National Research Foundation (NRF), to ensure that approaches to water research are consistent with South Africa's broad policy on science and innovation.

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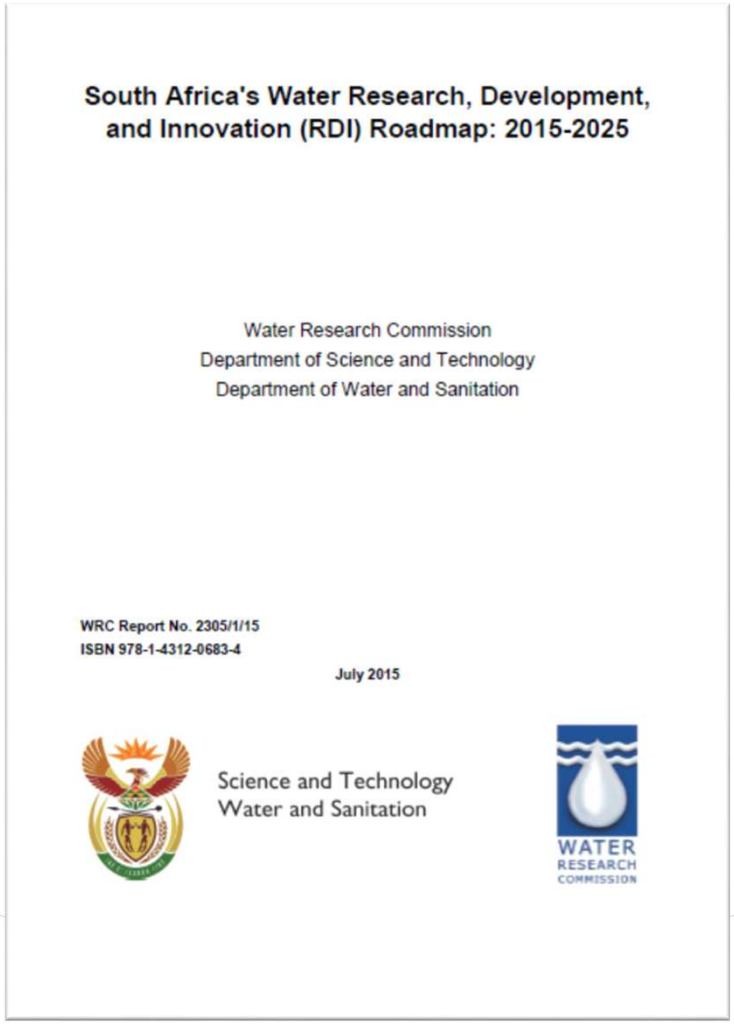
- *A "sense check" in terms of existing investments and approaches*
- *A plan to bring new partnerships and investments into the sector*
- *An opportunity to think through the streamlining of the RDI system*


South Africa's Water Research, Development, and Innovation (RDI) Roadmap: 2015-2025
Water Research Commission
Department of Science and Technology
Department of Water and Sanitation
WRC Report No. 2305/1/15
ISBN 978-1-4312-0683-4
July 2015
Science and Technology
Water and Sanitation
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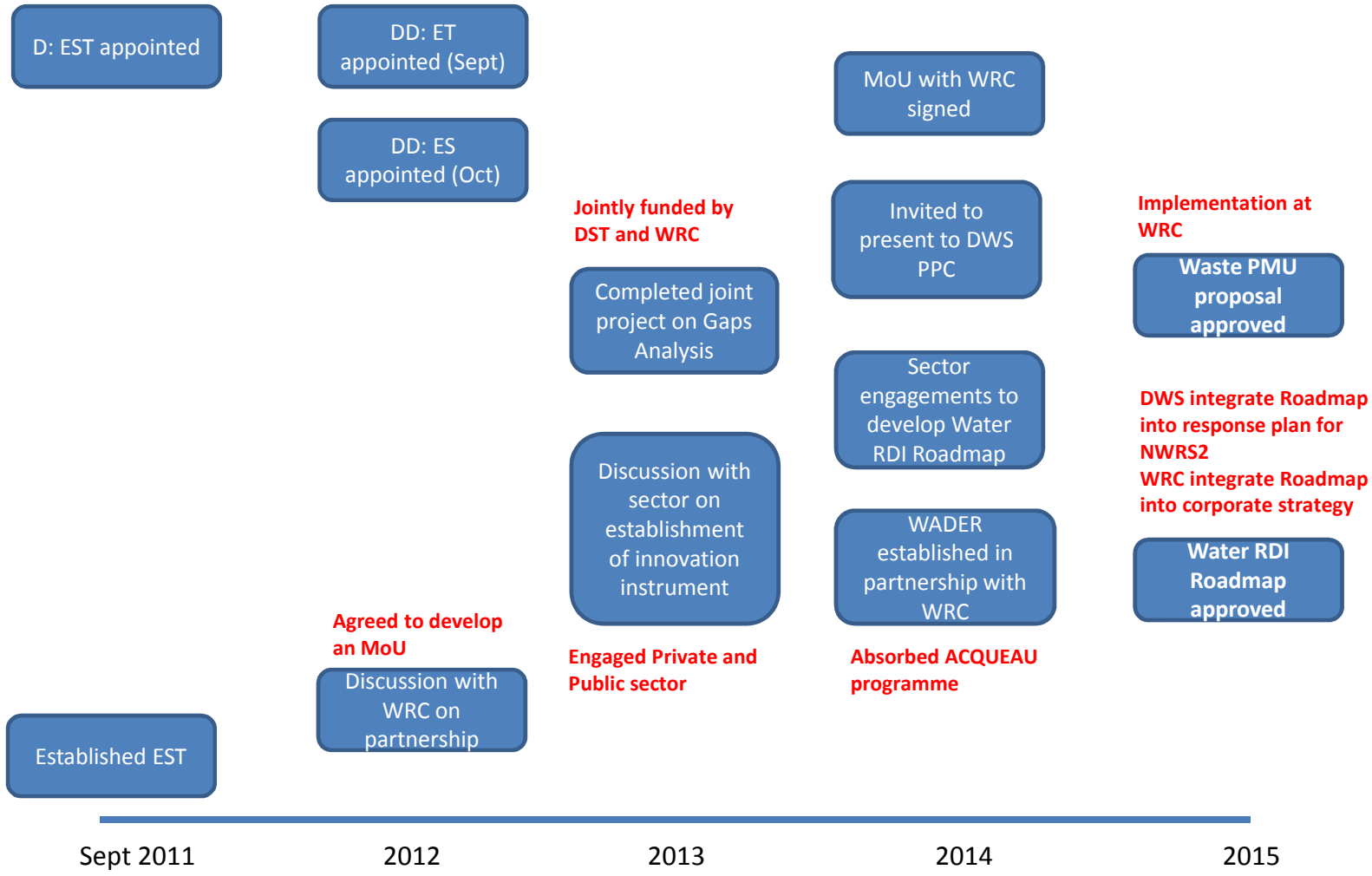

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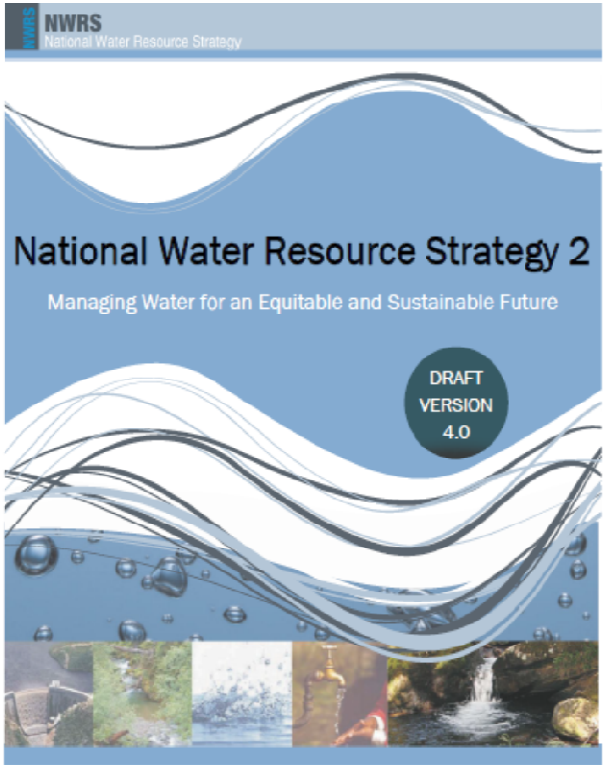
Government Strategic Plans



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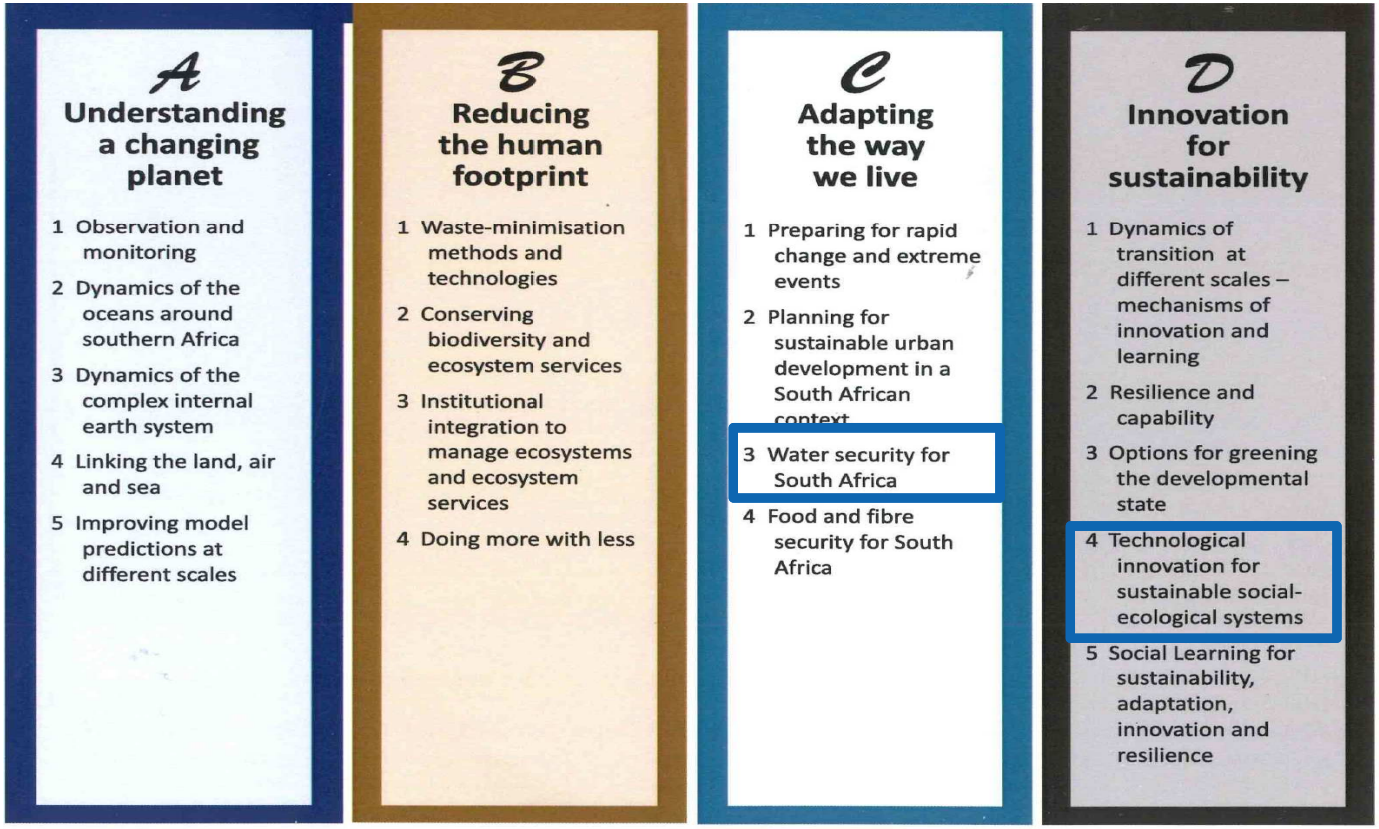
Priority Focus areas:

1. **Achieving Equity and Water Allocation Reform**
2. **Water Conservation and Demand management**
3. Institutional establishment and governance
4. Compliance monitoring and enforcement
5. Planning, infrastructure development and O&M

Global Change Research Plan



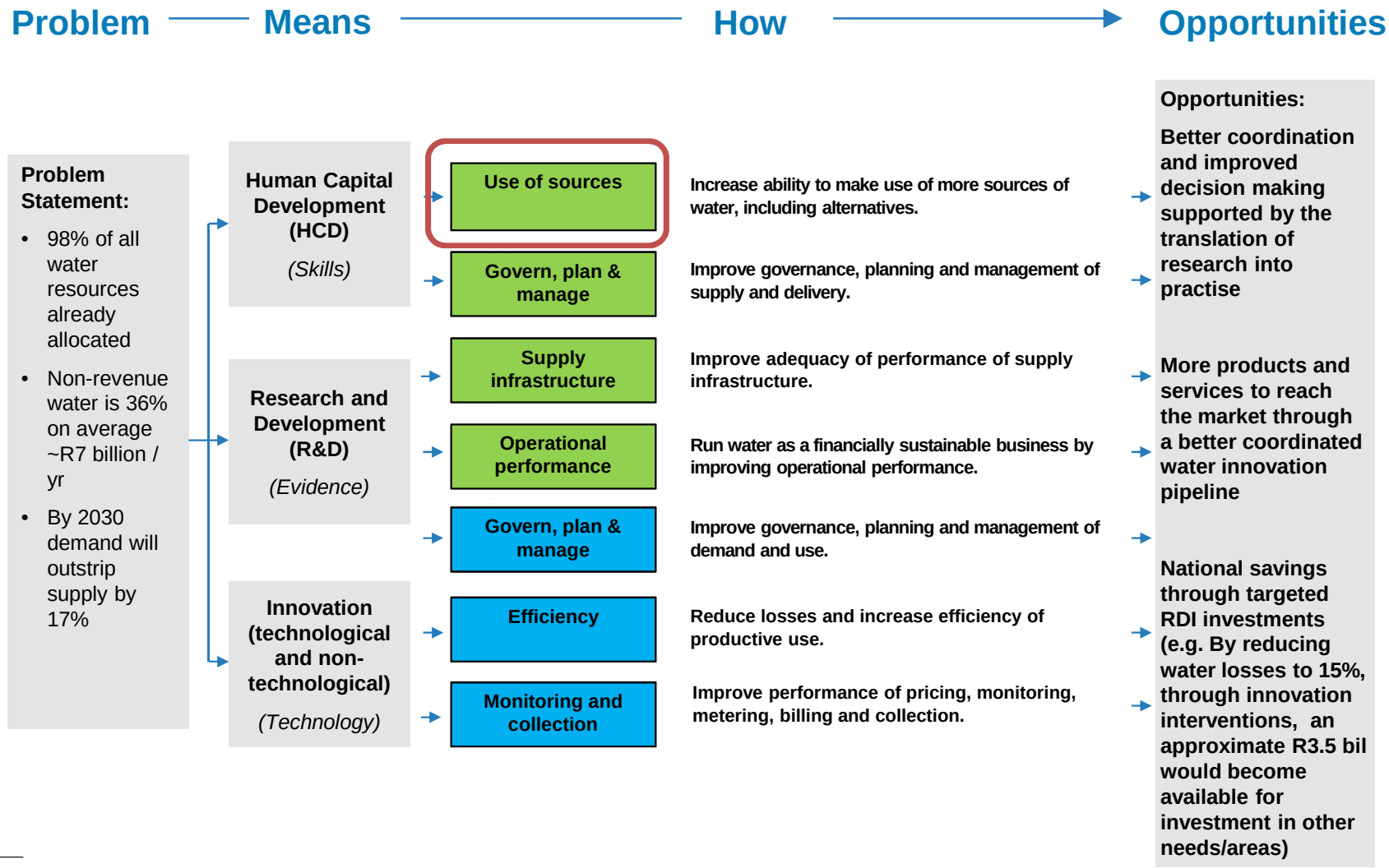
The Global Change Research Plan identifies four major cross-cutting knowledge challenges and 18 key research themes.

The approach to develop the Roadmap

Participation and input from 62 organisations in 32 workshops

Agri SA
Agricultural Research Council (ARC)
Amatola Water
Anglo American Coal
ARC-Institute for Soil, Climate and Water
BHP Billiton Energy Coal South Africa Ltd
Biomimicry SA
Chamber of Mines
City of Cape Town
City of Johannesburg
City of Tshwane
Coaltech
Coca Cola South Africa
Council for Scientific and Industrial Research (CSIR)
Department of Agriculture, Forestry and Fisheries (DAFF)
Department of Environmental Affairs (DEA)
Department of Science and Technology (DST)
Department of Water and Sanitation (DWS)
East Rand Water Care Company (ERWAT)
EON Consulting
Eskom-Mining
Eskom-Research & Development
Eskom-Technology, Strategy, and Research Management
Eskom-Water Resources
Ethekwini Municipality
Exxaro
Federation for a Sustainable Environment
Golder Associates Pty Ltd
Grain SA
Johannesburg Water
Land Rehabilitation Society of South Africa
Limpopo Provincial Department of Agriculture
Midvaal Water Company
Mintails Ltd
National Business Initiative (NBI)
National Planning Commission (NPC)
Nelson Mandela Metropolitan Municipality
NEPAD Business Foundation
Nestle
Rand Water
SA Association for Water User Associations
SA Irrigation Institute
SAB Miller
Sappi
Sasol
South African Local Government Association (SALGA)
South African National Biodiversity Institute (SANBI)
South African Weather Services (SAWS)
Stellenbosch University
Strategic Water Partners Network (SWPN)
Trans Caledon Tunnel Authority (TCTA)
Tshwane University of Technology (TUT)
Umgeni Water
Umhlaba Consulting Group
University of Pretoria (UP)
University of the Witwatersrand
Water Technologies Demonstration Programme (WADER)
Water Institute of Southern Africa (WISA)
Water Research Commission (WRC)
Western Cape Department of Agriculture
Wildlife and Environment Society of South Africa (WESSA)
Worldwide Fund for Nature SA (WWF-SA)

Strategically directing water RDI in support of impact



Example: Cluster on Sources (Increase ability to make use of more sources of water, including alternatives)

	Immediate 2015	Short Term 2016-2018	Medium Term 2019-2021	Long term 2022 – 2024
Focus	**Explore:** Develop RP – defined research streams, objectives, plan. Aligned with NWRS2 and desalination strategy	**Research Programme**	**Centre of Excellence** for technologies associated with water recycling	Two **Professional Service Centres**
Objective	Scope the whole opportunity with customers and stakeholders ▶ Customers: Users ▶ Mix and target mix over time – sources that are not waste	▶ Target particular sources that have higher potential ▶ Accelerate process of making operational impact ▶ Change the mix towards the ideal		▶ Provide effective technical assistance for regional water boards, WSAs and WSPs in decision-making about water sources and resource planning, technology selection, etc. ▶ Support strategic supply-side decision-making (link to Supply GPM)
Need	**Quantify Need** ▶ From the Reconciliation Strategy, frame requirement to identify and make use of alternative supplies for agriculture and public supply: management, technology ▶ Define objective and requirement to increase use of treated effluent: management, technology ▶ Define objective and requirement to increase and sustain levels of rainwater harvesting and efficiency of conservation methods.	**Need** ▶ Produce up to date maps of rainfall and allocations - 2016 ▶ Develop Opportunities Map for each alternative source – precipitation, ground, waste and link to Planning and Management in Supply GPM ▶ Assess industrial ecology of (7) industrial urban centres	**Need** ▶ Continue monitoring for emerging pollutants and changes in sources of supply	▶ **Professional Service Centre** provides technical assistance to municipalities (specifications, technical and professional advice, support with tender evaluation)
Potential	**Assess Potential** ▶ Identify suitable sites ▶ Conduct scientific-economic evaluation of alternative approaches eg potential and value of improving yields from enhanced rainfall, fog harvesting for strategic uses	**Realise Potential** ▶ Complete feasibility studies for sites with identified potential – including fitness for purpose. Identify requirements on treatment (alternate sources that are not waste) ▶ Implement efficient treatment management system for wastewater ▶ Increase the capability to identify and make use of alternative supplies ▶ Increase systemic ability to make use of treated effluent	**Realise Potential** ▶ **Centre of Excellence** for technologies associated with water recycling for different downstream uses. ▶ Continue to improve efficiency of treatment management system for wastewater ▶ Channel promising technologies to WADER (link to minimising Deliberate Demand in Productive Use	▶ **Professional Service Centre** supports functional resources planning and allocation processes, including reconciliation remapping, transfer schemes, macro decisions on water supply
Enablers	**Enablers (link to Supply Gov., Plan, Manage)** ▶ Catalyse linkages between producers and users e.g. mines and farms (non food uses) ▶ Define programmes directed at increasing social acceptance of recycled water; behaviour change for alternative options	**Enablers** ▶ Implement research and programmes to address public perception issue around direct potable reuse	**Enablers** ▶ Improve industrial regulatory frameworks ▶ Improve the quality of decision making information and also the uptake – resources planning and allocation	

Source: Mutualfruit Framework, WRC Analysis

Note: Developed via a series of structured sessions with the WRC to articulate research initiatives in terms of their evolution, duration and research capacity implications

Returns: Anticipated RDD Outputs, by Objective and Indicator

Objectives	Key Performance Indicator	RDD Outputs*	Explanatory notes
Technology Development	Products and services to market	2	Successful breakthrough technologies
	Technology packages	11	New technols. successfully developed / deployed
	Prototypes	32	Brand new technols. developed
Knowledge Generation	Registered full patents	80	New, full patents
	Provisional patents / applications	220	Provisional pct applications
	Publications	1940	Peer-reviewed
		Water SET - related HCD	***In addition to current national HCD numbers, which are:***
Human Capital Development	Post doctoral researchers	220	425
	Doctorates	540	1274
	Masters	800	7516

Assumptions in respect of investment in Human Capital Development and Knowledge Generation are derived from prior domain experience in South Africa. Anticipated conversion rates in technology development are consistent with international benchmarks in the translation of science to end-use technology. The investment per patent application refers to the level of investment in R&D activity that typically results in one patent application, and not to the cost of patent application fees and management.

Implementation of the Roadmap – Intervention 1

- Programme 2 and Programme 5 of the DST jointly funded with the WRC
- A Gap Analysis of Technologies, Techniques and Capacity for the Water and Wastewater sector in South Africa
- Key messages from the study
  - South African Water Researchers contribute three times the national average for science outputs in ISI-index publications (Pouris, 2013)
  - Problem identified is that the NSI for water is failing to meet strategic goals
  - Need to strengthen the linkages between R&D, industry, and end-users of knowledge and technology
  - DST, WRC, NRF and TIA need to coordinate and align their actions in the NSI Framework
  - Need to strengthen policy to drive innovation
  - There is a need for ring-fenced budgets for technology demonstration in government

Implementation of the Roadmap – Intervention 2

- Partnership
  - MoU signed in 2014
  - Co-developed the Water RDI Roadmap
  - Incorporation of Water RDI Roadmap into the WRC Business Plan
    - Hosting the Water RDI PMU
    - Hosting WADER
  - Serve on numerous reference groups
  - Participation in numerous WRC events
  - Partnered on the WRC symposium in 2013 and 2015
  - DDG: SIP served on the WISA Board

Implementation of the Roadmap - Intervention 3

- Water Technologies Demonstration Programme (WADER)
  - WRC contracted to pilot WADER – January 2014
  - First Manager appointed in April 2014
  - Current Manager – Dr Manjusha Sunil
- Vision: To bridge the gap between water research and the market to achieve a connected water innovation system that delivers socio-economic benefits for South Africa.
- TIA is represented on the Management Committee of WADER

wader
WATER TECHNOLOGIES DEMONSTRATION PROGRAMME
A KEYSTONE FOR WATER TECHNOLOGY INNOVATION

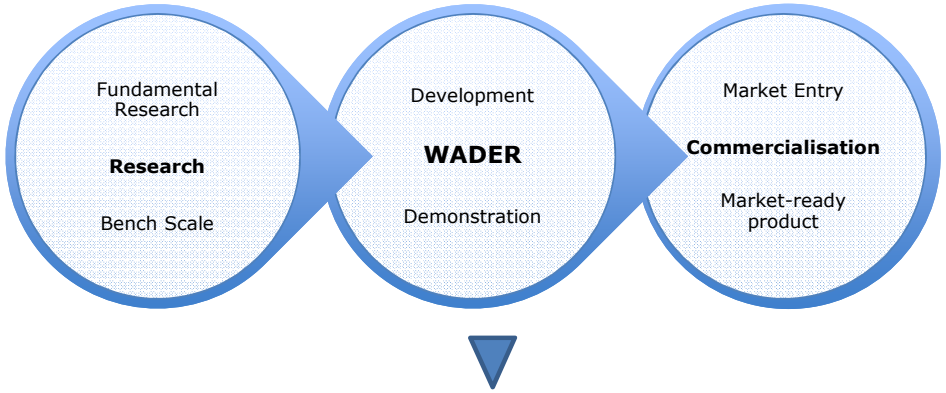
technology innovation AGENCY

Implementation of the Roadmap - Intervention 3

wader

WATER TECHNOLOGIES DEMONSTRATION PROGRAMME

A KEYSTONE FOR WATER TECHNOLOGY INNOVATION



Taking technologies out of the laboratory and proving them in real-world test situations

Implementation of the Roadmap Intervention 4

- EUREKA Platform - ACQUEAU
  1. MIWARE – Mintek / VTT (Finland).
     - Awarded the label in July 2014.
     - Objective of the project is to realise 3 demonstrated technologies for the treatment of acid-mine drainage (AMD)
     - 2 Demonstrations planned for 2017
  2. VitaSOFT Process – VitaOne8 / Nuwater (United Kingdom).
     - Conditionally awarded the label in December 2014.
     - Conditions were to
       1. provide detailed information about the treatment process and material flows;
       2. Secure a pilot site and
       3. secure national funding from the United Kingdom (Nuwater)
     - PCT application filed
  3. Sulfateq – Project Assignment Pty (Ltd) / Paques BV (Netherlands)
     - Awarded the label in July 2015
     - Project is to assess the Sulfateq technology for SA conditions for sulphate removal from AMD
     - Engineering design is complete
     - Unable to secure national funding from the Netherlands

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WATER TECHNOLOGIES DEMONSTRATION PROGRAMME
A KEYSTONE FOR WATER TECHNOLOGY INNOVATION

Implementation of the Roadmap – Intervention 5

- Technology Accelerator Programme in partnership with SALGA
  - SALGA contributes R350 000 to the call
  - First call published in June 2015 – 12 technology vendors responded
  - 2 were selected and are currently being contracted:
    1. Aquatrip water systems
    2. Arumloo – a low flush toilet
  - Both technologies are to be demonstrated in schools in the City of Johannesburg

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WATER TECHNOLOGIES DEMONSTRATION PROGRAMME
A KEYSTONE FOR WATER TECHNOLOGY INNOVATION

Implementation of the Roadmap – Intervention 6

- International Partnership
  - Memorandum of Understanding (MoU) signed between the WRC and the Water Environment Research Foundation (WERF) Leaders Innovation Forum for Technology (LIFT) at the WRC Symposium in 2015.
  - Allows WADER access to WERFs Technology Evaluation Criteria

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WATER TECHNOLOGIES DEMONSTRATION PROGRAMME
A KEYSTONE FOR WATER TECHNOLOGY INNOVATION

From left: Dr Amit Pramanik, WERF, Dr Henry Roman, DST and Mr Dhesigen Naidoo, WRC

Image: Adapted from http://www.wrc.org.za/News/Pages/WRCandWERFpartnerforappropriatetechnologydevelopment.aspx, 2016

Implementation of the Roadmap – Intervention 7

- Numerous engagements held with DWS throughout 2014
- In 2015 incorporated the Water RDI Roadmap into the National Water Resources Strategy 2 (NWRS2) Implementation Plan
  - Ch 14: Research and Innovation
  - Cross-linked to other relevant chapters within NWRS2
- Water and Sanitation Sector Leadership Group (WSSLG)

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Implementation of the Roadmap – Intervention 8

- Ecological Infrastructure
  - Mzimvubu Catchment (Eastern Cape), planned dam building
    - Ntabelanga and Laleni Dams
  - DST / DEA NRM 10 year partnership pre-dam building activity
    - Support for developing the Research Plan
    - Coordinating the RDI stakeholders
    - Data management and governance structures

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Implementation of the Roadmap – Intervention 9

- Establishment of a Catchment-based Ecological Infrastructure RDI Platforms
  - Mzimvubu
  - Umgeni
  - Breede
  - Limpopo
- Coordination and collaboration of RDI role-players in each of these catchments

SANBI
Biodiversity for Life
South African National Biodiversity Institute

Implementation of the Roadmap – Intervention 10

- Hitachi-DST Scholarship Programme
  - From 2015 only open to young water engineers from water utilities or municipalities
  - 2-month scholarship provides on-the-job training at Hitachi factories, visits to Japanese water utilities and a Japanese introductory course
  - Includes training fees; return flights to and from Japan, accommodation, local travel expenses in Japan, insurance and a food allowance for each successful candidate
- DST – Hitachi Symposium
  - Durban
  - Johannesburg

HITACHI
Inspire the Next

Implementation of the Roadmap – Intervention I I

- Human Capital Development (Masters, Doctoral)
  - Water RDI Students

Total students	Male	Female	Black (broad definition)	White
14	5	9	7	7

- Established Biomicry Platform with Biomimicry SA in March 2015

- Projected to grow to 35 students in 2016/17

Implementation of the Roadmap – Intervention I2

- Youth Development
  - Developing Enviropreneurs
  - Focus on water and biodiversity

# applications	Male	Female	Black (broad definition)	White
188	107	81	179	9

# participants	Male	Female	Black (broad definition)	White
17	13	4	15	2

IMVELISI
Developing Enviropreneurs

GreenMatter

YWP
YOUNG WATER PROFESSIONALS

AWETHU·PROJECT

GREEN | TALENT
SUSTAINABILITY CAREERS FOR ALTERNATIVE FUTURES

Climate innovation Center South Africa
Accelerating inclusive growth for innovative clean tech companies

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UNIVERSITY OF JOHANNESBURG

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Implementation of the Roadmap – Intervention I2

- Outcomes from the Bootcamp
  - Mzu Mkhize registered his business – Morning Dew
  - Michelle Hiestermann has registered her business – Shintsha
  - Theo Pistorius registered his business, has a website http://integritsense.co.za/ and secured 3 contracts. Through the bootcamp has connected with SAB Miller as a potential client.
  - Peter Lesibana Petrus through Imvelisi, connected with and is receiving advice from the Water Research Commission
  - Yonela Makhabeni received a job offer from the Department of Environmental Affairs and has accepted to assist them in taking forward their community projects.
  - Sylvester Selala has received interest from DEA NRM and their advice on taking forward his environmental board game

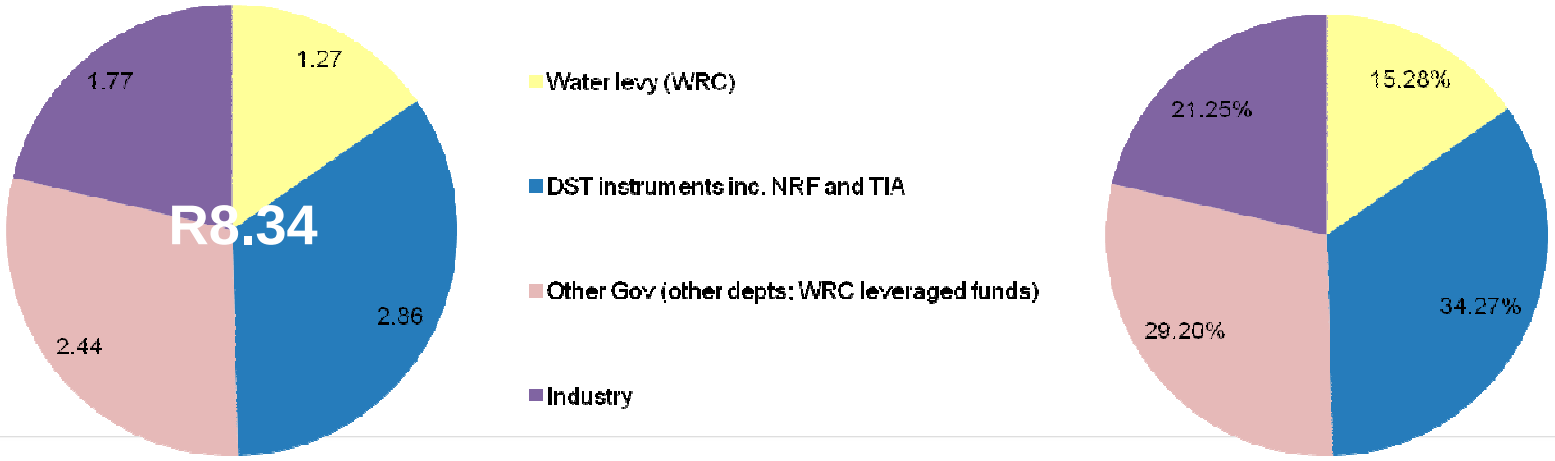
Looking ahead 2016/17

- Establishment of the Water RDI PMU at the WRC
  - WRC will put in place the Water RDI PMU Manager
  - Develop a Water NSI partnership and tracking system
  - Prepare a joint MTEF bid to National Treasury with DWS
  - Set up collaborative RDI partnership with Australia
  - Develop a Consolidated Partnership and Co-funding Strategy

Looking ahead 2016/17

- Budget requirement
  - DST contribution – R12 million
  - WRC contribution – will be provided by financial year end based on project allocations
  - Require – R834 million per year

Preliminary investment ambition over ten years (R billion), including new and already planned funding



Chief Director: SIGE
Mr Isaac Maredi

Director: EST	Deputy Director: Environmental Technologies	Deputy Director: Environmental Services
Henry Roman	Magamase Mange	Shanna Nienaber