

# **Draft National Water and Sanitation Master Plan (NW&SMP)**

*Ready for the future and  
ahead of the curve*

**Version 2.4**

13 November 2017

**DISCLAIMER:**

This version of the Master Plan is work in progress and not the final Master Plan.

This document is to invite comments from stakeholders and the final version may differ.

# Preface by the Minister

To be completed.

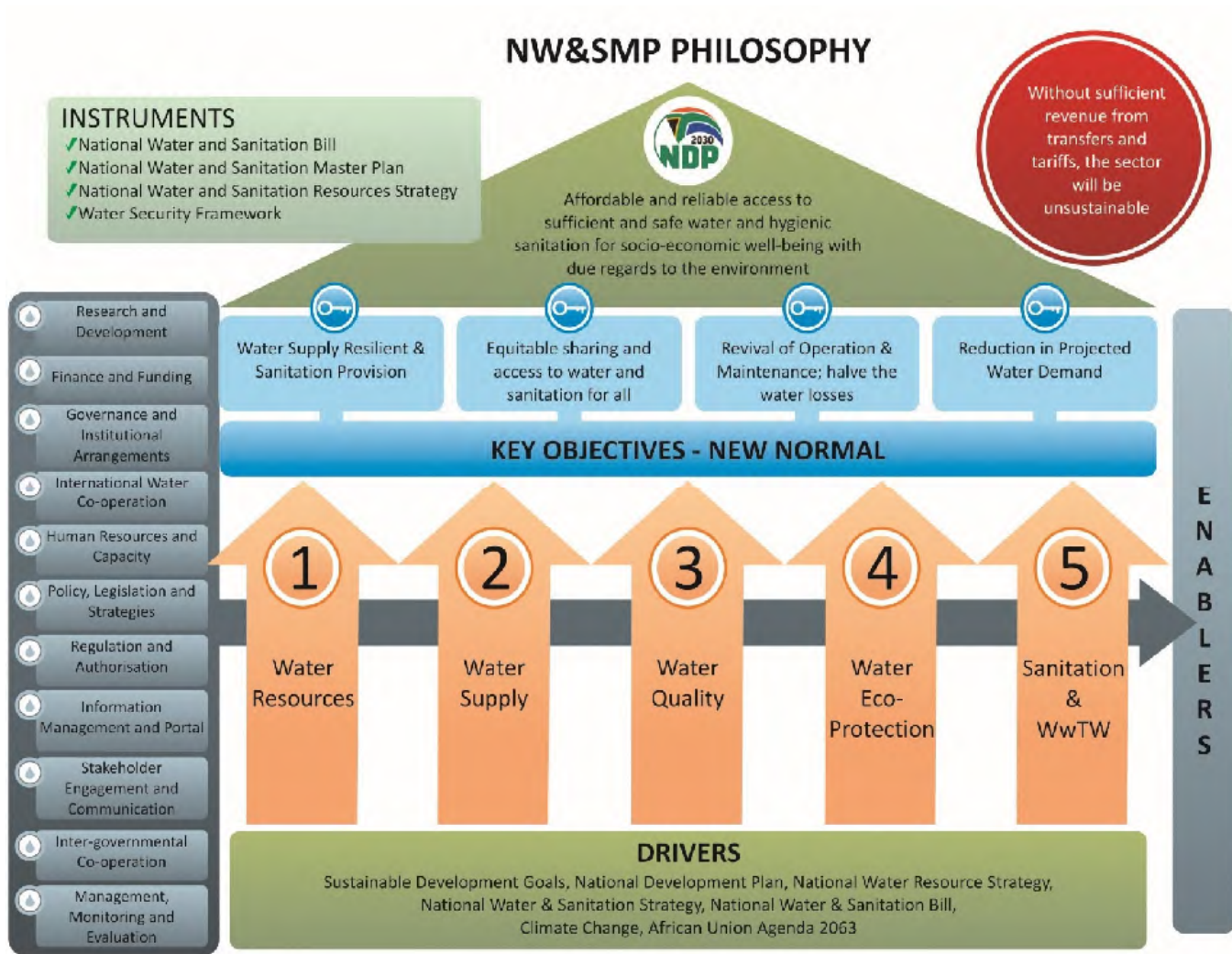
# Foreword by the Director General

To be completed.

# Executive Summary

To be completed.

# NW&SMP PHILOSOPHY



## Contents

<b>1.</b>	<b>DEFINING THE NATIONAL WATER AND SANITATION MASTER PLAN....</b>	<b>1-1</b>
1.1	<b>Background and Purpose of the National Water and Sanitation Master Plan (NW&amp;SMP)</b>	<b>1-1</b>
1.2	<b>Key Challenges and NW&amp;SMP Strategic Focus</b>	<b>1-1</b>
1.2.1	Legislative Context .....	1-3
1.2.2	Linkages between the NW&SMP with the SDGs, AU Agenda 2063, NDP and MTSF.....	1-4
1.2.3	Sustainable Development Goals.....	1-5
1.2.4	African Union’s (AU) Agenda 2063 .....	1-5
1.2.5	National Development Plan .....	1-5
1.2.6	Medium Term Strategic Framework.....	1-6
1.3	<b>NW&amp;SMP Vision, Objectives, Key Drivers, Pillars</b>	<b>1-6</b>
1.3.1	NW&SMP Vision.....	1-6
1.3.2	Pillars and Enablers for the NW&SMP .....	1-7
1.4	<b>NW&amp;SMP Status and Process</b>	<b>1-8</b>
<b>2.</b>	<b>WATER RESOURCES .....</b>	<b>2-9</b>
2.1	<b>Present State</b>	<b>2-9</b>
2.1.1	Available Water Resources .....	2-9
2.1.2	Water Requirements.....	2-11
2.1.3	Surface Water Development.....	2-15
2.1.4	Climate Change.....	2-18
2.1.5	Groundwater Infrastructure .....	2-19
2.1.6	Alternative Sources .....	2-20
2.1.7	Water Monitoring and Information.....	2-23
2.1.8	Flood Protection Infrastructure.....	2-24
2.2	<b>Summary of Water Resource Actions: Towards Water Resilience</b>	<b>2-25</b>
<b>3.</b>	<b>WATER SUPPLY .....</b>	<b>3-26</b>
3.1	<b>Present State</b>	<b>3-27</b>
3.1.1	Water Use and Context .....	3-27
3.1.2	Water Supply Infrastructure .....	3-28
3.1.3	Water Supply Reliability.....	3-28
3.2	<b>Problems, Challenges &amp; Drivers for Change</b>	<b>3-30</b>
3.3	<b>Desired Future State</b>	<b>3-32</b>
3.4	<b>Action Plan</b>	<b>3-34</b>
3.4.1	Planning .....	3-34
3.4.2	Project Implementation Approach.....	3-35
3.4.3	Water Services Investment and Funding Models .....	3-35
3.4.4	Monitoring and Compliance .....	3-36

<b>4.</b>	<b>SANITATION AND WASTEWATER TREATMENT .....</b>	<b>4-36</b>
<b>4.1</b>	<b>Present State</b>	<b>4-36</b>
4.1.1	Policy.....	4-36
4.1.2	Backlogs.....	4-37
4.1.3	Operations and Maintenance.....	4-39
4.1.4	Institutional .....	4-41
4.1.5	Innovation.....	4-41
<b>4.2</b>	<b>Problems, Challenges &amp; Drivers for Change</b>	<b>4-41</b>
4.2.1	Backlogs: Difficulty in Gaining Ground.....	4-41
4.2.2	Sustainability of Sanitation Services .....	4-41
4.2.3	Planning for the Provision of Services .....	4-42
4.2.4	Governance and Institutional Structures .....	4-42
<b>4.3</b>	<b>Desired Future State</b>	<b>4-42</b>
<b>4.4</b>	<b>Action Plan</b>	<b>4-43</b>
4.4.1	Provincial priorities .....	4-43
4.4.2	Municipal Sanitation Master Plans.....	4-44
4.4.3	Sanitation and Waste Water Treatment Infrastructure Projects to meet Goals.....	4-44
4.4.4	Improving Sustainability.....	4-45
4.4.5	Review of Governance and Institutional Models .....	4-46
4.4.6	Review of Regulations, Tariffs and Funding Structures.....	4-46
4.4.7	Promotion of RDI Projects .....	4-46
4.4.8	Resource Recovery, Effluent re-use, Improving Energy Efficiency at Waste Water Treatment Works and Reducing Water Use in Sanitation. 4-46	
<b>5.</b>	<b>OPERATION AND MAINTENANCE OF INFRASTRUCTURE .....</b>	<b>5-47</b>
<b>5.1</b>	<b>Introduction</b>	<b>5-47</b>
<b>5.2</b>	<b>Present State</b>	<b>5-47</b>
5.2.1	Water Resources Infrastructure.....	5-48
5.2.2	Potable Water Supply Infrastructure .....	5-48
5.2.3	Sanitation, Waste Water and Drinking Water Treatment.....	5-49
5.2.4	Asset Management.....	5-50
<b>5.3</b>	<b>Problems, Challenges &amp; Drivers for Change</b>	<b>5-50</b>
5.3.1	Overview .....	5-50
5.3.2	Human Resources and Capacity Building.....	5-50
5.3.3	Financial.....	5-51
5.3.4	Technology and Equipment.....	5-51
<b>5.4</b>	<b>Desired Future State</b>	<b>5-51</b>
5.4.1	Overview .....	5-51



	<b>5.4.2</b>	<b>Desired Future Water Operations and Maintenance Performance Standards</b> .....	<b>5-52</b>
<b>5.5</b>	<b>Action Plan</b>		<b>5-55</b>
<b>6.</b>	<b>WATER DEMAND MANAGEMENT</b> .....		<b>6-57</b>
<b>6.1</b>	<b>Present State</b>		<b>6-57</b>
	<b>6.1.1</b>	Overview .....	6-57
	<b>6.1.2</b>	Agriculture Sector .....	6-57
	<b>6.1.3</b>	Water Services Institutions and Local Government Sector .....	6-58
	<b>6.1.4</b>	Industries, Mining and Power Generation Sectors. ....	6-61
<b>6.2</b>	<b>Problems, Challenges &amp; Drivers for Change</b>		<b>6-63</b>
<b>6.3</b>	<b>Desired Future State</b>		<b>6-63</b>
<b>6.4</b>	<b>Action Plan</b>		<b>6-64</b>
	<b>6.4.1</b>	Agricultural Sector .....	6-64
<b>7.</b>	<b>WATER QUALITY MANAGEMENT</b> .....		<b>7-68</b>
<b>7.1</b>	<b>Background</b>		<b>7-68</b>
	<b>7.1.1</b>	What is meant by “Water Quality” .....	7-68
<b>7.2</b>	<b>Present State</b>		<b>7-68</b>
	<b>7.2.1</b>	National and Catchment Perspective.....	7-68
	<b>7.2.2</b>	Problems, Challenges & Drivers for Change.....	7-70
<b>7.3</b>	<b>Desired Future State</b>		<b>7-71</b>
	<b>7.3.1</b>	High-level Water Quality Management Master Plan Targets.....	7-71
<b>7.4</b>	<b>Action Plan</b>		<b>7-76</b>
	<b>7.4.1</b>	From high-level drivers to a uniform National Strategic Response.....	7-76
	<b>7.4.2</b>	Plan of Action to maintain or improve Water Quality .....	7-77
	<b>7.4.3</b>	Enabling requirements for Implementation.....	7-78
	<b>7.4.4</b>	Implementation Monitoring and Evaluation .....	7-79
<b>8.</b>	<b>WATER ECOLOGICAL SYSTEMS</b> .....		<b>8-84</b>
<b>8.1</b>	<b>Present State</b>		<b>8-84</b>
	<b>8.1.1</b>	River Ecosystems.....	8-84
	<b>8.1.2</b>	Wetland Ecosystems .....	8-85
	<b>8.1.3</b>	Estuarine Ecosystems .....	8-86
	<b>8.1.4</b>	Groundwater.....	8-86
<b>8.2</b>	<b>Problems, Challenges &amp; Drivers for Change</b>		<b>8-86</b>
	<b>8.2.1</b>	River Ecosystems.....	8-86
	<b>8.2.2</b>	Wetland Ecosystems .....	8-87
	<b>8.2.3</b>	Estuarine Ecosystems .....	8-87
	<b>8.2.4</b>	Groundwater.....	8-88

<b>8.3</b>	<b>Desired Future State</b>	<b>8-88</b>
8.3.1	Rivers and Wetlands .....	8-88
8.3.2	Freshwater Ecosystem Priority Areas (FEPAs) are a valuable national asset.....	8-89
8.3.3	Health tributaries and wetlands support the sustainability of hard-working rivers .....	8-89
8.3.4	Estuaries .....	8-89
8.3.5	Groundwater.....	8-89
<b>8.4</b>	<b>Action Plan</b>	<b>8-90</b>
8.4.1	Actions for Rivers and Wetlands.....	8-90
8.4.2	Actions for Estuaries.....	8-91
8.4.3	Actions for Groundwater .....	8-91
<b>9.</b>	<b>POLICIES, LEGISLATION AND STRATEGIES .....</b>	<b>9-94</b>
<b>9.1</b>	<b>Present State</b>	<b>9-94</b>
<b>9.2</b>	<b>Problems, Challenges &amp; Drivers for Change</b>	<b>9-95</b>
<b>9.3</b>	<b>Desired Future State</b>	<b>9-95</b>
<b>9.4</b>	<b>Action Plan</b>	<b>9-96</b>
<b>10.</b>	<b>REGULATION AND AUTHORISATION .....</b>	<b>10-96</b>
<b>10.1</b>	<b>Present State</b>	<b>10-97</b>
<b>10.2</b>	<b>Water Resource Use Regulation</b>	<b>10-97</b>
10.2.1	Regulatory Complexity.....	10-97
10.2.2	Regulatory Capacity .....	10-98
10.2.3	Separation of Regulation and Oversight .....	10-101
10.2.4	National/provincial/local regulation .....	10-101
10.2.5	Regulatory Independence.....	10-101
10.2.6	Fragmented Regulation .....	10-101
10.2.7	Regulation of natural Monopoly institutions.....	10-102
10.2.8	Economic Regulation.....	10-102
10.2.9	Sector Information .....	10-102
10.2.10	Legislative Overlaps/Inconsistencies .....	10-102
<b>10.3</b>	<b>Problems, Challenges &amp; Drivers for Change</b>	<b>10-102</b>
10.3.1	Blanket Implementation of Regulation .....	10-102
10.3.2	Differentiated Approach.....	10-103
10.3.3	Alignment to Regulatory Enablers .....	10-106
10.3.4	Regulatory Governance.....	10-108
10.3.5	Policy and Legislation.....	10-108
10.3.6	Regulatory Capacity .....	10-109
10.3.7	Institutional Capacity .....	10-109
10.3.8	Regulatory Structure/Domains.....	10-109

	10.3.9 Compliance Monitoring and Enforcement .....	10-110
	10.3.10 Positive Developments- .....	10-110
<b>11.</b>	<b>GOVERNANCE AND INSTITUTIONAL ARRANGEMENTS.....</b>	<b>11-111</b>
11.1	<b>Present State</b>	<b>11-111</b>
	11.1.1 Governing Legislation .....	11-111
	11.1.2 Institutional Reform and Realignment .....	11-111
11.2	<b>Problems, Challenges and Drivers for Change</b>	<b>11-112</b>
	11.2.1 Specific Challenges .....	11-112
	11.2.2 Key Drivers for Change .....	11-114
11.3	<b>Desired Future State</b>	<b>11-115</b>
	11.3.1 The Overarching Vision .....	11-115
11.4	<b>Action Plan</b>	<b>11-116</b>
	11.4.1 Catchment Management Agencies .....	11-116
	11.4.2 Regional Water Utilities .....	11-116
	11.4.3 National Water Resources Infrastructure .....	11-116
	11.4.4 Local Water Resource Management Institutions.....	11-116
<b>12.</b>	<b>HUMAN RESOURCES, SKILLS DEVELOPMENT AND CAPACITY .....</b>	<b>12-116</b>
12.1	<b>Present State</b>	<b>12-117</b>
	12.1.1 Approach to Skills Development and Capacity Building .....	12-117
	12.1.2 The Skills Development Mandate in the Water Sector .....	12-118
	12.1.3 Skills Development .....	12-118
	12.1.4 Institutional Capacity .....	12-120
	12.1.5 Environmental Capacity.....	12-120
12.2	<b>Problems, Challenges &amp; Drivers for Change</b>	<b>12-120</b>
	12.2.1 Human Skills .....	12-120
	12.2.2 Institutional Capacity .....	12-121
	12.2.3 Environmental Capacity.....	12-122
12.3	<b>Desired Future State</b>	<b>12-122</b>
12.4	<b>Action Plan</b>	<b>12-123</b>
	12.4.1 Proposed Key Programmes (10 Point Plan) .....	12-123
<b>13.</b>	<b>INTERNATIONAL WATER COOPERATION .....</b>	<b>13-127</b>
13.1	<b>Present State</b>	<b>13-127</b>
13.2	<b>Problems, Challenges &amp; Drivers for Change</b>	<b>13-129</b>
13.3	<b>Desired Future State</b>	<b>13-129</b>
13.4	<b>Action Plan</b>	<b>13-130</b>
	13.4.1 Reliability of supply:.....	13-130
	13.4.2 Influencing the global water agenda .....	13-130
	13.4.3 Knowledge sharing and capacity building in Africa: .....	13-131

	13.4.4	Development of the water research and innovation sector.....	13-131
	13.4.5	Improved donor funding.....	13-131
<b>14.</b>		<b>RESEARCH, DEVELOPMENT AND INNOVATION .....</b>	<b>14-132</b>
	<b>14.1</b>	<b>Present State</b>	<b>14-134</b>
	<b>14.2</b>	<b>Problems, Challenges &amp; Drivers for Change</b>	<b>14-135</b>
	<b>14.3</b>	<b>Desired Future State</b>	<b>14-140</b>
	<b>14.4</b>	<b>Action Plan</b>	<b>14-140</b>
<b>15.</b>		<b>FINANCE AND FUNDING .....</b>	<b>15-141</b>
<b>16.</b>		<b>IMPLEMENTATION PROTOCOL.....</b>	<b>16-141</b>
	<b>16.1</b>	<b>Background</b>	<b>16-141</b>
	<b>16.2</b>	<b>Legislative Framework</b>	<b>16-142</b>
	<b>16.3</b>	<b>Implementation of the MOU</b>	<b>16-142</b>
	<b>16.4</b>	<b>Roles and Responsibilities</b>	<b>16-143</b>
	<b>16.5</b>	<b>Disputes</b>	<b>16-146</b>
<b>17.</b>		<b>INFORMATION MANAGEMENT AND DATA PORTAL .....</b>	<b>17-146</b>
	<b>17.1</b>	<b>Present State</b>	<b>17-146</b>
	<b>17.2</b>	<b>Drivers for MP Web Portal</b>	<b>17-146</b>
	<b>17.3</b>	<b>Content and Functionality</b>	<b>17-146</b>
	<b>17.4</b>	<b>Action Plan</b>	<b>17-148</b>
<b>18.</b>		<b>STAKEHOLDER PARTICIPATION AND COMMUNICATION.....</b>	<b>18-148</b>
	<b>18.1</b>	<b>Present State</b>	<b>18-148</b>
	<b>18.2</b>	<b>Problems, Challenges &amp; Drivers for Change</b>	<b>18-149</b>
	<b>18.3</b>	<b>Desired Future State</b>	<b>18-150</b>
	<b>18.4</b>	<b>Action Plan</b>	<b>18-151</b>
<b>19.</b>		<b>MANAGEMENT, MONITORING AND EVALUATION .....</b>	<b>19-152</b>
	<b>19.1</b>	<b>Introduction</b>	<b>19-152</b>
	<b>19.2</b>	<b>Present State of Planning</b>	<b>19-153</b>
		19.2.1 Present Planning Requirements .....	19-155
		19.2.2 Present Planning Processes.....	19-156
	<b>19.3</b>	<b>Present State of Monitoring and Evaluation</b>	<b>19-156</b>
		19.3.1 Current Monitoring Requirements.....	19-156
		19.3.2 Current Monitoring Processes .....	19-158
		19.3.3 Current Evaluation Requirements.....	19-161
		19.3.4 Current Evaluation Processes .....	19-161
	<b>19.4</b>	<b>Desired State of Monitoring and Evaluation for the NW&amp;SMP</b>	<b>19-161</b>
		19.4.1 Proposed Planning Processes.....	19-161
		19.4.2 Proposed Monitoring and Evaluation Processes.....	19-163

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**ANNEXURE 1: Definitions..... 19-165**  
**ANNEXURE 2: References ..... 19-170**  
**ANNEXURE 3: Written submissions received ..... 19-174**

## List of Annexures

Annexure A:

Annexure B:

Annexure C:

Annexure D:

## List of Figures

FIGURE 1.1: ALIGNMENT OF THE NW&SMP WITH LEGISLATIVE INSTRUMENTS .....	1-4
FIGURE 1.2: NW&SMP TIMELINES .....	1-5
FIGURE 1.3: ALIGNMENT OF NATIONAL PLANNING PROCESS WITH SECTORAL & DEPARTMENTAL PLANNING PROCESS .....	1-6
FIGURE 1.4: NW&SMP PHILOSOPHY .....	1-7
FIGURE 1.5: PROCESS FLOW .....	1-8
FIGURE 2.1: LIMITED WATER RESOURCE POTENTIAL .....	2-10
FIGURE 2.2: PROJECTED DEFICIT BETWEEN WATER REQUIREMENTS AND WATER SUPPLY .....	2-10
FIGURE 2.3: THE PROJECTED WATER MIX .....	2-11
FIGURE 2.4: WATER USE BY SECTOR .....	2-12
FIGURE 2.5: BASIC URBAN WATER SUPPLY CHALLENGES.....	2-14
FIGURE 2.6: WATER NEEDS ASSESSMENT.....	2-14
FIGURE 2.7: INTER-BASIN WATER TRANSFERS IN SOUTH AFRICA.....	2-16
FIGURE 3.1: WATER USE BY ECONOMIC SECTOR IN SOUTH AFRICA .....	3-27
FIGURE 3.2: WATER BALANCE AT MUNICIPAL LEVEL AND THE CURRENT WATER LOSSES AFFECTING IT.....	3-27
FIGURE 3.3: NATIONAL WATER SUPPLY BENCHMARKS.....	3-28
FIGURE 3.4: RELIABILITY OF WATER SUPPLY SERVICES PER PROVINCE .....	3-29
FIGURE 3.5: THE DELIVERY CHALLENGE.....	3-29
FIGURE 3.6: CAPITAL REQUIREMENTS FOR NEW AND UPGRADING OF INFRASTRUCTURE VS REHABILITATION .....	3-30
FIGURE 3.7: RISK AND VULNERABILITY PER WSA .....	3-32
FIGURE 3.8: PILLARS OF SUSTAINABLE WATER SERVICES .....	3-34
FIGURE 4.1: SEVEN SANITATION POLICY PILLARS.....	4-37
FIGURE 4.2: SANITATION BACKLOGS PER WSA, APRIL 2017 .....	4-38
FIGURE 4.3: SANITATION PLANNING NEEDS.....	4-39
FIGURE 5.1: ELEMENTS OF ACCEPTABLE SERVICE .....	5-47
FIGURE 5.2: CRR/CRRMAX TREND ANALYSIS .....	5-49
FIGURE 5.3: SUMMARY OF WATER SERVICES QUERIES TO THE DWS CUSTOMER SERVICE (JUNE 2016 – JUNE 2017).....	5-50
FIGURE 6.1: HISTORICAL TREND OF WATER USE EFFICIENCY WITHIN THE EIGHT LARGE WATER SUPPLY SYSTEMS.....	6-59
FIGURE 6.2: Eskom’s PERFORMANCE (WATER INTENSITIES FOR THE PAST THREE YEARS).....	6-63
FIGURE 7.1: DIFFERENT TYPES OF WATER QUALITY PROBLEMS ACROSS SOUTH AFRICA (ASHTON, 2012) .....	7-69
FIGURE 7.2: HIGH-LEVEL WATER QUALITY MANAGEMENT MASTER PLAN TARGETS .....	7-72
FIGURE 7.3: INTERNATIONAL, NATIONAL AND CATCHMENT WATER QUALITY PLANNING (ADAPTED FROM DWS, 2015).....	7-75
FIGURE 7.4: FROM HIGH-LEVEL WATER QUALITY MANAGEMENT DRIVERS TO POLICY FRAMEWORK TO STRATEGIC RESPONSE.....	7-77
FIGURE 11.1: OVERARCHING VISION .....	11-115
FIGURE 12.1: MULTI-DIMENSIONAL APPROACH TO CAPACITY BUILDING .....	12-117
FIGURE 12.2: PIPELINE APPROACH.....	12-118
FIGURE 12.3: NUMBER OF REGISTERED ENGINEERS PER MUNICIPAL CATEGORY .....	12-119
FIGURE 13.1: INTERNATIONAL CONTEXT OF WATER .....	13-127
FIGURE 13.2: AQUIFER LOCATIONS .....	13-128
FIGURE 14.1: OVERLAP OF KEY ASPECTS .....	14-133
FIGURE 14.2: DISTILLATION OF THREE DOCUMENTS.....	14-134
FIGURE 17.1: MASTER PLAN WEB PORTAL OVERVIEW .....	17-147
FIGURE 18.1: KEY CHANNELS.....	18-150
FIGURE 19.1: LONG-TERM RELATIONSHIP AND TIMING OF GOVERNMENT ACCOUNTABILITY DOCUMENTS .....	19-154
FIGURE 19.2: ACCOUNTABILITY DOCUMENTS WITHIN THE REPORTING FRAMEWORK .....	19-157

## List of Tables

TABLE 2-1: PROJECTIONS OF WATER USE REQUIREMENTS.....	2-12
TABLE 2-2: SURFACE WATER: KEY CHALLENGES, DRIVERS & INTERVENTIONS.....	2-16
TABLE 2-3: CLIMATE CHANGE: KEY CHALLENGES, KEY DRIVERS & INTERVENTIONS.....	2-19
TABLE 2-4: GROUNDWATER: KEY CHALLENGES, KEY DRIVERS & INTERVENTIONS.....	2-19
TABLE 2-5: ALTERNATIVE SOURCES: KEY CHALLENGES, DRIVERS & INTERVENTIONS.....	2-22
TABLE 2-6: KEY CHALLENGES, DRIVERS & INTERVENTIONS.....	2-24
TABLE 2-7: FLOOD PROTECTION: KEY CHALLENGES, DRIVERS & INTERVENTIONS.....	2-25
TABLE 2-8: PILLARS OF WATER RESOURCE RESILIENCE FOR SOUTH AFRICA.....	2-25
TABLE 4-1: PROVINCIAL SANITATION BACKLOGS.....	4-37
TABLE 4-2: GREEN DROP SCORES PER PROVINCE.....	4-39
TABLE 4-3: PROVINCIAL PRIORITIES.....	4-43
TABLE 4-4: IMPLEMENTATION TARGETS.....	4-45
TABLE 4-5: FOCUS AREAS.....	4-47
TABLE 5-1: WATER OPERATIONS AND MAINTENANCE PERFORMANCE STANDARDS.....	5-52
TABLE 6-1: HIGH LEVEL KEY WC/WDM ISSUES AND MEASURES TO BE IMPLEMENTED IN THE AGRICULTURE SECTOR.....	6-64
TABLE 6-2: HIGH LEVEL KEY WC/WDM ISSUES AND MEASURES TO BE IMPLEMENTED IN THE WATER SERVICES SECTOR.....	6-65
TABLE 6-3 HIGH LEVEL KEY WC/WDM ISSUES AND MEASURES TO BE IMPLEMENTED IN THE INDUSTRIES, MINING AND POWER GENERATION SECTOR.....	6-67
TABLE 7-1: HIGH-LEVEL WATER QUALITY MANAGEMENT MASTER PLAN TARGET 1.....	7-73
TABLE 7-2: HIGH-LEVEL WATER QUALITY MANAGEMENT MASTER PLAN TARGET 2.....	7-74
TABLE 7-3: HIGH-LEVEL WATER QUALITY MANAGEMENT MASTER PLAN TARGET 3.....	7-75
TABLE 7-4: HIGH-LEVEL WATER QUALITY MASTER PLAN TARGETS AND THE REQUIRED STRATEGIC ACTIONS.....	7-78
TABLE 7-5: HIGH-LEVEL WATER QUALITY MANAGEMENT MASTER PLAN TARGETS AND THE REQUIRED ENABLING ACTIONS.....	7-79
TABLE 7-6: IMPLEMENTATION SCHEDULE.....	7-80
TABLE 7-7: THE HIGH-LEVEL MASTER PLAN TARGETS, ENABLING ACTIONS AND HIGH-LEVEL MASTER PLAN INDICATORS, AND THEIR RELATIONSHIPS TO THE SUSTAINABLE DEVELOPMENT TARGETS AND INDICATORS.....	7-81
TABLE 8-1: ECO-PROTECTION PLAN.....	8-92
TABLE 10-1: REGULATORY STAKEHOLDERS/ROLE PLAYERS.....	10-99
TABLE 10-2: RESULTS OF THE PRIMARY WATER SECTOR REGULATORY AUTHORITIES.....	10-104
TABLE 10-3: REGULATORY ENABLERS.....	10-106
TABLE 11-1:.....	11-114
TABLE 12-1: CIVIL ENGINEERING METRICS – 2005 COMPARED WITH 2015.....	12-119
TABLE 14-1:.....	14-135
TABLE 14-2: INVESTMENT THEMES FOR THE WATER MASTER PLAN.....	14-137

## List of acronyms and abbreviations

### To be updated

<i>ACIP</i>	Accelerated Community Infrastructure Program
<i>AIP</i>	Alien Invasive Plants
<i>AMCOW</i>	African Ministers' Council on Water
<i>AMD</i>	Acid Mine Drainage
<i>ARC</i>	Agricultural Research Council
<i>b/a</i>	billion per annum
<i>BBBEE</i>	Broad-Based Black Economic Empowerment
<i>bn</i>	Billion= 1000 000 000
<i>BRICS</i>	Brazil, Russia, India, China and South Africa
<i>CARA</i>	Central Adoption Resource Authority
<i>CHE</i>	Council on Higher Education
<i>CMA</i>	Catchment Management Agency
<i>CME</i>	Compliance, Monitoring and Enforcement
<i>CMF</i>	Catchment Management Forum
<i>CMS</i>	Catchment Management Strategy
<i>COP 17</i>	17th Conference of the Parties
<i>CRDP</i>	Comprehensive Rural Development Program
<i>CRU</i>	Central RIA Unit
<i>CSI</i>	Corporate Social Investment
<i>CSIR</i>	Council for Scientific and Industrial Research
<i>CSO</i>	Civil Society Organization
<i>DAFF</i>	Department of Agriculture, Forestry and Fisheries
<i>DBE</i>	Departments of Basic Education
<i>DBSA</i>	Development Bank of Southern Africa
<i>DDT</i>	Dichlorodiphenyltrichloroethane
<i>DEA</i>	Department of Environmental Affairs
<i>DCoG</i>	Department of Cooperative Governance
<i>DHET</i>	Department of Higher Education and Training
<i>DM</i>	District Municipality
<i>DMR</i>	Department of Mineral Resources
<i>DOE</i>	Department of Energy
<i>DHS</i>	Department of Human Settlements
<i>DPE</i>	Department of Public Enterprises
<i>DPISA</i>	Department of Public Service & Administration
<i>DRD&amp;LR</i>	Department of Rural Development & Land Reform
<i>DST</i>	Department of Science and Technology
<i>DTI</i>	Department of Trade and Industry
<i>DWA</i>	Department of Water Affairs
<i>DWAF</i>	Department of Water Affairs & Forestry
<i>DWM</i>	Developmental Water Management
<i>e.g.</i>	for example
<i>EU</i>	European Union
<i>ELU</i>	Existing Lawful Use
<i>etc.</i>	etcetera; and so on
<i>EWSETA</i>	Energy and Water Sector Education and Training Authority
<i>EXCO</i>	Executive Committee
<i>FAO</i>	Food and Agriculture Organisation
<i>FET</i>	Further Education and Training



<i>FETWater</i>	Framework Programme for Research, Education and Training in Water, South Africa (UNESCO initiative)
<i>G8</i>	The Group of Eight (world's eight wealthiest western countries)
<i>GA</i>	General Authorisations
<i>GCM</i>	Global Circulation Models
<i>GCIS</i>	Government Communication Information System
<i>GDP</i>	Gross Domestic Product
<i>GET</i>	General Education and Training
<i>GFETQSF</i>	General and Further Education and Training Qualifications Sub-Framework
<i>GG</i>	Government Gazette
<i>GGP</i>	Gross Geographic Product
<i>GIS</i>	Geographical Information System
<i>GLeWAP</i>	Groot Letaba River Water Development Project
<i>GN</i>	Government Notice
<i>GRIP</i>	Groundwater Resource Information Project
<i>HDI</i>	Historically disadvantaged individuals
<i>ha</i>	Hectares
<i>HE</i>	Higher Education
<i>HEI</i>	Higher Education Institutes
<i>HEQSF</i>	Higher Education Qualifications Sub-framework
<i>HRDS</i>	Human Resources Development Strategy
<i>HYDSTRA</i>	Integrated water resources management software
<i>IB</i>	Irrigation board
<i>IBSA</i>	The India-Brazil-South Africa Dialogue Forum
<i>IDP</i>	Integrated Development Plan
<i>IDZ</i>	Industrial Development Zone
<i>i.e.</i>	that is
<i>IHP</i>	International Hydrological Programme
<i>IPAP3</i>	Industrial Policy Action Plan 3
<i>IPP</i>	Independent Power Producers
<i>IRP</i>	Integrated Resource Plan
<i>IRR</i>	Institutional Reform and Realignment
<i>IT</i>	Information technology
<i>i.t.o.</i>	in terms of
<i>IUA</i>	Integrated Units of Analysis
<i>IWA</i>	International Water Association
<i>IWRM</i>	Integrated Water Resource Management
<i>IWWMP</i>	Integrated Water and Waste Management Plan
<i>IWT TSA</i>	Industry Water Task Team of South Africa
<i>JPTC</i>	Joint Permanent Technical Committee
<i>JSE</i>	Johannesburg Stock Exchange
<i>JWC</i>	Joint Water Commission
<i>KNP</i>	Kruger National Park
<i>KPI</i>	Key performance indicator
<i>LEDP</i>	Local Economic Development Plan
<i>LGSETA</i>	Local Government Sector Education & Training Authority
<i>LHDA</i>	Lesotho Highlands Development Authority
<i>LHWP</i>	Lesotho Highlands Water Project
<i>LRAD</i>	Land Reform for Agricultural Development
<i>LTAS</i>	Long Term Adaptation Scenarios
<i>LWC</i>	Limpopo Watercourse Commission
<i>m<sup>3</sup>/a</i>	cubic meter per annum
<i>mm/year</i>	millimetres per year

<i>mg/l</i>	milligrams per litre
<i>Ml/day</i>	megalitres per day= 1 000 000 litres/day
<i>MAR</i>	mean annual runoff
<i>MDG</i>	Millennium Development Goals
<i>MFMA</i>	Municipal Finance Management Act
<i>MIG</i>	Municipal Infrastructure Grant
<i>MISA</i>	Municipal Infrastructure Support Agency
<i>MMTS2</i>	Mooi-Mgeni Transfer Scheme Phase 2
<i>MoU</i>	Memorandum of Understanding
<i>MTEF</i>	Medium Term Expenditure Framework
<i>MWIG</i>	Municipal Water Infrastructure Grant
<i>MW</i>	MegaWatts
<i>NATED</i>	National Technical Education
<i>NCBF</i>	National Capacity Building Framework for Local Government
<i>NDP</i>	National Development Plan
<i>NEMA</i>	National Environmental Management Act
<i>NFEPA</i>	National Freshwater Ecosystem Priority Areas
<i>NGA</i>	National Groundwater Archive
<i>NGP</i>	New Growth Path
<i>NGO</i>	Non-government organisation
<i>NGS</i>	National Groundwater Strategy
<i>NMBMM</i>	Nelson Mandela Bay Metropolitan Municipality
<i>NPC</i>	National Planning Commission
<i>NPS</i>	Non-point source
<i>NPSS</i>	Non-Point Source Strategy
<i>NQF</i>	National Qualifications Framework
<i>NRF</i>	National Research Foundation
<i>NRW</i>	Non-Revenue Water
<i>NSA</i>	National Skills Accord
<i>NSDP</i>	National Spatial Development Perspective
<i>NSDS</i>	National Skills Development Strategy
<i>NSI</i>	National System of Innovation
<i>NT</i>	National Treasury
<i>NWA</i>	National Water Act (Act 36 of 1998)
<i>NWAC</i>	National Water Advisory Council
<i>NWRI</i>	National Water Resource Institute
<i>NWRS</i>	National Water Resource Strategy
<i>NWRS1</i>	National Water Resource Strategy (first edition, 2004)
<i>NWRS2</i>	National Water Resource Strategy (second edition 2013)
<i>ODA</i>	Official Development Assistance
<i>OECD</i>	Organisation for Economic Cooperation and Development
<i>ORASECOM</i>	Orange-Senqu (River Basin) Commission
<i>ORWRDP</i>	Olifants River Water Resource Development Project
<i>OQSF</i>	Occupational Qualifications Sub-Framework
<i>OSD</i>	Occupation Specific Dispensation
<i>PALAMA</i>	Public Administration Leadership and Management Academy
<i>PES</i>	Present Ecological State
<i>Ph</i>	Phase
<i>PFMA</i>	Public Finance Management Act
<i>PGDP</i>	Provincial Growth and Development Plan
<i>PGDS</i>	Provincial Growth and Development Strategy
<i>PMU</i>	Project Management Unit

<i>PPP</i>	Public Private Partnerships
<i>P/S</i>	pump station
<i>PWC</i>	Permanent Water Commission
<i>QCTO</i>	Quality Council for Trades and Occupations
<i>R&amp;D</i>	Research and Development
<i>R&amp;I</i>	Research and Innovation
<i>RBIG</i>	Regional Bulk Infrastructure Grant
<i>RBO</i>	River Basin Organizations
<i>RDM</i>	Resource Directed Measures
<i>RDP</i>	Reconstruction and Development Programme
<i>REGIS</i>	Software system developed in the Netherlands, currently under investigation for its application in South Africa
<i>RIA</i>	Regulatory Impact Assessment
<i>RIDMP</i>	Regional Infrastructure Development Master Plan
<i>RISDP</i>	Regional Indicative Strategic Development Plan
<i>Rio+20</i>	United Nations Conference on Sustainable Development, 2012
<i>RPL</i>	Recognition of Prior Learning
<i>RQO</i>	Resource Quality Objectives
<i>RSA</i>	Republic of South Africa
<i>RSAPIII</i>	Regional Strategic Action Plan III
<i>RWH</i>	Rainwater harvesting
<i>RWU</i>	Regional Water Utility
<i>RWQO</i>	Receiving Water Quality Objective
<i>SA</i>	South Africa
<i>SAAWU</i>	South African Association of Water Utilities
<i>SADC</i>	Southern African Development Community
<i>SAICE</i>	South African Institution of Civil Engineering
<i>SALGA</i>	South African Local Government Association
<i>SAWS</i>	South African Weather Service
<i>SDC</i>	Source Directed Controls
<i>SETA</i>	Sector Education & Training Authority
<i>SIP</i>	Strategic Integrated Project
<i>SIWI</i>	Stockholm International Water Institute
<i>SULP</i>	Sustainable Utilization Plans
<i>SWPN</i>	Strategic Water Partnership Network
<i>TAC</i>	Technical Advisory Committee
<i>TCTA</i>	Trans Caledon Tunnel Authority
<i>UDF</i>	Urban Development Framework
<i>UN</i>	United Nations
<i>UNCSD</i>	United Nations Conference on Sustainable Development
<i>UNEP</i>	United Nations Environment Programme
<i>GEMS</i>	Global Environment Monitoring System
<i>UNFCCC</i>	United Nations Framework Convention on Climate Change
<i>UNESCO</i>	United Nations Educational, Scientific and Cultural Organization
<i>VGG</i>	Vaal Gamagara
<i>WAR</i>	Water Allocation Reform
<i>WAS</i>	Water Accounting System
<i>WARMS</i>	Water Registration Management System
<i>WARS</i>	Water Allocation Reform Strategy
<i>WCWSS</i>	Western Cape Water Supply System
<i>WCWDM</i>	Water Conservation and Water Demand Management
<i>WDCS</i>	Waste Discharge Charge System
<i>WISA</i>	Water Institute of Southern Africa

<i>WMA</i>	Water Management Area
<i>WMP</i>	Water Management Plan
<i>WMS</i>	Water Management System
<i>WRA</i>	Water Research Act
<i>WRC</i>	Water Research Commission
<i>WRM</i>	Water Resource Management
<i>WRTC</i>	Water Resources Technical Committee
<i>WS</i>	Water Services
<i>WSA</i>	Water Services Authority
<i>WSAct</i>	Water Services Act (Act 108 of 1997)
<i>WSDP</i>	Water Services Development Plans
<i>WSLG</i>	Water Sector Leadership Group
<i>WSP</i>	Water Services Provider
<i>WMA</i>	Water Management Area
<i>WTW</i>	water treatment works
<i>WWC</i>	World Water Council
<i>WWTW</i>	waste water treatment works
<i>WUL</i>	Water Use License

### List of Units used in the Report

The following standard units have been used in this report

<i>Description</i>	<i>Standard unit</i>	<i>Description</i>	<i>Standard unit</i>
Elevation	m.a.s.l.	Velocity, speed	m/s, km/hr
Height	m	Discharge	m <sup>3</sup> /s
Distance	m, km	Mass	kg, ton
Dimension	mm, m	Force, weight	N, kN, MN
Area	m <sup>2</sup> , ha or km <sup>2</sup>	Moment, torque	Nm, kNm, MNm
Volume (storage)	m <sup>3</sup> , million m <sup>3</sup> , Ml/day	Ampere	A, kA
Yield	million m <sup>3</sup> /a	Volt	V, kV
Mean annual runoff	million m <sup>3</sup> /a	Electric power	kVA, kW, MW
Pressure	Pa, kPa, MPa	Acceleration	m/s <sup>2</sup>
Diameter	mm dia., m dia.	Density	kg/m <sup>3</sup>
Power	kW, MW	Slope (H:V) or (V:H)	1:5 (H:V) or 5:1 (V:H)
Energy	kJ, MJ	Gradient (V:H)	%
Temperature	°C	Frequency	Hz, kHz, MHz

## 1. DEFINING THE NATIONAL WATER AND SANITATION MASTER PLAN

### 1.1 Background and Purpose of the National Water and Sanitation Master Plan (NW&SMP)

South Africa is a water scarce country with ever-growing requirements for water to achieve its developmental and economic growth objectives. The water scarcity situation is further exacerbated by the ever-increasing impact of climate change. Studies indicate that climate change will result in extreme weather patterns resulting in floods and droughts. The country is currently suffering one of the most severe droughts in years which is currently gripping the City of Cape Town and has also recently experienced devastating floods in Kwa-Zulu Natal (KZN).

The NW&SMP forms part of a various initiatives led by the Department of Water and Sanitation (DWS) and other esdepartments to ensure that water and sanitation services are secure and sustainable, so that they contribute towards meeting the national development objectives. The purpose for the NW&SMP includes:

- Providing an overall perspective of the situation in the water and sanitation sector and a consolidated plan of actions to improve the current situation in order to meet the desired future state of the sector, defined by Government's vision, goals and targets until 2030 (NDP and SDG's).
- Setting out the framework for managing water resources and provision of water and sanitation services in the short, medium and long-term.
- Developing a schedule of interventions, actions and investments, required to enable the achievement of these targets, and specifying the roles and responsibilities, the specific actions, the intermediate and final targets and deadlines and how performance will be monitored and measured.

This first-of-its-kind NW&SMP introduces a new paradigm that will guide the South African water sector, led by the Department of Water and Sanitation and supported by local government and other sector partners, toward the execution of tangible actions specified in the Plan. These actions form the focus of the Plan and will be consolidated and prioritised in a practical, achievable and measurable way to resolve the pressing water and sanitation challenges that the country is facing.

### 1.2 Key Challenges and NW&SMP Strategic Focus

Water resource management and water service delivery challenges have escalated over the past few years in the country and the water sector in South Africa cannot afford to ignore these challenges and continue with a business as usual approach. There is a need to act decisively in addressing the deterioration of standards and restore the integrity and effectiveness of

***Ready for the future and ahead of the curve.***

**Water security is a critical challenge confronting South African and the world in the 21st century. Water security presents a profound challenge to South Africa's social wellbeing and economic growth. South Africa's water scarcity could get rapidly worse as supply contracts and demand escalates due to growth, urbanization, unsustainable use, degradation of wetlands, water losses and a decrease in rainfall due to climate change. Based on current demand projections, the water deficit confronting the country could be between 2.7 and 3.8 billion cubic meters, a gap of approximately 17%, by 2030. The South African water sector must take bold steps to adopt a 'new normal' to head off the projected water gap.**

governance, delivery, management and monitoring systems so as to ensure greater sustainability of water resources whilst pursuing the country's developmental goals of the country. The NW&SMP seeks to restore strategic focus and mobilise support and resources to address the key critical challenges in a practical and measurable way. Some of the challenges and the key focus areas are outlined below:

***South Africa must ensure equitable access to water***

- The need to ensure that national water resources benefit all citizens equitably is urgent as water remains the single most important catalyst and driver of socio-economic growth and development. The water allocation to agriculture stand at about 62% but not much traction has been achieved in advancing reasonable allocation to previously disadvantaged individuals. The NW&SMP aligns with government's transformative agenda as outlined in the NDP, as it seeks to address past inequities in a constructive and practical way, identifying areas where redress and equitable balance can be achieved in the allocation and usage of the water resource.
- Water security is one of the biggest issues/challenges facing South Africa and the world in this 21st century. It presents a profound challenge to the Country's social wellbeing and our economic growth. Based on projections, by 2030, the water deficit could be between 27 000 and 38 000 million m<sup>3</sup>/a, a gap of about 17% of available surface and ground water if no substantive action is taken: This will require a "Business Unusual" approach to close the gap.
- South Africa's water availability is at risk and could deteriorate rapidly as supply contracts and demand escalates due to growth, urbanization, inefficient use, degradation of wetlands, water losses and negative impacts on yield due to climate change. Serious interventions should be made to reduce demand by improving efficiency, adopting new technologies and reducing losses (especially in the Agricultural and Municipal sectors).

***South Africa must balance supply and demand***

***South Africa must diversify its water mix***

- South Africa has coastal areas where sea water is unlimited, and desalinated sea water and waste water need to be brought into the water mix.
- The requirements of Neighbouring States and the Country's international obligations on an equitable share from our shared resources could further impact on water availability for RSA.
- It is reported that despite South Africa being a water scarce county, more water is consumed per capita at approximately 237 l/c/d compared with the world average consumption of approximately 173 l/c/d (July 2017). The country's water losses are also exceptionally high with NRW currently standing at about 41%. Actual physical losses are at 35% (July 2017). Serious interventions should be made to reduce demand by improving efficiency, adopting new technologies and reducing losses (especially in the Agric and urban sectors).

***South Africa must ensure effective water and sanitation services***

***South Africa must create a financially sustainable water sector***



- There is a need to optimise institutional arrangements to improve governance and ensure that key sector objectives are achieved. These institutions include, Regional Utilities, CMAs, National Infrastructure Agency. The capacity of WSA to operate, maintain and manage assets for existing infrastructure needs urgent attention. Stats SA General Household Survey (GHS):

**South Africa must build effective water sector institutions**

- 89% households have access to operational services but reliability is only at 63%
- Current access to sanitation services is 80% on average (50% in some LM's). The Country needs to aim at an increase to 90% by 2019 and 100% by 2030 as per the SDG's targets and the NDP.

**South Africa must restore raw water quality**

- It is reported that 56% of the over 1 150 WWTW are in poor and critical state, and need to be rehabilitated urgently and properly maintained afterwards.

- 44% of 962 domestic WTWs are in a poor condition and need urgent rehabilitation. This excludes private works and industrial treatment

- Deteriorating Water Quality is a major constraint to economic and social development and reduces the sustainably available resource (Impact significantly on cost). Urgent measures are required to protect the river systems as they transfer the life blood of the Nation around the country.

**South Africa must protect and restore ecological infrastructure**

**South Africa must manage data and information better**

- A lack of data and information resulting from a weak monitoring system poses high risks to decision making and planning and urgently needs to be addressed through the formalisation of an effective national hydrological monitoring centre.

- The water availability will continue to be a challenge into the future and application of the latest Research, Innovation and Development in water-less/alternative water and sanitation systems should be implemented urgently. The latest developments in 'water-less' water and sanitation solutions should be implemented urgently.

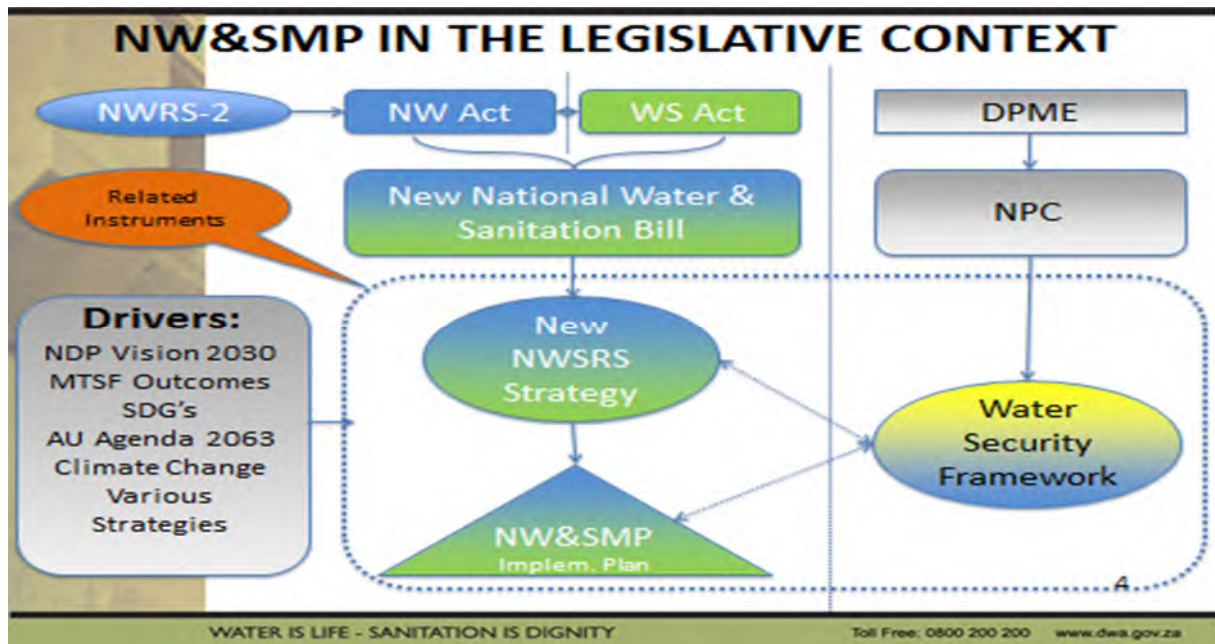
### 1.2.1 Legislative Context

The NW&SMP has been developed within the context of the current legislative review process which will combine the National Water Act 36 of 1998 and the Water Services Act 208 of 1997 into a single Act, in order to streamline the management and delivery of water services across the water value chain.

The new legislation will also require the development of a National Water and Sanitation Resources and Services Strategy (NWSRSS), which will integrate the water resources with the water and sanitation services strategies; and which is being developed concurrently with the new legislation and the NW&SMP. The NWSRSS (to be completed by August 2018) will therefore incorporate an update of the existing National Water Resources Strategy (NWRS), but will add to it the strategies for the water and sanitation services parts of the water value chain. This

NW&SMP is intended to serve as the implementation mechanism for the NWSRSS as it defines key actions to achieve the key outcomes outlined in the strategy and the Water Security Framework.

The diagram below illustrates the alignment of NW&SMP with legislative instruments.



*Figure 1.1: Alignment of the NW&SMP with Legislative Instruments*

### 1.2.2 Linkages between the NW&SMP with the SDGs, AU Agenda 2063, NDP and MTSF

The NW&SMP sets out the framework for how South Africa is going to manage its water resources and implement water and sanitation programmes to achieve its own targets set within the NDP, MTSF and MTEF and the global and the African agenda outlined within the SDGs and the AU Agenda 20163. The diagram below provides a good illustration on how do the NW&SMP fit into the timelines of the national and the global planning framework.



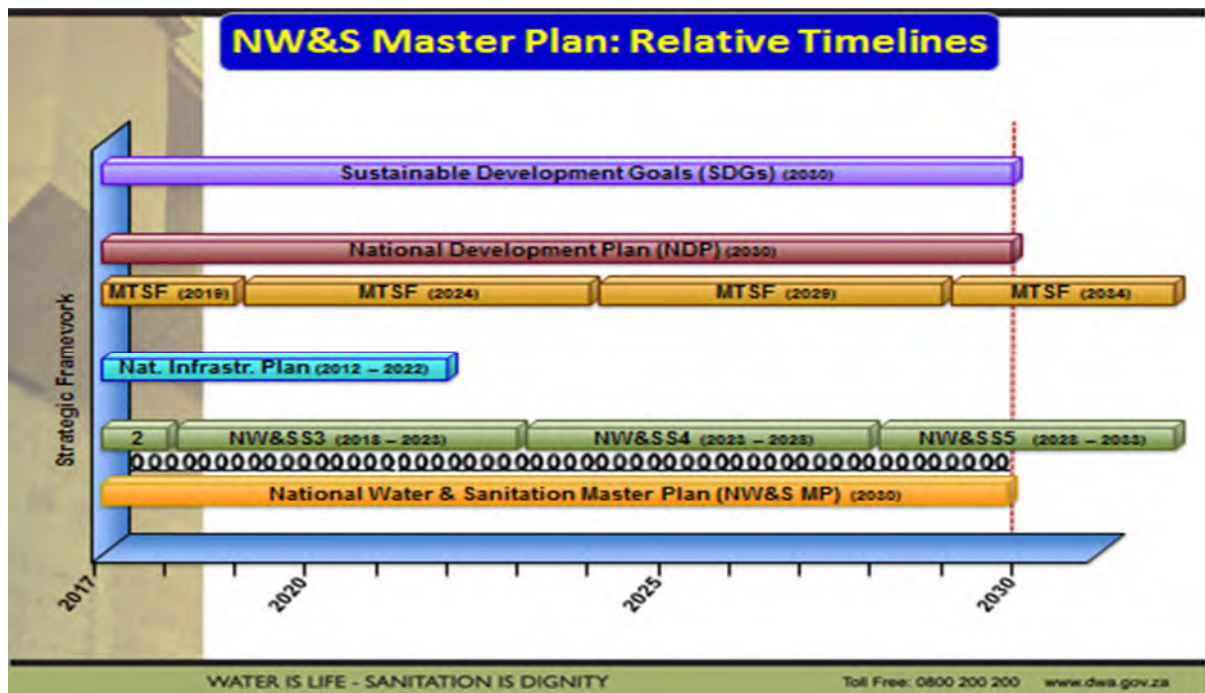


Figure 1.2: NW&SMP Timelines

### 1.2.3 Sustainable Development Goals

South Africa is an important player on the global stage and has participated in a variety of critical global initiatives and programmes, including the development of the Sustainable Development Goals (SDGs). The negotiation of a new set of global development goals, led by the United Nations during 2015 provided a unique opportunity to map a pathway to a better future for all. Goal 6, which stipulates, “to ensure the availability and sustainable management of water and sanitation for all,” is central to realising the vision of a better future for all and the NW&SMP has aligned all its interventions to achieve this goal.

### 1.2.4 African Union’s (AU) Agenda 2063

There are seven African aspirations of Agenda 2063, which reflect the desire for shared prosperity and well-being, for unity and integration, and for a continent of free citizens. The most relevant aspiration is number one which includes the following:

- Eradicating poverty and achieving high standards of living for all;
- Ensuring well-educated citizens and a skills revolution underpinned by science, technology and innovation;
- Modernised infrastructure and agriculture;
- Structurally transformed economies to create growth, decent jobs and economic opportunities for all; and
- Preservation of the environment and ecosystem.

### 1.2.5 National Development Plan

The National Development Plan (NDP) is South Africa’s supreme strategic document. The NDP articulates the vision of development for the country and also identifies key milestones and targets to be implemented by all sectors in pursuit of the vision of the NDP. The key programmes and targets articulated by the NDP include the following:

- Ensure people have access to clean, potable water and that there is sufficient water for agriculture and industry, recognizing trade-offs in the use of water;
- Reduce water demand in urban areas to 15% below business-as-usual scenario by 2030;
- Complete Lesotho Highlands Water Project Phase 2 by 2020;
- Comprehensive management strategy including an investment programme for water resource development, bulk supply and wastewater management for major centres by 2012, with review every five years;
- Develop regional market for food, energy and water and put in place water management agreement with neighbouring countries; and
- Develop regional utilities to deliver some local government services on an agency basis where local or district municipalities lack capacity.

### 1.2.6 Medium Term Strategic Framework

The MTSF confirms the commitment of government to the identified goals through resource allocation and budget prioritisation. The NDP guides the prioritisation process on the MTSF in the allocation of resources and NW&SMP serves to define how the priorities will be executed and reported by the sector. The outcomes below are related to the water sector and include the following:

- MTSF Outcome 6: An efficient, competitive and responsive economic infrastructure
- MTSF Outcome 7: Vibrant, equitable, sustainable rural communities contributing towards food security for all;
- MTSF Outcome 9: Responsive, accountable, effective and efficient developmental local government system;
- MTSF Outcome 10: Protect and enhance our environmental assets and natural resources; and
- MTSF Outcome 11: Related to international relations and co-operation.



**Figure 1.3: Alignment of National Planning Process with Sectoral & Departmental Planning Process**

## 1.3 NW&SMP Vision, Objectives, Key Drivers, Pillars

### 1.3.1 NW&SMP Vision

The vision of the NW&SMP is to achieve reliable and affordable access to adequate and safe water and sanitation to improve social and economic well-being with due regard to the

environment. The key objectives of the NW&SMP speak to the main challenges within the water sector, including:

- Water supply resilience and sanitation provision;
- Equitable sharing and allocation of resources;
- Infrastructure management & operation and maintenance; and
- Efficient water demand management and reduction in water losses.

The NW&SMP is premised on five pillars which reflect key programmes that have been identified to reach the key Objectives and operationalise the new water sector paradigm. The Master Plan also highlights the enablers that require essential consideration in support of reaching these objectives.

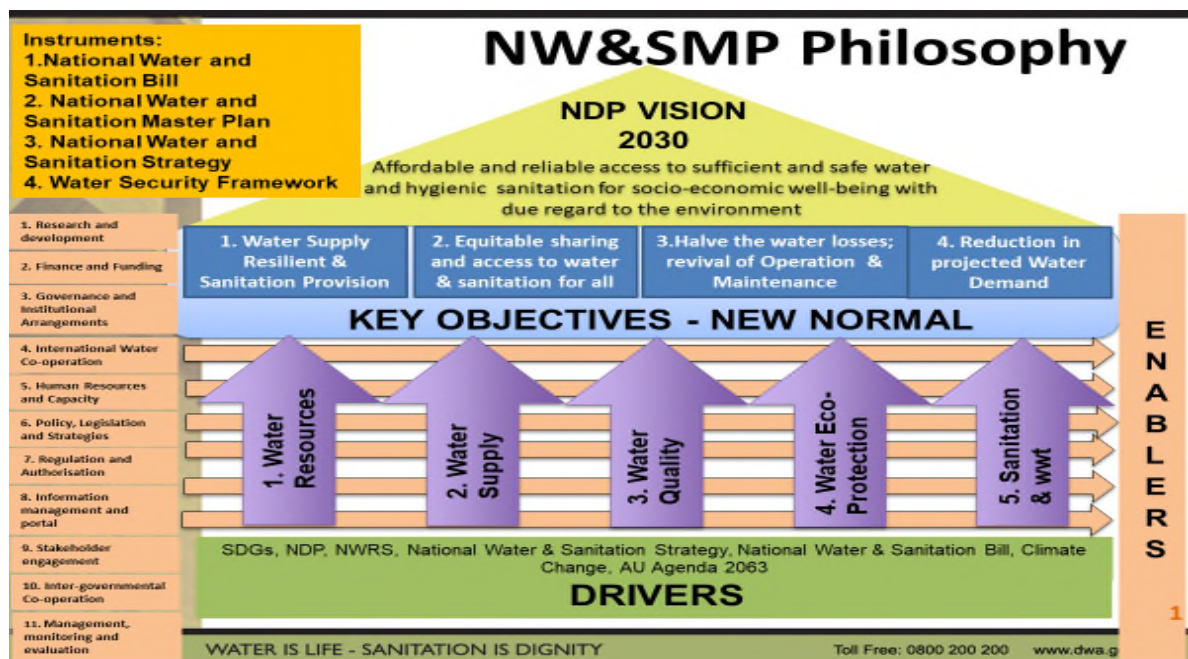


Figure 1.4: NW&SMP Philosophy

### 1.3.2 Pillars and Enablers for the NW&SMP

The five pillars are identified as key programmes that will support the vision and the objectives and will remain the key focus in terms of resources allocation and prioritisation by the sector. The pillars are listed as follows:

- Water Resources;
- Water Supply;
- Water Quality;
- Water Eco-Protection; and
- Sanitation and waste water treatment.

The themes projected as enablers in the Master Plan will play a crucial role in ensuring that the Pillars have the correct support mechanisms for successful implementation. The enablers have been identified as follows:

<p><b>Research and Development</b></p> <p><b>Finance and Funding</b></p> <p><b>Governance and Institutional Arrangements</b></p> <p><b>International Water Co-operation</b></p> <p><b>Human Resources and Capacity</b></p> <p><b>Policy, Legislation and Strategies</b></p>	<p><b>Regulation and Authorisation</b></p> <p><b>Information management and portal</b></p> <p><b>Stakeholder engagement</b></p> <p><b>Inter-governmental Co-operation</b></p> <p><b>Management, monitoring and evaluation</b></p>
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### 1.4 NW&SMP Status and Process

The process to develop the NW&SMP involved the identification of critical priorities for the sector and alignment with SDGs, African Agenda 63, NDP and the MTSF. The NW&SMP is a sector documents and therefore ownership and support by all stakeholders is important. The actions outlined herein will be implemented by various stakeholders in a collaborative manner. The successful implementation will therefore depend on the effective roll out of the Plan and allocation of roles and responsibilities, resources and timeframes for identified actions to different stakeholders. The stakeholders were engaged through various platform to ensure that their input is gathered and incorporated. The mechanisms for stakeholder engagement included:

- Provincial workshops with facilitated discussion with different stakeholders;
- Presentations at various stakeholder’s forums;
- Direct engagement with government department through intergovernmental relations to identify duplication areas of overlaps to improve integrated planning; and
- Creating a portal and posting the document for ease of access by all.

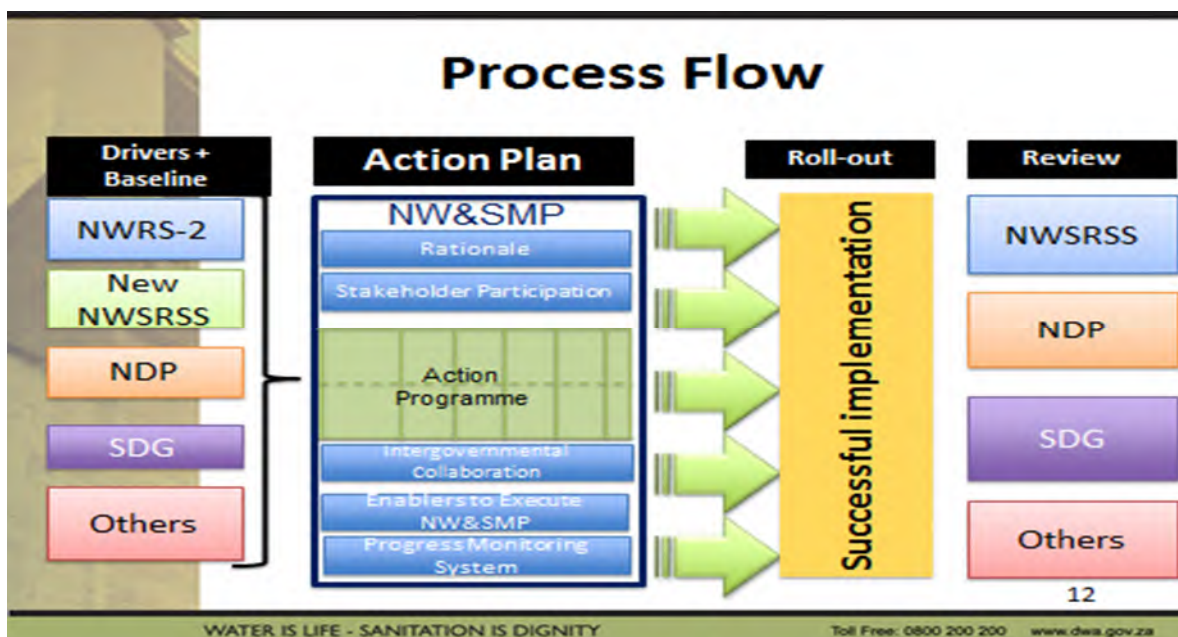


Figure 1.5: Process Flow



## 2. WATER RESOURCES

This section proposes interventions that will achieve and maintain the balance of available water resources with projected water requirements until 2030 and beyond.

### 2.1 Present State

#### 2.1.1 Available Water Resources

South Africa has a dry climate, with an average annual rainfall of 465 mm, compared to the world average of 860 mm.

The rainfall is also highly variable within seasonal distribution patterns with evaporation and transpiration increasing inversely from the wetter east to the arid west.

The total annual runoff is approximately 49 000 million m<sup>3</sup>/a giving a reliable yield of surface water at an acceptable assurance of supply of approximately 10 200 million m<sup>3</sup>/a.

Approximately 3 000 million m<sup>3</sup>/a of the surface yield is moved via inter-basin transfers to areas in the country where in-basin requirements exceed available supplies.

South Africa shares four of the river basins with its neighbours, the Limpopo, Inkomati, Pongola/Maputo and Orange rivers and arrangements must be made with our neighbours on how to share the yield of these rivers.

With the completion of the dams and associated water resource systems already at the advanced planning stage, the maximum economically feasible increase of yield from surface resources would have almost been reached in all major catchments.

The present volume of groundwater use is estimated at between 2 000 and 3 000 million m<sup>3</sup>/a.

The total realistically accessible groundwater potential is about 4 500 million m<sup>3</sup>/a of the estimated sustainable potential groundwater yield of around 7 500 million m<sup>3</sup>/a.

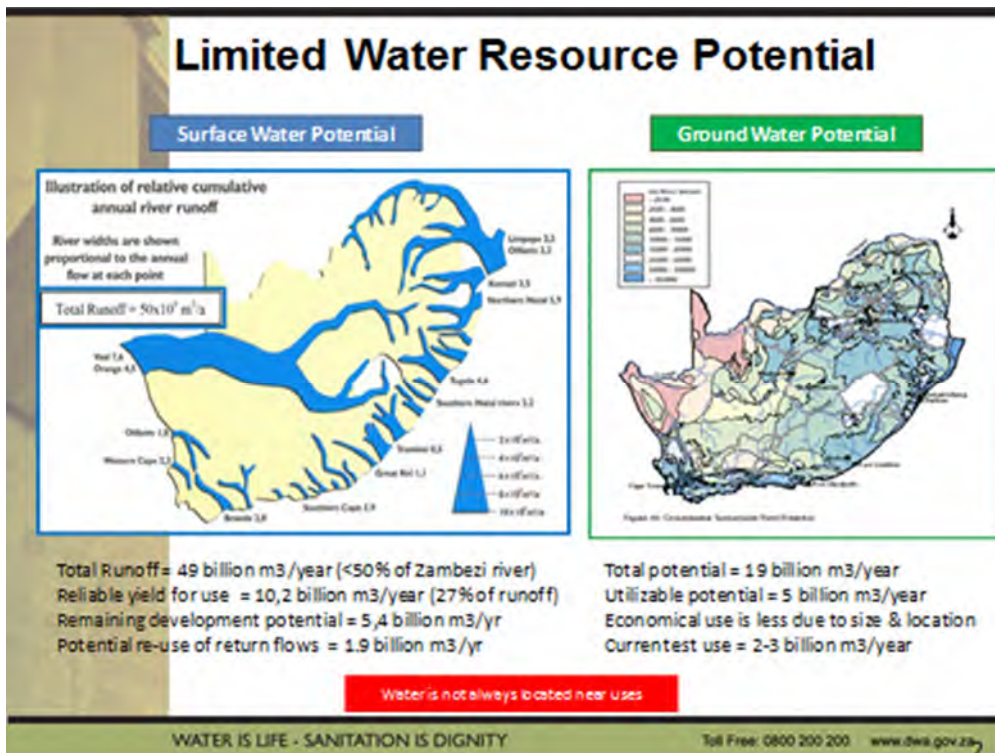


Figure 2.1: Limited Water Resource Potential

Based on projections, the national water deficit, or difference between water requirements and water availability, could be between 27 000 and 38 000 million m<sup>3</sup>/a by 2030, a gap of about 17% of available surface and ground water, if the proposed interventions proposed in this plan are not implemented.

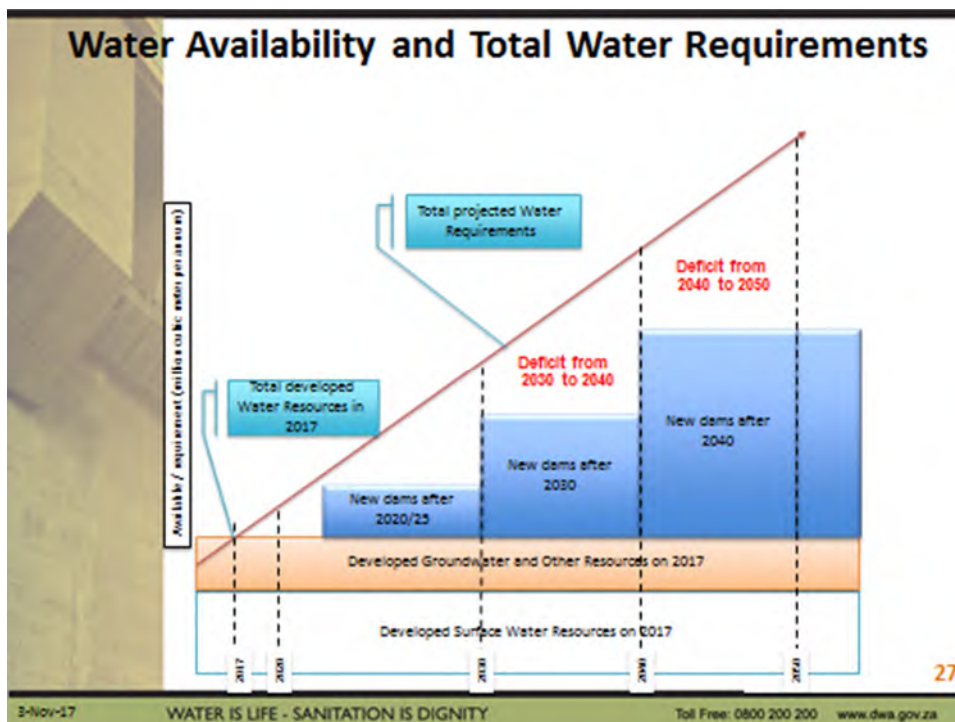


Figure 2.2: Projected Deficit between Water Requirements and Water Supply

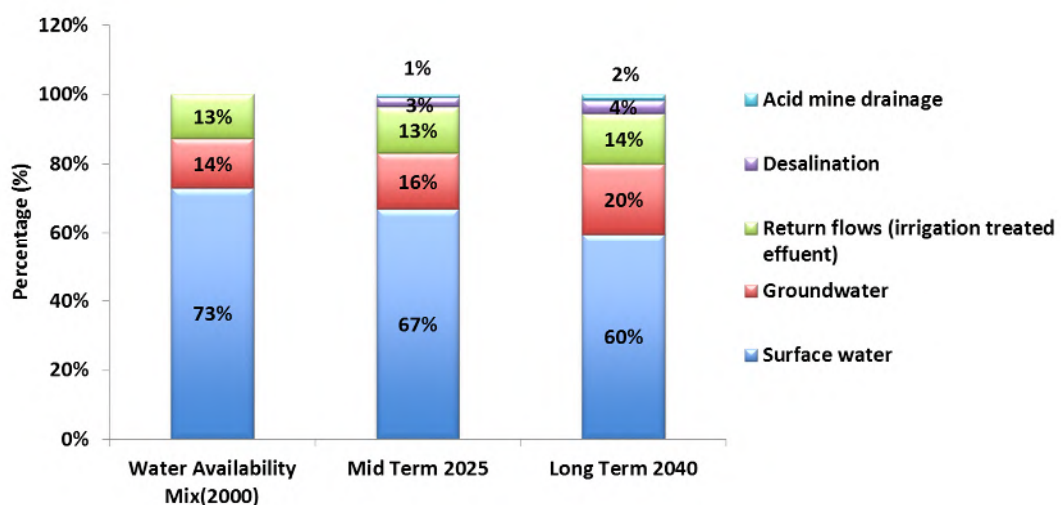
It is abundantly clear that a Business as Usual” approach will not address the projected shortfalls between water requirements and supply and ensure water security. What is urgently required are

serious interventions to reduce demand by improving efficiency, adopting new technologies and reducing losses (especially in the Agriculture and Municipal sectors).

The country must shift its focus from surface water dependency towards the sustainable use of water resources through initiatives such as integrated catchment management and water conservation and demand management.

**South Africa must diversify its water mix**

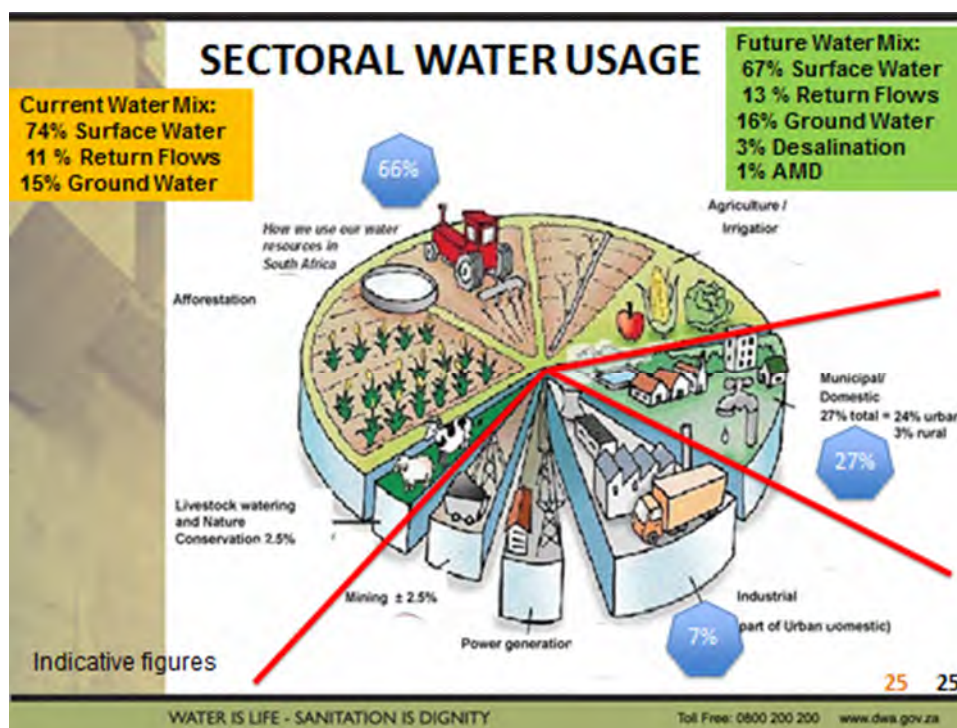
The mix of water sources will also need to change with an increase in the use of alternative sources such as the re-use of water, and the desalination of other sources such as brackish groundwater, mine water, and seawater must also be significantly increased.



**Figure 2.3: The Projected Water Mix**

### 2.1.2 Water Requirements

The distribution of water use by sector is shown in the diagram below:



**Figure 2.4: Water Use by Sector**

It will be noted that Agriculture is the largest user at 66% of the total water use, followed by municipal and domestic use at 27%.

Growth in water requirements depend on many factors, but current projections of water use requirements (Table 2-1) for each sector is as follows:

**Table 2-1: Projections of Water Use Requirements**

No	User sector	(2015)	2030
1	Agriculture (irrigation and livestock watering)	9 000	9 700
2	Municipal (industries, commerce, urban and rural domestic)	4 447	5 800
3	Strategic/Power generation	362	430
4	Mining and bulk industrial	876	1 017
5	Ecology		
6	International obligations	178	178
7	Afforestation	431	434
	<b>Total</b>	<b>15 294</b>	<b>17 559</b>

The challenges per water use sector are as follows:

### Agriculture and Forestry

Capital costs will most probably be too high to provide affordable additional water to this sector. Agriculture is encouraged to move to much more efficient ways technologies of irrigation to allow for future expansion with the water already allocated to it.

**South Africa must ensure equitable access to water**



## International Obligations

All new water resources developments with a trans-boundary impact will be developed, planned and implemented in consultation with the relevant basin states according to accepted protocols.

## Strategic Power Generation

DWS signed an MoU with Eskom in which Eskom undertook to move from wet-cooled to dry-cooled power generation systems, to reduce their water foot-print.

## Mining and Industry

Water availability should not be a limiting factor for growth in this sector, but mining will be required to practice WC/WDM and to consider re-use of both mining and industrial waste water in their processes, to reduce their raw water requirements.

## Municipal and domestic and commerce and industry in municipal areas:

Further growth in the population currently at approximately 56 million people, eradication of backlogs and general improvement of water services will require additional water for this sector. However, significant distribution losses and wastage is prevalent and must be addressed.

## Ecosystems:

Providing for the ecological water requirements is a legal priority and is inherent in all water resources planning that environmental water requirements will be catered for.

### 2.1.2.1 Reconciliation of Supply and Demand

A number of Reconciliation Strategies that reconcile supply and demand have been prepared for the large water supply systems and for the metropolitan areas.

Reconciliation strategies at a lesser detail have also been developed for all other towns and clusters of villages in the country. These reconciliation strategies are available on the DWS data portal.

***South Africa must balance supply and demand***

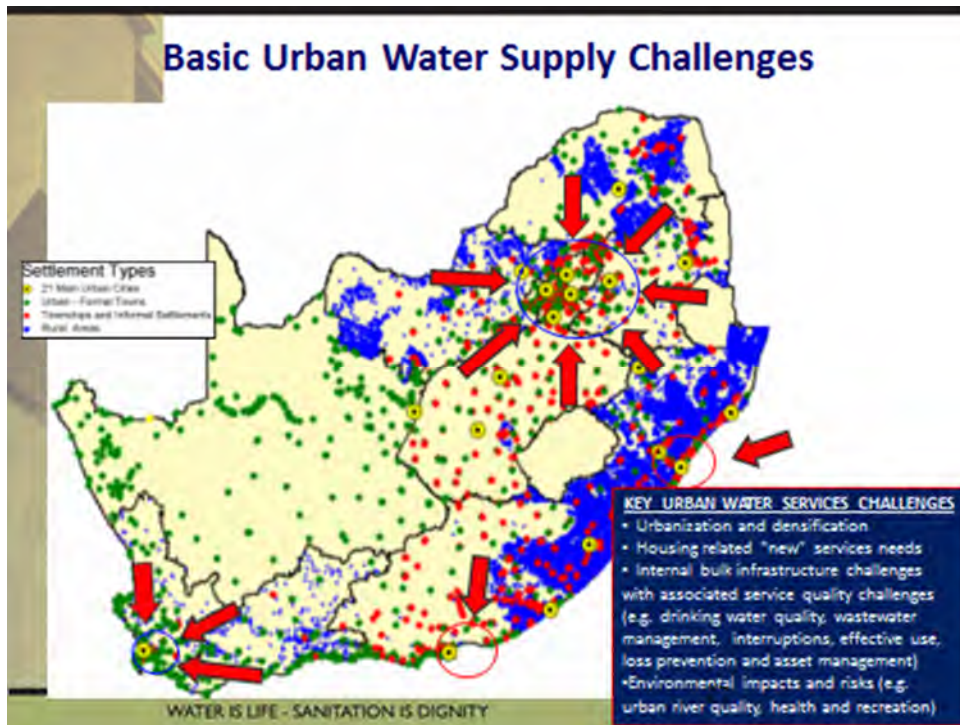


Figure 2.5: Basic Urban Water Supply Challenges

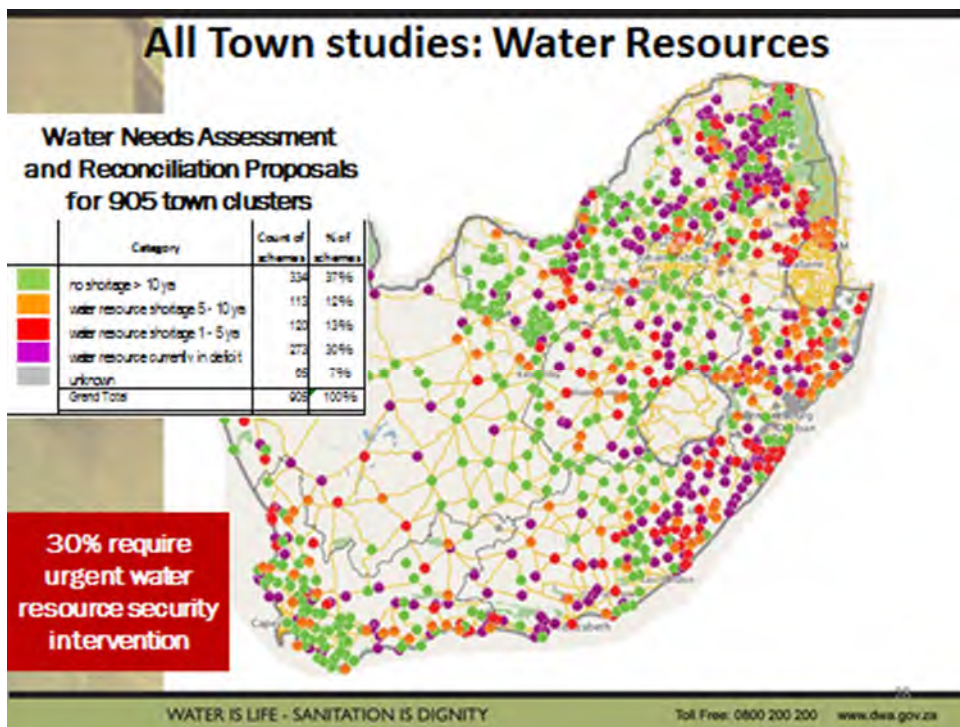


Figure 2.6: Water Needs Assessment

Rainfall, runoff and thus stream flow vary from year to year. Therefore, 100% assurance of water supply to any water user is seldom achievable. Implicit to this is the acceptance that some degree of failure with respect to supplying of the full yield, will occur.

For a specific river and water resource infrastructure, the higher the assurance of supply required (or the smaller the risk of failure which can be tolerated), the smaller the yield which can be abstracted, and vice versa.

In South Africa, water resource development projects have been designed, developed and operated with allocation criteria or standard operating rules that allow for user classification and their tolerance to failure of water supply.

The Reserve (basic human needs and ecological requirements) is the first priority followed by water use of strategic importance which includes water for Power Generation which has been provided a high assurance supply (99.5 %) which translates to 1: 200-year risk of failure. Water to meet international obligations is also given a higher priority. The priority classification is therefore built into the determination of the operating rule.

### 2.1.3 Surface Water Development

There are more than 4,395 registered dams in South Africa, of which 794 are considered large dams (i.e. dams with a wall height  $\geq 15\text{m}$ , or a wall height between 5 and 15 m and a storage capacity exceeding 3 million  $\text{m}^3$ ). The combined storage capacity of large dams is in the order of 31 000 million  $\text{m}^3$ .

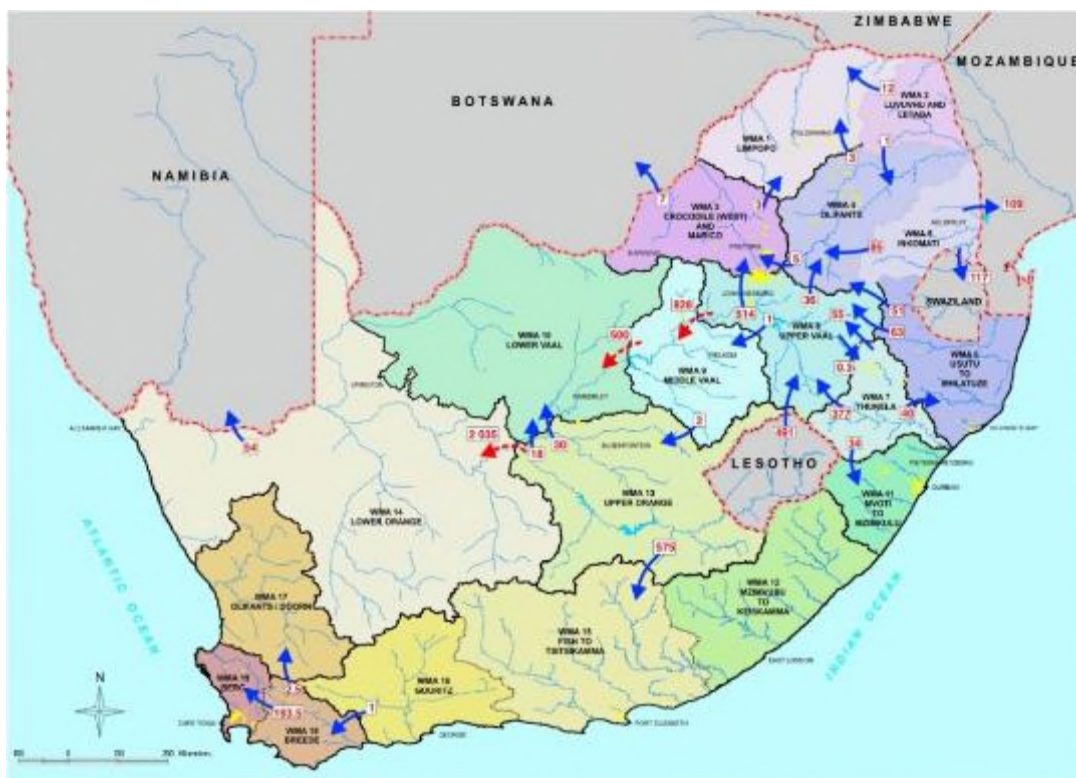
From the Reconciliation Strategies studies, several new major dam developments have been identified for implementation, including:

- Clanwilliam Dam Raising: Conveyance Infrastructure;
- Crocodile East Water Project;
- Development of Operating Rules for LHWP Phase 2;
- Foxwood Dam;
- Greater Mangaung Water Augmentation Project: Gariep Pipeline;
- Lower Orange River: Feasibility Study (Vioolsdrift Dam);
- Mfolozi River:Regional Water Supply Scheme;
- Mokolo Crocodile (West) River Augmentation Project;
- uMkhomazi Water Project Phase 1;
- Western Cape Water Supply System
- Mzimvubu Water Project: Dam at the Ntabelanga Site, WTW and Ntabelanga Bulk Distribution; and
- Desalination of AMD from the Wits mining basins in Gauteng has also been identified for implementation ( $\pm 150\text{MI/day}$  or  $\pm 54,8 \text{ Mil m}^3/\text{annum}$ ).

All future schemes should be developed utilising good planning and engineering practice appropriate technology, and be cost effective.

Communities in the vicinity of new developments, without local resources, should be supplied from these developments as a matter of principle.

Inter-basin water transfer schemes transfer water from water-rich catchments to a recipient water-poor catchment. There are 28 inter-basin transfer schemes with a total transfer capacity exceeding 7 000 million m<sup>3</sup>/annum (Figure 2.7).



**Figure 2.7: Inter-basin Water Transfers in South Africa**

Inter-basin transfers will in future be even more of a necessity in many areas. The Olifants River Water Resource Development Project, the Mokolo-Crocodile West Water Augmentation Scheme - Phase 2 and the Lesotho Highlands Water Project – Phase 2 are currently being planned.

**2.1.3.1 Actions**

**Table 2-2: Surface Water: Key Challenges, Drivers & Interventions**

<b>Key Challenge</b>	<b>Driver</b>	<b>Intervention</b>
<b>SURFACE WATER</b>		
Inadequate information on water balances	Lack of funding, and lack of skills for water resource planning  Long lead times for planning	Conduct water resource assessment studies Conduct water reconciliation studies Prioritise and conduct planning and water balance studies to firm up on the water balance information Conduct training in water resource management through exchange programs, strengthen tertiary institutions curricula in water resource planning, mentorship Implement structured and timed water balance studies Strengthen CMA capacity to conduct water balance studies Improve planning models
Inadequate funding for planning	Budget competition	Leveraging funding from partners in addition to Government sources for water resources planning.
Spatial and temporal variability of rainfall	Variable climatic conditions potentially exacerbated by climate change	Monitor situation Consider alternative resources



<b>Key Challenge</b>	<b>Driver</b>	<b>Intervention</b>
Misalignment of water resources and requirements	Key water sources are mostly situated in the north east of the country	Development of inter-basin transfers, such as LWHP WDM Develop non-conventional resources, such as re-use
Limited surface water runoff	Rainfall occurrence in nature	Proper management of key water source areas Alternative sources such as re-use and desalination (especially near coast)
Scarcity of water and competition of water across sectors	Droughts and potential climate change  Uneven distribution of rainfall	Create additional storage (dams) where feasible Inter-basin transfer schemes and transfer of water to settlement sites Avail funding for long term planning Clear invasive alien species Revitalise or renew and relocate storage areas once existing facilities reach end of life Improve models and develop guidelines to enable reallocation movement of water across sectors Review policy positions that preclude water transfers across sectors and river basins Devise action plans and policies and guidelines across water sectors to reduce unit water demand Review assurance of supply models/framework Incorporate GCM models into our water resource
Irrigation water	Availing additional water to meet the targets for agriculture as specified in the NDP vision 2030 and DAFF irrigation strategy	<b>Dialogue</b> with the agricultural sector and other users in a water management area to derive an action plan to implement revised allocation of water to catchments based on an appropriate lower assurance of supply  <b>Develop guidelines</b> for preferential water allocation to deserving sectors a group
Shared water resources	Trans-boundary river basins and aquifers	Establish/strengthen governance of river basin organisations Update database of international water agreements for South Africa Conduct joint trans-boundary studies Jointly plan and implement trans-boundary water projects Develop decision support tools for trans-boundary water management for surface and ground water Review of treaties and agreements
Poor catchment management	Lack of skills and institutional structures	Integrated catchment management, including catchment management studies Establish CMA and staff with skilled technical resources Catchment management studies and strategies Management of land-use

<b>Key Challenge</b>	<b>Driver</b>	<b>Intervention</b>
Operating rules	Efficient operating of system, including during drought times	Regular update of water resources yield model, including update of hydrology records and land-use Optimise system Develop drought operating rules Manage system accordingly – create capacity in local authorities.
Deteriorating state of existing infrastructure	Too small operational and maintenance budgets	More budget and grants towards replacement, rehabilitation, upgrade and maintenance of infrastructure Ring-fencing of operations and maintenance budget
Dam safety regulations and requirements	Changed design criteria	Ensure adequate budget to ensure integrity of existing infrastructure is maintained

#### 2.1.4 Climate Change

Long-term climate change predictions depict the western half of the country to become drier and a greater variability, associated with more extreme events in the north and the east.

Average temperatures are expected to rise resulting in higher evaporation.

In general, **the areas of greatest concern are the isolated water resource systems that are dependent on a single resource**, including small farm dams in headwater catchments and water supply schemes for rural towns. Systems with greater integration and diversification have **greater resilience** to future climate change uncertainty.

The Western Cape System being dependent on a single resource, and located in the west may experience a substantial climate change impact.

### 2.1.4.1 Actions

**Table 2-3: Climate Change: Key Challenges, Key Drivers & Interventions**

<b>Key Challenge</b>	<b>Driver</b>	<b>Intervention</b>
<b>CLIMATE CHANGE</b>		
Declining water availability – western side of the country	Climate extremes	Diversification of water development of new sources (including re-use and desalination), especially for single source systems  Enhanced utilization of non-conventional sources (reuse of effluents, desalination of brackish and sea water, groundwater etc.), by 20%  Include impact in future planning
Flooding / droughts	More extreme events	Disaster management plans providing for these events  Flood structures and flood warning systems  Monitoring of the system through operating rules, and timeous implementation of water restrictions  Research in how both climatic (recurring drought) and non-climatic (e.g. land use change) stress factors impact on water availability in terms of quality and quantity, from now into the future to inform appropriate adaptation action

### 2.1.5 Groundwater Infrastructure

The present volume of groundwater use is estimated at between 2 000 and 3 000 million m<sup>3</sup>/a.

The total realistically accessible groundwater potential is about 4 500 million m<sup>3</sup>/a of the estimated sustainable potential groundwater yield of around 7 500 million m<sup>3</sup>/a.

Groundwater currently is an underutilised resource in South Africa. Most groundwater infrastructure for municipal domestic water supply was developed, and is operated and maintained by local authorities.

Failure of groundwater supply schemes is often blamed on the resource (i.e. the aquifer or the groundwater levels) rather than on the poor maintenance and operation of the infrastructure (including boreholes, pump, pipes and valves) used to abstract the groundwater or the poor management of the aquifer.

Artificial groundwater recharge, whereby surplus surface water is transferred underground to be stored in an aquifer for later abstraction and use, is growing in importance in South Africa and internationally. Artificial recharge of groundwater needs to become a strategic focus in ensuring sustainable reliable water resources in future.

#### 2.1.5.1 Actions

**Table 2-4: Groundwater: Key Challenges, Key Drivers & Interventions**

<b>Key Challenge</b>	<b>Driver</b>	<b>Intervention</b>
<b>GROUNDWATER</b>		
Groundwater is not strategically prioritised as a water resource development option	Lack of ownership and leadership on groundwater management and use  Lack of understanding of and appreciation for groundwater	Awareness and capacity building programmes (all sectors) on groundwater  Devise action plan to operationalize target to increase ground water use from 3 billion m <sup>3</sup> to 4.8 billion m <sup>3</sup> by 2040

<b>Key Challenge</b>	<b>Driver</b>	<b>Intervention</b>
Failure of groundwater schemes	Poor management of groundwater well-fields Poor operation and maintenance of borehole equipment Poor planning of groundwater schemes	Train municipal staff on the importance and role of groundwater in meeting the water supply requirements Proper cost allocation for scheme management and operation during the groundwater development planning phase
Deteriorating groundwater quality	Poor land use planning Poor mining practises	Proper treatment facilities for treatment of groundwater for domestic supply Conduct a proper hydrogeological investigation prior to any land use development Rehabilitation of mines Strengthen monitoring network
Uncontrolled and non-regulated drilling	Lack of regulatory framework and bylaws	Ensure that all boreholes are registered with the municipality in order to understand the extent of groundwater use. Develop regulations to register drillers and guide groundwater management. Strengthen authorisation process
Lack of capacity of groundwater specialists at local/sector level	Inadequate appointment and retention of groundwater skills	Ensure a groundwater specialist or an adequately trained technician on groundwater management be available at local level Redirecting finances to engage a groundwater specialist

### 2.1.6 Alternative Sources

Alternative sources of water to surface and ground water that will be promoted are as follows:

#### Water Conservation and Water Demand Management (WC/WDM):

Separate Water Conservation and Water Demand Management (WC/WDM) targets will be set for the following water use sectors: agriculture, industries, mining, power generation, domestic water supply, mainly through the local government sector, including general water use by the citizenry.

#### Desalination of seawater and brackish water:

Desalination of brackish groundwater has been in operation for decades in various small towns and settlements in the Northern Cape and along the coast, sometimes for emergency supply during droughts.

It is preferable that such large-scale desalination plants form part of the relevant municipality's basket of water resources for continuous water supply, and not be implemented as an emergency scheme, only to be used intermittently or during times of drought and inadequate supply from the conventional water resources. These schemes are too costly to be moth-balled for any length of time.

Feasibility studies for large-scale seawater desalination projects on a scale of 150 to 450 Ml/day have already been completed for both eThekweni and Cape Town, with the Nelson Mandela Bay



Municipality currently also investigating large-scale seawater desalination for future augmentation of its resources. Technical feasibility was established in both eThekweni and Cape Town, even though cost considerations have led to other smaller water augmentation projects being given priority.

The persistent drought and water crisis in the Western Cape have resulted in a call for short-term desalination solutions. This may well precipitate a renewed consideration of the earlier (large-scale, permanent) project evaluated. It would not be unrealistic to anticipate two or even three large-scale seawater desalination projects being launched nationally, within the next five years, in the major coastal hubs.

### Water re-use:

The water re-use schemes in Beaufort-West (direct re-use) and George (indirect re-use), which were also built as a result of the 2009-11 drought, are running full time and supplies good quality water to the inhabitants.

Water is already re-used indirectly on a large scale in in-land areas, as one town's waste water discharged into a river, forms part of a down-stream town's raw water abstraction from the same river.

The indirect re-use of water at present is estimated to already account for about 14% (million m<sup>3</sup>/a) of all available water, and this could be significantly increased with more direct re-use. Direct re-use is where the discharge from a waste water treatment works (WWTW) is treated to process or potable standards and fed back into the water distribution system.

There is huge scope for developing this source, especially in the larger towns and cities where suitable treatment technology of waste water is employed and suitably skilled staff is available to ensure proper treatment and monitoring of the water is done. The scope is especially large for coastal cities where further freshwater resources are becoming very scarce and costly to develop, as the discharge from WWTWs is often discharged into rivers close to estuaries or directly into the sea.

### Acid Mine Drainage:

Acid Mine Drainage (AMD) is generated when sulphide bearing minerals, often in the form of pyrite (which is iron-sulphide or FeS<sub>2</sub> found *inter alia* in reefs mined for gold), are exposed to oxygen and water. This process is characterised by the generation of sulphuric acid and dissolved iron.

The opportunity to turn a pollution problem into a water source has been investigated at feasibility level with the potential to treat the water to potable standard or for industrial use in the Witwatersrand and was found to be feasible.

### Control of Invasive Alien Vegetation:

Estimates suggest that close to 3% of the national mean annual runoff is intercepted by invasive alien vegetation. Invasive alien vegetation intercept and evapotranspirates more water than natural vegetation. Removal and containment of such vegetation will improve water availability. The **Working for Water** program, first under the auspices of DWS and now the responsibility of

DEA, is an initiative that has been actively eradicating invasive alien plants (IAPs) for the last 20 years.

### Re-allocation of Water:

For a water resource system in a mature phase of development, the re-allocation of water between water use sectors, though it does not add additional water to the mix, is an obvious and powerful method to move water from low to higher economic, beneficial uses.

### Rain Water Harvesting:

Rainwater harvesting involves the collection and storage of rainwater, either for immediate use or use before the onset of the next rainy season, and has been practised world-wide for millennia.

The current thrust is to encourage domestic rainwater harvesting as a way of improving household food security, income savings and improved reliability of water supply, especially in rural areas. Although mostly only suitable as augmentation, it has been proved that, with good management, rainwater harvesting can yield more economical water than formal municipal water supply.

#### 2.1.6.1 Actions

**Table 2-5: Alternative Sources: Key Challenges, Drivers & Interventions**

<b>Key Challenge</b>	<b>Driver</b>	<b>Intervention</b>
<b>DESALINATION</b>		
Relatively expensive water, also energy intensive in compared to other sources	High operational costs due to high capital and energy intensive operation	<ul style="list-style-type: none"> <li>Unlock funding mechanisms</li> <li>Develop financial models to assess costs of desalination schemes and determine when the schemes part of permanent water supply</li> <li>Train in desalination technologies</li> <li>Innovation in technology</li> <li>Action for the adoption of new practices in procurement, institutional arrangements, human capacity requirements, funding models, authorizations and project design.</li> </ul>
Ensuring sustainable power supply	Power requirements	Get commitment from ESKOM for uninterrupted sustainable power supply
Integration with existing distribution system	Cost of constructing large pipelines through built-up areas	Optimise design
Data on input water quality and sea currents	Lack of long-term data	Ensure data gets collected over at least 3 seasons before final process design is done
<b>DIRECT AND INDIRECT RE-USE</b>		
Acceptance by public of water re-use for potable use	Public resistance due to ignorance	Develop and implement a comprehensive public awareness and education communication strategy
Ensuring treated water adhere strictly to standards	Lack of adequately equipped laboratories to test for all potential contaminants	Ensure that enough adequately equipped and staffed laboratories are established country-wide to enable testing for potential contaminants in the treated water.
Disposal of brine	Large quantities of brine that will be produced	Do research on ways of reducing the brine that must be disposed of and or potential for harvesting economical constituents from the brine

<b>Key Challenge</b>	<b>Driver</b>	<b>Intervention</b>
Integration with existing distribution system	Cost of constructing large pipelines through built-up areas	Optimise location of treatment works and design of system
Monitoring the quality of the water produced	Health concerns	Ensure competent staff are in charge of the works, that monitoring is done diligently and that where there is a problem encountered, it is addressed immediately and suitably. Provision of holding capacity until batches are proved fit for use.
<b>RAINWATER HARVESTING</b>		
Promote rainfall harvesting for households as conjunctive source to municipal water	Initial capital cost On site management requirement.	Education and promotion. Provide grants to incentivise RWH projects
Rainwater harvesting in the rural remote areas of the country	Not all climatic regions are suitable for RWH	Larger storage facilities to be made available for capturing unique storm event. Adapt roofs to be suitable for rainwater harvesting.
<b>ACID MINE DRAINAGE</b>		
Disposal of salts removed in treatment process	Quantities of brine that will be produced when treated to industrial or potable standard	Do research on ways of reducing the brine that must be disposed of or harvesting economical constituents from the brine
Cost recovery for O&M and CAPEX into treatment technologies and infrastructure	Current cost model involves subsidy from fiscus and capital injection from Treasury with partial cost recovery through an input of an AMD levy to all Vaal River system users	Sustainable solutions by getting off-take agreements to major users like the big metros in Gauteng who are positioned near the AMD outfall or catchments and other industrial users
Mine legacy issues of abandoned mines, derelict, ownerless, which contribute to the AMD problem	No financial provision made to manage underground mine water post closure	Approval of mine closure should ensure financial provision of mine water management and therefore comprehensive and bankable mine water management plans.

### 2.1.7 Water Monitoring and Information

Reliable data and information on the status and trends of the water resources in South Africa enables proper analysis and planning to make informed decisions. This includes data on quantity, quality and on events such as floods, droughts, chemical composition and pH.

**South Africa must manage data and information better**

The coverage of rainfall and runoff gauging in the country has however deteriorated.

Accordingly, one of the main challenges for the future will be to get hydrological monitoring 'back up to standard through recruitment and training of suitable personnel and the allocation of adequate funds for installation and maintenance of rain gauges and gauging stations.

### 2.1.7.1 Actions

**Table 2-6: Key Challenges, Drivers & Interventions**

<b>Key Challenge</b>	<b>Driver</b>	<b>Intervention</b>
<b>MONITORING</b>		
Paucity of rainfall and hydrological data and information	Information	<p>Recruitment of suitable personnel?</p> <p>Allocation of adequate funds for rain gauges and gauging stations including increasing observation network by 30% by 2025</p> <p>Collecting meteorological and hydrological data and information collaboratively with South African Weather Services (SAWS) and other relevant partners</p>
Inefficient water use in agriculture		<p>Increased water use efficiency by 40% (by 2025) particularly in major water user sectors such as Agriculture</p> <p>voluntary water use reduction initiatives</p> <p>empowering local government in optimal and sustainable water management and use</p>

### 2.1.8 Flood Protection Infrastructure

Floods are a common occurrence in South Africa and they lead to the loss of lives and hundreds of millions of rand worth of property destruction. Flooding occurs in all river systems in the country with notable floods in the North-West province (2017), Lephalale (2014), Somerset West (2013), Vereeniging (2010), Vaal (1996), KZN (1987) and Laingsburg (1981). Other flood prone areas include the towns of Douglas, Prieska and Upington along the Orange River.

Measures for protecting lives and property from floods may be non-structural and structural. The former aims to mitigate or reduce the impacts of floods by influencing human behaviour and practices through policies and laws, public awareness raising, training and education.

The structural approach entails the creation of physical defence systems in order to control the flood waters through the reduction of its destructive power or by redirecting the flood waters away from exposed human settlements and property. It also includes measures such as planting vegetation to retain extra water; terracing hillsides to slow flow downhill; the construction of floodways (man-made channels) to divert floodwaters and construction of levees, lakes, dams, reservoirs and retention ponds to hold extra water during times of flooding.

Owing to the high capital and maintenance costs, dedicated structural flood control measures are not widespread in South Africa. The only major flood control dams in South Africa are Beervlei and Qedusizi dams. Instead, major water storage infrastructure doubles as flood control measures. Those with gated spillways, such Vaal and Bloemhof dams, have supplementary storage and specific operating rules for flood control.

Flood protection should create a safe environment. All dams should be designed to safely control floods. Operating rules, based on a dynamic monitoring system of our rivers during flood events, should be implemented, with appropriate warning systems.

### 2.1.8.1 Actions

**Table 2-7: Flood Protection: Key Challenges, Drivers & Interventions**

<b>Key Challenge</b>	<b>Driver</b>	<b>Intervention</b>
<b>FLOOD PROTECTION</b>		
Creation of a safe environment		All dams should be designed to safely control floods
		Operating rules, based on a dynamic monitoring system of our rivers during flood events, should be implemented, with appropriate warning systems

## 2.2 Summary of Water Resource Actions: Towards Water Resilience

The action plans and interventions of the water resources and infrastructure management theme envision a South Africa with a resilient water resource system built on the pillars listed in Table 2-8 below:

**Table 2-8: Pillars of Water Resource Resilience for South Africa**

<b>No</b>	<b>Program Name</b>	<b>Description/ outcomes</b>	<b>Current status</b>	<b>Gap</b>
	<b>Water conservation and water demand management</b>	Improving water use efficiency, keep water losses within acceptable level and reduce non-revenue water.	Major water supply distribution systems attrition	Implementation plans and enforcement
	<b>Water transfers across political and international boundaries</b>	Water transfer schemes from water-rich to water-poor areas for increased resilience to the vagaries of variability of rainfall in space and time, as well as mitigating the effects of climate change	International agreement in place	Trans boundary Integrated water resources management
	<b>Broaden the water resources mix</b>	Including other non-traditional water resources such as desalination, water re-use and rainwater harvesting	Inroads towards desalination and reuse	Inadequate research and development for cheap technologies for harnessing and creating new water
	<b>Conjunctive use of surface and groundwater</b>	Elevating the importance of groundwater as a reliable and effective source in areas where surface water is sparsely distributed over vast distances.	GW not yet genuinely considered as a reliable source of water by Water Services Authorities	Insufficient knowledge about ground water Insufficient groundwater management capacity
	<b>Strengthening and improvement of water measuring and monitoring network</b>	Wider network of rainfall, runoff and groundwater measurement infrastructure and monitoring to improve knowledge of water availability and climate trends	Deteriorating and slow expansion of the monitoring and measuring networks.	Infrastructure not enough. Insufficient maintenance capability

### 3. WATER SUPPLY

Access to water supply services is a basic human right and this is enshrined in the Constitution of South Africa. This is furthermore reflected in the Water Services Act, 1997 (Act No. 108 of 1997), the National Development Plan and the recent global Sustainable Development Goals (Goal 6.1) committed to by the Head of State on 25 September 2015.

Water supply is an essential service to ensure and facilitate social and economic development, business security and environmental health. Lack thereof has serious social, economic, environmental, health and security risks. These must be minimized and proactively translated into supporting and enabling a productive and prosperous society.

*The obligation is “To ensure that all people in South Africa have access to effective, reliable, affordable and sustainable water services”.*

*The expectation is that it must happen on a sustained basis*

The South African Government has prioritized water supply services since 1994 and clear targets have been set and reviewed on a regular basis:

- The National Development Plan (NDP) and the new global Sustainable Development Goals (SDG) have set a goal for 100% reliable and sustainable water supply service before 2030.
- In its commitment to serve its people and the moral obligation to the vulnerable people, Government has formally approved a target of 90% reliable water supply services by 2019. This has formally been approved by Cabinet in July 2014 and is reflected in Outcome 9 (9.1) of the Medium Term Strategic Framework (MTSF).

*Target:*

*100% access to infrastructure and 90% reliable and sustainable services by 2019*

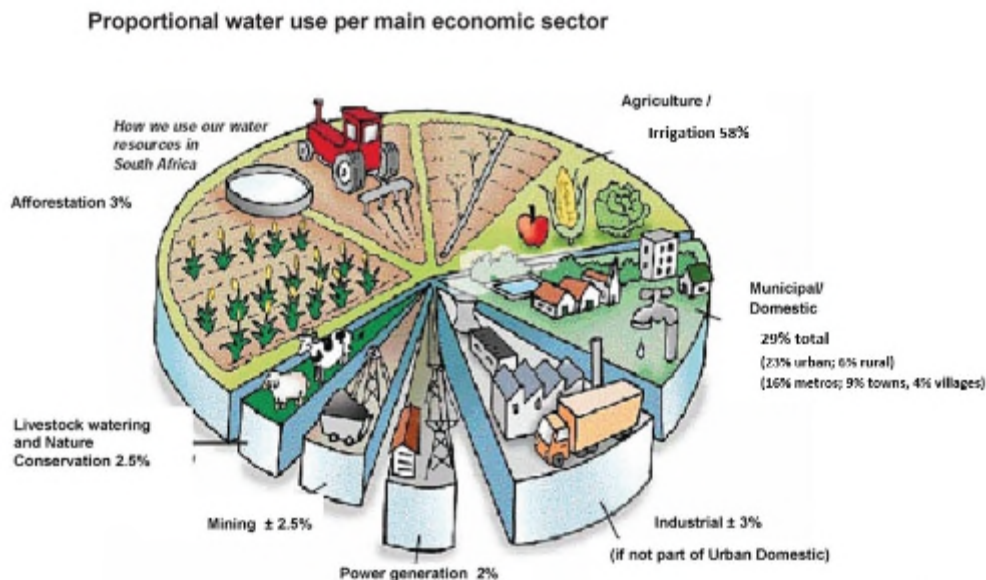
*The key focus of the outcome is reliability underpinned by sustainable water management, financial viability, affordability and service quality, which means: ongoing services delivery depends on a non-stop sequence of actions (from source to tap to source), process management and business practices.*



### 3.1 Present State

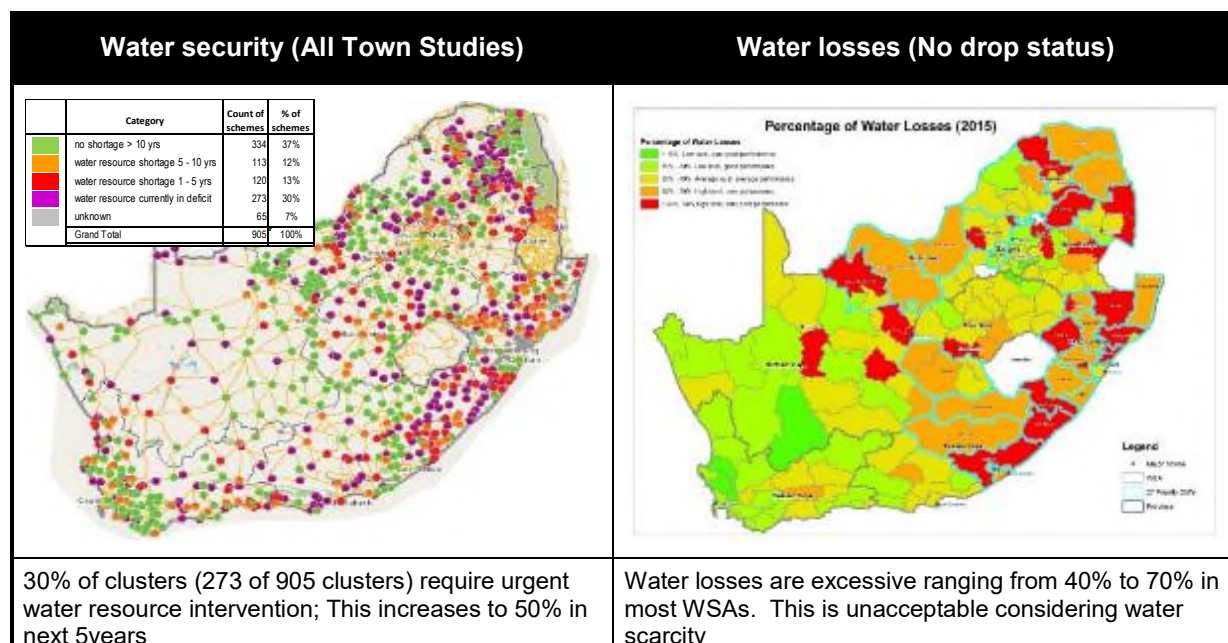
#### 3.1.1 Water Use and Context

Municipal domestic, commercial and industrial water use is about 29% of the total water use in South Africa. The domestic water use can further be split into urban use of 23% (metros 16%) and rural use 11% (communal basic use 4%). Figure 3.1 below provides an indication of water use proportions by main economic sector in South Africa.



**Figure 3.1: Water Use by Economic Sector in South Africa**

The following map shows the water balance at municipal level (All Towns Studies) and the current water losses affecting it:



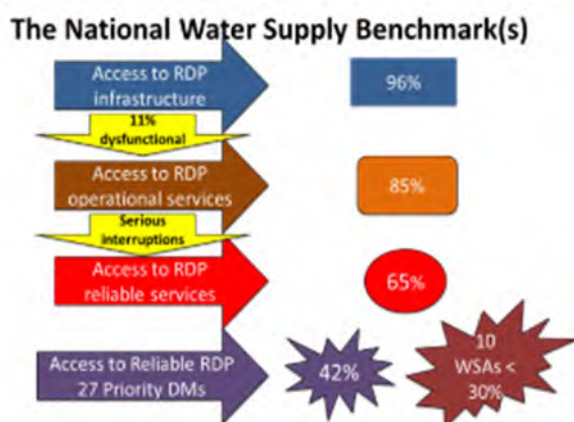
**Figure 3.2: Water Balance at Municipal Level and the Current Water Losses Affecting it**



### 3.1.2 Water Supply Infrastructure

#### 3.1.2.1 Extent and State of Water Supply Infrastructure

Baseline figures on access to water supply and reliable service delivery have been established for the country in partnership with StatsSA and are illustrated in Figure 3.3 below.



**Figure 3.3: National Water Supply Benchmarks**

Achievement to date and key shortfalls include:

- South Africa performed well in eradicating the backlog in basic water services infrastructure and access to basic services from 59% in 1994 to 96% in 2016
- While infrastructure is in place, about 11% of schemes are fully dysfunctional and in a collapsed state, resulting in operational access being reduced to 85%

Water reticulation infrastructure includes more than 290 000 km of pipelines and an estimated 7 680 456 house connections, 5 078 545 yard taps and more than 2 146 146 households served by street taps (StatsSA Community Survey 2016).

#### 3.1.3 Water Supply Reliability

Reliable water supply is defined as:

- Adequate water resources and associated storage to supply water at the required level of assurance (e.g. 98% for domestic use) across seasons and climate variation;
- Appropriate and functional water infrastructure to distribute water from sources to users, including inter-basin transfer schemes and regional bulk water supply. Key challenges are access to infrastructure (rural areas) and ageing infrastructure in urban areas;
- Water treatment to comply with user specific water quality requirements;
- Continuous and efficient operation and management of water supply processes by the responsible institution (including skills, capacity and accountability);
- Responsible water use in compliance with water use payment, water conservation, water demand management and wastewater regulations;
- Diligent infrastructure asset management to maintain efficient water supply delivery;
- Financial management (budgeting, funding, tariffing, revenue collection & saving);
- Disaster and risk management to mitigate impact of water-related risks;
- Good governance (leadership, planning, regulation, disaster and control); and
- Political will, guidance and support (centrality of water; outcome targets).

**South Africa must ensure effective water and sanitation services**

While access to water supply infrastructure is over 96% compliant, the challenge often lies with reliability, which can be a major source of public frustration. The following map illustrates the extent and seriousness of reliability challenges per province.

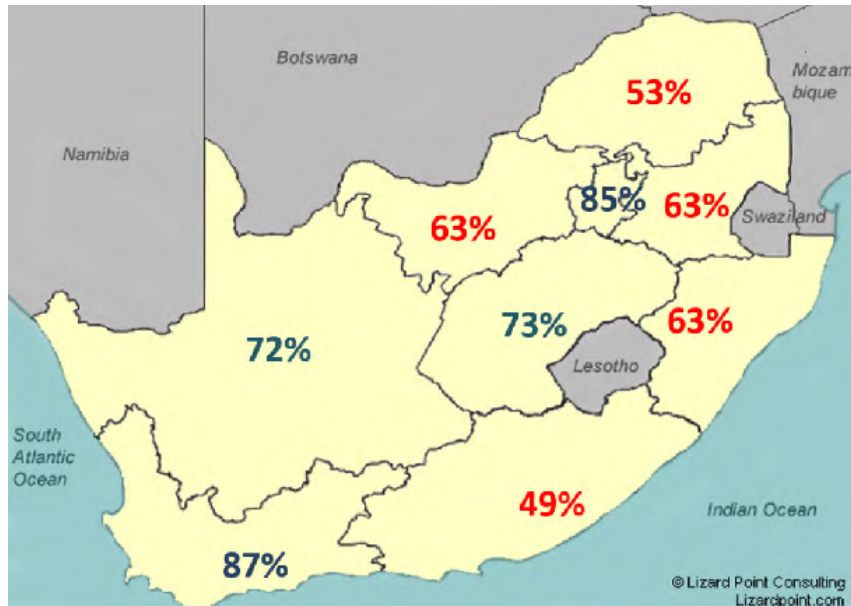


Figure 3.4: Reliability of Water Supply Services per Province

On average, the current water supply reliability is only at 65%. In the 27 priority district municipalities (DMs,) the water reliability is only 42% with the worst 10 Water Services Authorities (WSAs) below 30% reliability.

The key challenge is to move from 65% reliability to 90% reliability by 2019. This implies a 13 % improvement per annum on the national scale, and even more for the 27 priority DMs (24%). For the worst WSA, an improvement of 40% per annum is required at present. This delivery challenge is illustrated in Figure 3.5 below:

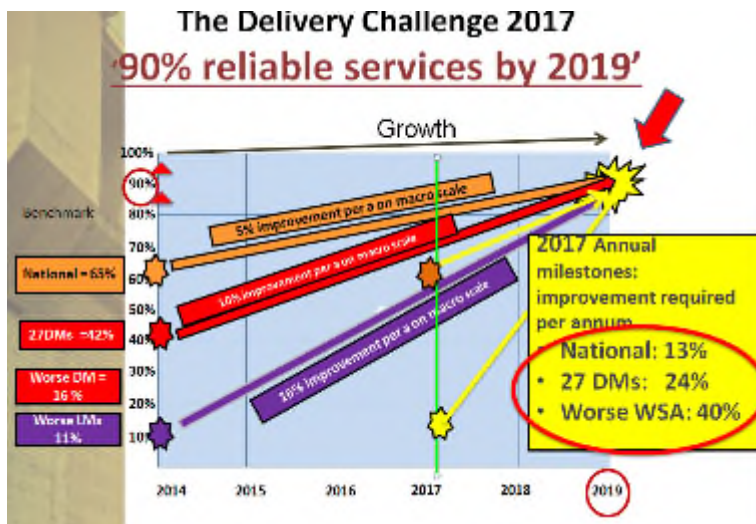
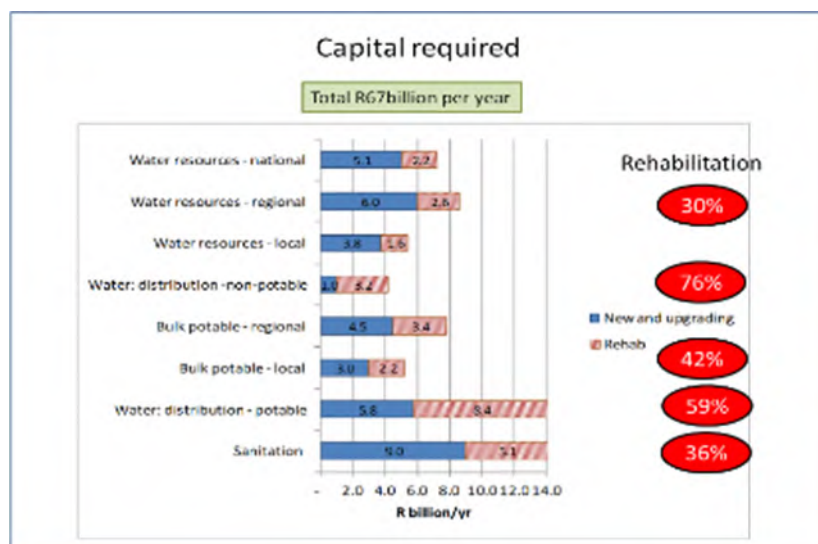


Figure 3.5: The Delivery Challenge

- The challenge requires extensive effort and commitment
- The bulk of the challenge is poor operation and recovery of poor performing systems
- The intervention must take cognisance of the growth in population and development
- A 30-fold improvement (based on existing delivery trend) is required in some areas to achieve the Outcome-9 target

Low reliability is partly caused by aged infrastructure. This is a ticking time-bomb, as further water supply interruptions are eminent if aged infrastructure is not timeously renewed. The following graph shows the estimated capital investment required per water supply stage. The percentages in red circles, indicate the extent of rehabilitation versus new upgrade investments. Rehabilitation and renewal is mostly more than 50% of the future investment cost.



A comprehensive modelling of all municipal infrastructure shows that about 55% of water supply infrastructure is aged and needs urgent rehabilitation or replacement.

This aspect has been neglected and has a major impact on sustainable water supply. Improved infrastructure asset management and dedicated funding for refurbishment and renewal is required.

**Figure 3.6: Capital Requirements for New and Upgrading of Infrastructure vs Rehabilitation**

### 3.2 Problems, Challenges & Drivers for Change

Water supply is a complex environment which must be well understood, appreciated and considered. The following list contains some of the challenges experienced:

- South Africa's 56 million inhabitants live in more than 28 thousand communities, each requiring a reliable water supply service.
- The socio-economic profile of South Africa is highly variable with 63% of households earning less than R38,000 per year (indigent level) resulting in high levels of grant dependency with the related impact on affordability and services viability. In rural areas, this figure is on average 77%.
- Water services is a dynamic business (moving target) affected by population growth, urbanisation, migration and immigration:
  - While population growth is on average at 1,2% this varies from negative to positive across communities. The growth in the number of households is much higher and currently is at about 3% per annum nationally. This is due to migration of people (mainly urbanisation) and the dedicated housing programme of Government, leading to sub-division of large families.
  - While only 33% of the population is currently living in rural areas, they represent 81% of the national count of settlements due to their small scattered nature.
  - Urbanisation continues to have a major impact on water supply provisioning with many rural people moving to urban centres in search of jobs and services.
- Municipal profiles also include commercial, business and industrial users and furthermore need to serve the associated needs of schools, hospitals, sports and recreation, parks and government institutions.
- The economic climate is currently inadequate to address the required investment (40% shortfall) and sustainable management (inadequate funding for operation and maintenance) is severely strained. This requires more effective financial water management and governance.

- The water services functions are extremely dispersed between role players with ineffective programme alignment, governance and supply-chain management. There is an urgent need to address accountability, coordination and leadership.
- Constitutional water supply responsibility lies with 144 municipalities that have been assigned the function of water services authorities (WSAs). District Municipalities oversee the delivery of services to the most vulnerable, rural poor citizens. At least 33% of municipalities are regarded as dysfunctional and more than 50% have no or very limited technical capacity.
- South Africa is also strained by key attitude and culture problems such as not valuing water, poor accountability, non-payment for services, new-infrastructure syndrome, vandalism, theft, pollution, wastage and abuse, as well as a general culture of inadequate operation and maintenance.
- The sustainable water supply programme must be viewed against various existing programme initiatives and policies. They must be re-aligned, adjusted and re-focussed towards achieving reliable and sustainable water supply services.

It is clear that the country is not performing sufficiently against the obligation and that drastic and diligent intervention is required on a sustained basis. The unacceptable level of performance results in increasing public frustration with associated protests and vandalism. The following maps show the integrated risk per Water Services Authority and a municipal self-assessment of their vulnerability to fail.



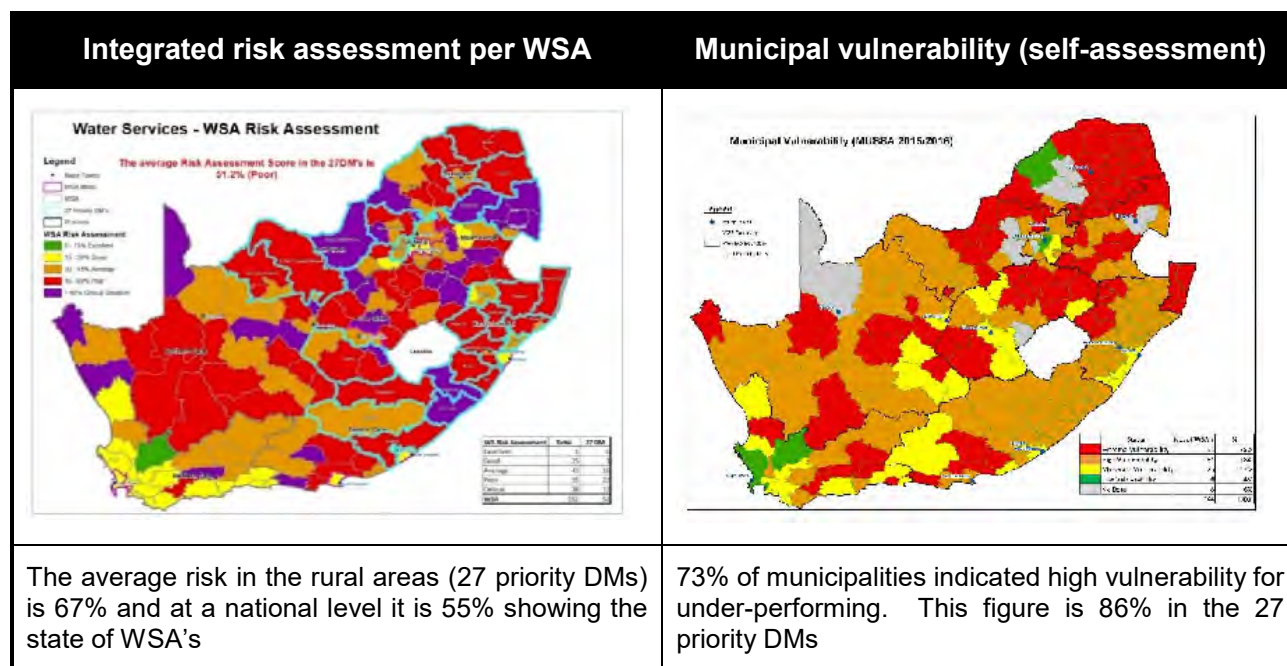


Figure 3.7: Risk and Vulnerability per WSA

### 3.3 Desired Future State

The South African Government aims to meet the target of providing 100% reliable and sustainable water supply services before 2030 as set in the National Development Plan (NDP) and the Global Sustainable Development Goals (SDGs).

The Government has made a further commitment to the above target by formally approving a target of providing 90% coverage of reliable water supply services by 2019 in the Medium Term Strategic Framework (MTSF).

To achieve these commitments, the NW&SMP aims to address specific intervention areas, which are listed below:

- **Access to unserved households** is still a high priority, but currently only applies to 4% of the households in South Africa.
- **Dysfunctional schemes** are a growing problem and currently affect 11% of households. In addition, up to 50% of municipal infrastructure is at an advanced age.
- The core challenge lies with **reliability of water supply** and service quality such as drinking water quality and water losses. This challenge has been completely neglected in the past and requires drastic intervention. This represents 80% to 90% of the total intervention plan and comprises more than 30 sub intervention activities, including operations, maintenance, water loss detection, formalization of illegal connections, institutional capacity and skills.
- While the initial focus of the country was primarily on basic services delivery, the need for **total services** to higher levels of services, business, commerce and industry, as well as associated needs such as schools, health services and economic use must be addressed. It also includes providing for population growth, migration and housing programmes.

- **Water security** problems represent 30% to 50% of the reliability problems. This is escalated during drought situations. Diligent water resource management is required.
- Inadequate **water governance** and administration has been identified as a key problem requiring focussed intervention on improved, planning, programme management, discipline, accountability, regulation and institutional arrangements. It also includes strong leadership, coordination and drive.
- All of the above interventions need dedicated management, resourcing and enabling **support**. This includes effective financial management and financing, appropriate solutions, technology and research, skills development, institutional arrangements, knowledge, social awareness and culture, as well as the respect and valuing of water.

The key issues thus are:

#### Reliability

- Move from “new infrastructure approach” to “effective operation and maintenance and sustainable / reliable services”

#### Need for a total services approach

- Extend services from basic services only to a total services business approach
- Address funding and support from basic services to total reliable services
- Apply life-cycle and value-chain management approaches

#### Need to ensure effective governance

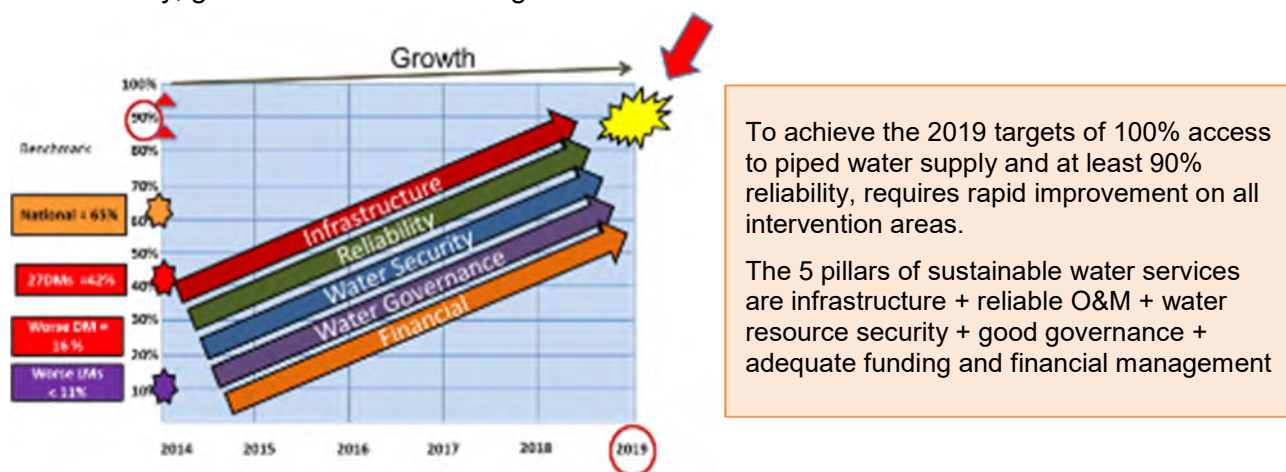
- Apply professional governance model, including integrated planning, institutional framework and accountability
- Effective alignment of current dispersed programmes and oversight
- Address enabling actions
- Address viability
- Apply an integrated and caring water management culture

It is clear that there is a major problem with regards to reliable water provisioning. To address this, an extended and comprehensive intervention framework has been developed to address not only access to water supply infrastructure, but the total sustainable water supply delivery business.

Successful achievement of the required outcome and above performance areas depends on essential enabling support being in place. This includes financial management and support, effective institutional arrangements and capability, focussed research and innovation, as well as a variety of social and cultural actions.



This framework serves as the formal structure for the intervention programme, water services development planning and the 27 priority DM areas. Each of the priority intervention areas (1 to 11) requires a combination of the following 5 core elements, infrastructure, reliability actions, water security, governance and financing:



**Figure 3.8: Pillars of Sustainable Water Services**

### 3.4 Action Plan

To date the focus was on meeting the basic services infrastructure backlog. Although successful, this has resulted in the neglect of existing services and non-adoption of a total business approach, leading to operational failures and poor service quality. An expansion from a focussed backlog approach to a more holistic and forward-looking management model must be adopted comprising a three-pronged approach which also addresses sustainable management and recovery of poor services.

As reflected in the figure below, the core intervention streams are:

- Maintain existing good services (including the prevention of future failures);
- Recover poor services (including aged infrastructure, refurbishments and poor operation); and
- Implement new infrastructure in township extensions and unserved areas.

Four priority intervention areas have been identified, namely:

- Planning;
- Project Implementation Approach;
- Water Services investment and funding models; and
- Monitoring and Compliancy.

Each of these intervention areas will be summarised below:

#### 3.4.1 Planning

<b>Activity</b>	<b>Responsibility</b>	<b>Target date</b>	<b>Estimated cost</b>
National programme ownership must be embedded in the DWS Annual Performance Plan (APP)	DWS	2018 / 2019	
National service status perspectives must be updated annually	DWS – WS Macro Planning	Annually	R17m per year

<b>Activity</b>	<b>Responsibility</b>	<b>Target date</b>	<b>Estimated cost</b>
Topic Plans and Strategies must be developed and updated, including: WWTW WTW Water resource alignment O&M Strategies Replacement of old infrastructure WC / WDM	DWS Water Services, DWS topic owners, COGTA	Developed by 2018 / 2019 and updated every annually	R15m per year
Water services reliability plans (145 plans) should be compiled every 5 years. The outcomes of the plans are: Governance implementation programmes Functional implementation programmes Water security implementation programmes New infrastructure development programmes Funding models	DWS Water Services Planning, COGTA, MISA, WSAs)	Every 5 years	R140m every 5 years
WSDP / IDP programme management coordination support to ensure effective WSDP completion by all WSAs	DWS / WSAs	Annually	R10m per year
Project Planning to ensure appropriate and comprehensive feasibility studies / Implementation Readiness Studies (IRS)	DWS	Annually	R34m per year

### 3.4.2 Project Implementation Approach

<b>Activity</b>	<b>Responsibility</b>	<b>Target date</b>	<b>Estimated cost</b>
Develop project funding ring fencing strategy that addresses: Governance Functionality Water Security New Infrastructure	DWS, COGTA, National Treasury	2018 / 2019	R10m

### 3.4.3 Water Services Investment and Funding Models

<b>Activity</b>	<b>Responsibility</b>	<b>Target date</b>	<b>Estimated cost</b>
National water infrastructure investment framework	DWS, National Treasury	Annually	R2m per year
National water services sector funding models	DWS, National Treasury	Annually	R2m per year

The following table unpacks the status of current funding mechanisms:

<b>Funding Action</b>	<b>Status</b>			
	<b>Fund</b>	<b>Require</b>	<b>Avail.</b>	<b>Short</b>
Funding (water resource infra.)	DWS / Muni.	R25,5b	R14,9b	R10,6b
Funding (municipal infra.)	MIG/MWSIG/revenue	R23,5b	R14,1b	R9,4b
Funding (potable bulk infra.)	RBIG / WB's	R10,1b	R7,4b	R2,7b

<b>Funding Action</b>	<b>Status</b>			
	<b>Fund</b>	<b>Require</b>	<b>Avail.</b>	<b>Short</b>
Funding (non-potable bulk infra.)	DWS /other	R7,0b	R4,0b	R3,0b
Funding (housing water infra.)	RHIG/IHSG/ USDG	R4,2b	R3,0b	R1,2b
Funding (operation)	Inadequate;			
Funding (management)	Requires improved			
Funding (governance)	revenue & funding			
Funding (social)	model; Address infra			
Funding (institutional)	and management;			

### 3.4.4 Monitoring and Compliance

<b>Activity</b>	<b>Responsibility</b>	<b>Target date</b>	<b>Estimated cost</b>
Establish and implement project implementation monitoring programme	DWS / COGTA	Annually	R19m per year
Annual WSA Water Services delivery audit report (145 reports)	DWS / WSA	Annually	No additional cost, included in WSDP activities
Establish and maintain overall reliability report and tracking system	DWS	Annually	R20m per year

## 4. SANITATION AND WASTEWATER TREATMENT

The provision of sanitation services is a key requirement for the establishment of sustainable, healthy communities and protection of the environment. Women and girls, and other vulnerable members of society are particularly affected by poor sanitation services. There remains a vast challenge to achieve the 2030 target of sustainable sanitation for all, requiring coordinated inputs from multiple stakeholders.

A more focussed attention to changing the way sanitation services are provided can have a number of social and economic benefits that are aligned to national development goals. Sanitation infrastructure and practices have a significant potential to enhance the principles of health, dignity and the protection of the environment, ensuring an improved quality of life for all.

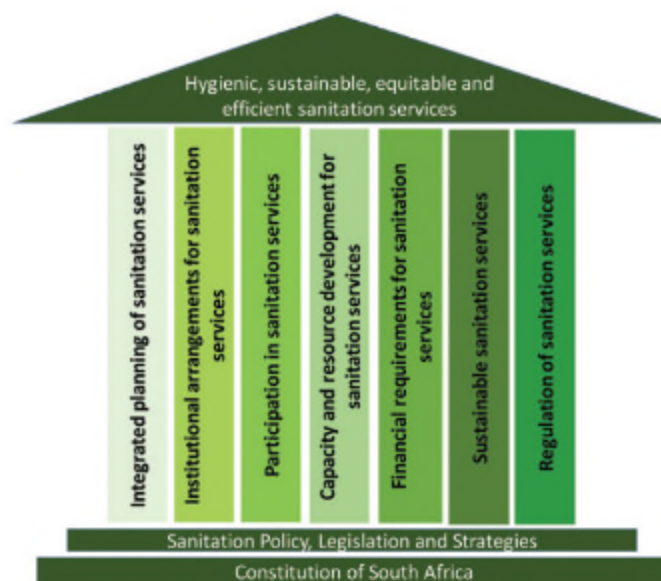
### 4.1 Present State

#### 4.1.1 Policy

The right to access to acceptable sanitation is enshrined in the constitution.

Cabinet approved the National Sanitation Policy in 2016. This policy addresses the “seven policy pillars” to achieve hygienic, sustainable, equitable and efficient sanitation services (Figure 4.1).

This Master Plan supports the implementation of the principles of the National Sanitation Policy in all aspects of planning.



**Figure 4.1: Seven Sanitation Policy Pillars**

#### 4.1.2 Backlogs

Since 1994, and particularly after 2001, an estimated 5.15 million households have been served with safe and acceptable sanitation. The backlog in 1994 was estimated at 4 million households, whereas at April 2017 it is estimated that there are still 3.96 million unserved households. The slow progress in the eradication of the backlog is due to population growth, households becoming smaller (and hence growing at a faster rate than the population), and urban migration (where a person may have been served at his rural home, but has now moved to an informal settlement in a city and has become another un-served member). In addition, the service provided to households previously served has become inadequate in some areas due to many factors including VIP pits not being emptied regularly, ageing infrastructure and infrastructure operated above its design capacity.

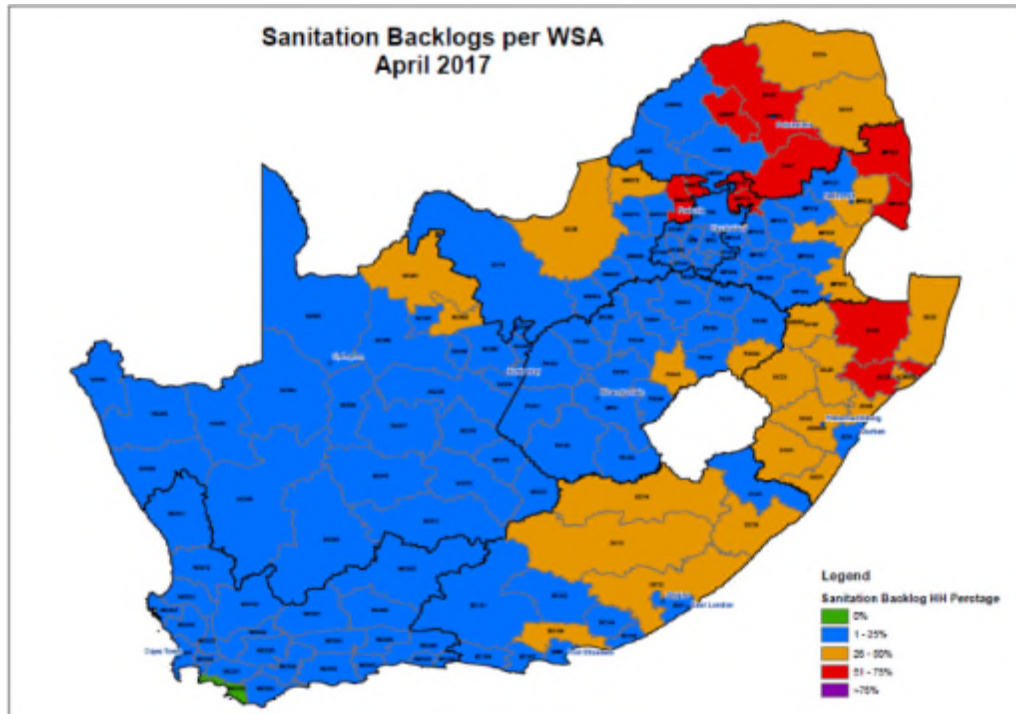
The provincial backlogs (services below RDP level) for sanitation services are indicated in Table 4-1.

**Table 4-1: Provincial Sanitation Backlogs**

Province	Total Households	No. of households below RDP level	% households below RDP level
Eastern Cape	1 807 050	416 391	23.0
Free State	969 199	190 802	19.7
Gauteng	5 153 011	469 836	9.12
Kwa-Zulu Natal	2 963 154	1 018 736	34.4
Limpopo	1 652 306	793 557	48.0
Mpumalanga	1 283 056	494 165	38.5
North West	1 288 454	431 003	33.5
Northern Cape	362 527	68 168	18.8
Western Cape	1 992 998	84 143	4.22
<b>TOTAL</b>	<b>17 471 755</b>	<b>3 966 801</b>	<b>22.7</b>

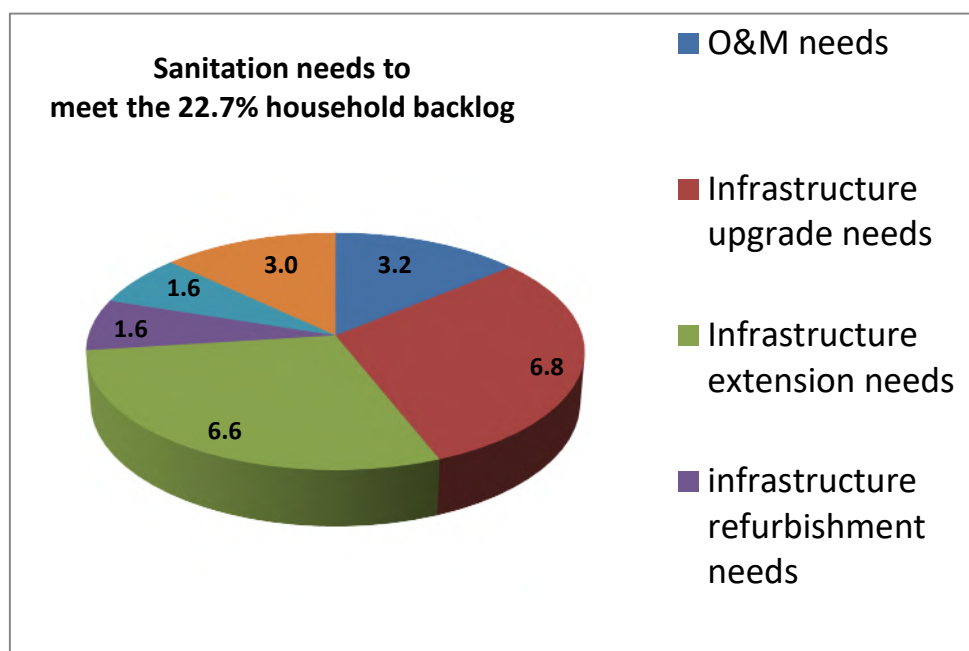
(Source: Census 2011 updated to April 2017 – DWS Water Services Knowledge System)

From a WSA perspective, the situation is as presented in Figure 4.2. From the Table 7-4 and the map (Figure 4.2), it is evident that the largest backlogs, in terms of percentage and in terms of number of households, are in Limpopo, Mpumalanga and Kwa-Zulu Natal. Certain WSAs have backlogs of greater than 50% of total households and the focus of efforts to eradicate sanitation backlogs will have to be intensified in these areas.



**Figure 4.2: Sanitation Backlogs per WSA, April 2017**

In South Africa, 22.7% of households do not have access to an acceptable and adequate sanitation service. The current service provision shortcoming is a combination of challenges as indicated in Figure 4.3, which indicates that approximately 3.0% of households have never received a service, while the remainder of households have access to a sanitation service, however, there are various requirements to ensure its adequacy and sustainability.



**Figure 4.3: Sanitation Planning Needs**

#### 4.1.3 Operations and Maintenance

Two thirds of the WSAs that have settlements served with VIPs assume responsibility for desludging at least some of their VIPs. However, only half of the budget required for this is available and only 17% had a policy in place to guide this function.

The frequency of emptying VIP pits varies between municipalities, with most being in the range of 5 to 8 years.

In terms of operation and maintenance of wastewater treatment works and associated sewerage infrastructure, the situation is monitored by DWS via the Green Drop assessment. Table 4-2 below indicates the Green Drop scores for the different provinces in South Africa. The table indicates that there is a great need to significantly improve the operation and maintenance of sewerage infrastructure in South Africa, but also the management of the wastewater treatment infrastructure, particularly within the provinces achieving less than 70% overall scores. Note also that all provinces have a risk profile score of > 50%, indicating that the environment and water resources are under threat of significant pollution from poor operation and maintenance or over-loading of wastewater treatment works in the country.

**Table 4-2: Green Drop Scores per Province**

Province	No of WWTW	Provincial Green Drop score (%)	Risk profile (CRR as % of CRR(max))
Eastern Cape	123	67.2	70.0
Free State	95	31.5	83.0
Gauteng	56	78.8	57.0
Kwa-Zulu Natal	143	82.0	55.0
Limpopo	67	24.0	79.0
Mpumalanga	76	56.0	73.0
North West	35	50.0	76.0
Northern Cape	71	23.0	76.0
Western Cape	155	83.1	62.0



<i>Province</i>	<i>No of WWTW</i>	<i>Provincial Green Drop score (%)</i>	<i>Risk profile (CRR as % of CRR(max))</i>
<b>TOTAL</b>	<b>821</b>		

(Green Drop Report, 2014, CRR = Cumulative Risk Rating)

Compliance with the Green Drop regulations is generally very poor, with 119 of the 144 WSAs achieving less than 80% compliance in the 2014 Green Drop assessment. This reflects the lack of attention being afforded to the proper management of wastewater in most municipalities. The future focus will require more focus on operation and maintenance, institutional capacity, and adequate resources for management of sanitation.

In certain municipalities there are severe capacity constraints for wastewater operation and maintenance.

### Other Sectors:

The provision of safe sanitation services to schools has been accelerated since 2011 with the Department of Education (DoE) introducing the Accelerated Schools Infrastructure Development Initiative (ASIDI) programme with ambitious targets for ensuring all schools have acceptable levels of sanitation for learners and educators. There has also been an increasing focus on the needs of the girl child which has resulted in both the DoE and a number of non-government organisations (NGOs) and private enterprises and individuals taking initiatives to provide personal sanitary supplies to keep the girl child in school.

However, the provision of sanitation infrastructure at schools is not enough to ensure that learners feel comfortable to use the toilets. Issues of child sensitive design, proper operation and maintenance, together with a number of social aspects, also need to be addressed in the provision of sanitation at schools.

The DoE (DoE) has norms and standards for school sanitation, which guide the provision of toilets and wash basins based on pupil and teacher numbers and ratios.

The provision of sanitation services to public institutions (for example hospitals, clinics, police stations and correctional facilities) is the responsibility of the respective national or provincial departments. The Department of Public Works is usually appointed to plan, design and implement water and sanitation services for these institutions. The backlog has generally been eradicated, but the current status of these services is not known. The budgets for the operation and maintenance of these facilities are with the provincial departments.

Sanitation in the agricultural sector may be seen as facilities for farm workers and secondly for farm dwellers (who are generally not employed by the farmer). Sanitation services for farm workers are covered by the Basic Conditions of Employment Act, whilst farm dwellers are the joint responsibility of the farmer and the municipality (where there is an agreement between the farm owner and the municipality). Farm dwellers are vulnerable and in some cases, receive very poor or no services.

Industries are subject to by-laws of the responsible municipality. However, in many cases the by-laws are out-dated and/or not specific on the requirements of effluent discharged to the sewers. This results in some wastewater treatment works receiving strong effluents that disrupt the treatment processes and a poor quality final effluent.

#### 4.1.4 Institutional

The Municipal Infrastructure Grant programme guide states that inter alia, the DWS is responsible to “Provide support to municipalities in terms of feasibility studies, business plans and implementing water services capital projects”; and to “Monitor water sector related conditions and progress in meeting targets for water and sanitation”.

DWS has set specific conditions (approved by the Municipal Infrastructure Task Team) specific to the water supply and sanitation sector. These are assessed in the technical reports, and where feasible, during project implementation.

#### 4.1.5 Innovation

South Africa has a long history of innovation within the sanitation sector, with research institutions, universities and the private sector having made internationally recognised breakthroughs in various fields. These include biological nutrient removal wastewater treatment works, use of algae in wastewater treatment, application of constructed wetlands for wastewater treatment, and ecological on-site sanitation systems. The Water Research Commission (WRC) now facilitates the testing and further development of innovations of technologies from international programmes within the Bill and Melinda Gates Foundation. The University of KwaZulu-Natal, Cape Peninsula University of Technology and Tshwane University of Technology are at the forefront of research and development within certain disciplines. These include struvite recovery, faecal sludge re-use and the practical adoption of various approaches to the promotion of sanitation in informal and rural settlements. With the strength of these institutions, South Africa can be assured of future innovative developments that can be further commercialised within the sector.

### 4.2 Problems, Challenges & Drivers for Change

The key challenges facing the sanitation sector in South Africa are as follows:

#### 4.2.1 Backlogs: Difficulty in Gaining Ground

Although the Government has delivered more than 5.15 million households with sanitation facilities between 1994 and April 2017, it is not acceptable that so many remain unserved at this stage. Service delivery protests are often with respect to households that have never been served with improved sanitation, or that have sanitation facilities that are not functioning properly.

Informal settlements are by nature transitional settlements where land ownership is not assured, settlements are usually unplanned, and technologies are not suited to these conditions. Municipalities are often reluctant to make infrastructure investments in informal settlements due to:

- settlements not being permanent;
- institutional structures not constant;
- often there is a lack of space to install services; and
- land ownership becomes a hindrance and requires additional time and resources to find a solution.

#### 4.2.2 Sustainability of Sanitation Services

Sustainability of sanitation services relates to a number of aspects of providing a sanitation service:

- VIP pits that are not emptied regularly and poor operation and maintenance of some Waste Water Treatment Works and other infrastructure. This is reflected in Green Drop Reports;
- Ageing sanitation infrastructure;
- In many cases infrastructure is operated beyond its design capacity;
- Available funding for operations and maintenance and insufficient budget being allocated for O&M;
- Capacity and skills to operate and maintain sanitation infrastructure at WSA level;
- Available water supply for water borne sanitation / droughts / climate change. South Africa is a water scarce country and the use of fresh water for flushing toilets is not environmentally responsible. Innovation applied to the need for low water use and low environmental impact technologies which are also sustainable must be encouraged and supported;
- Municipalities are struggling to generate revenue from services provided due to high unemployment, unwillingness to pay and vandalism. In addition, use of more than the free basic allocation without payment is common amongst all economic groups; and
- Addressing challenges or high strength industrial and agricultural processing effluents at Waste Water Treatment Works.

#### 4.2.3 Planning for the Provision of Services

Forward planning in many municipalities is a challenge due to:

- IDPs and WSDPs not being current;
- Poor planning for non-capital costs such as O&M, refurbishment, capital replacement and capacity building of operational staff; and
- Many municipalities do not have adequate records of existing infrastructure and services installed.

#### 4.2.4 Governance and Institutional Structures

The governance and institutional structures require a re-focus in order to address programme bottle necks, neglect of operation and maintenance, and providing adequate support where there is a lack of capacity.

South Africa has taken a number of steps to address institutional shortcomings in the sanitation sector. These include support institutions to strengthen sanitation service delivery at local government level. However, there is a further need to address institutional challenges related to project management and to operation and maintenance of sanitation infrastructure. The needs include human resource capacity, budget allocations and improved asset management.

### 4.3 Desired Future State

The key objectives for sanitation service delivery within the National Water and Sanitation Master Plan are as follows:

- Acceleration of adequate and equitable sanitation service delivery and meeting the target of universal access to acceptable sanitation services by 2030 while paying special attention to the needs of women and girls, and those in vulnerable situations;

- Meeting South Africa’s international obligations towards achieving the Sustainable Development Goals (SDGs);
- Ensuring the sustainability of sanitation services provided;
- Growing the application of safe resource recovery from sanitation systems; and
- Raising the profile of sanitation.

#### 4.4 Action Plan

The following interventions are required to meet the objectives of the sector and to address current problems and challenges:

##### 4.4.1 Provincial priorities

**Table 4-3: Provincial Priorities**

<b>Province</b>	<b>Meeting backlog</b>	<b>Addressing wastewater treatment works</b>	<b>O&amp;M priorities</b>
Eastern Cape	Additional resources* for rural programme and urban informal settlements, as well as other backlogs.	Upgrade failing WWTW, extend capacity of under-capacity works	Moderate GD risk profile: Strengthen O&M capacity and resources in all areas
Free State	Additional resources* for rural & urban programmes as well as other backlogs. Replace all bucket toilets in formal areas	Upgrade failing WWTWs, improve maintenance of WWTWs, extend capacity of under-capacity works	High GD risk profile: Strengthen O&M capacity and resources in all areas
Gauteng	Additional resources* for urban informal settlements as well as other backlogs.	Extend good performance to all areas	Moderate GD risk profile: Strengthen O&M capacity and resources in selected areas
Kwa-Zulu Natal	Additional resources* for rural programme and urban informal settlements as well as other backlogs.	Extend good performance to all areas	Moderate GD risk profile: Strengthen O&M capacity and resources in selected areas
Limpopo	Additional resources* for rural programme as well as other backlogs.	Upgrade failing WWTWs, improve maintenance of WWTWs, extend capacity of under-capacity works	High GD risk profile: Strengthen O&M capacity and resources in all areas
Mpumalanga	Additional resources* for rural and small town programmes as well as other backlogs.	Upgrade failing WWTWs, improve maintenance of WWTWs, extend capacity of under-capacity works	High GD risk profile: Strengthen O&M capacity and resources in all areas
North West	Additional resources* for rural and small town programmes as well as other backlogs.	Upgrade failing WWTWs, improve maintenance of WWTWs, extend capacity of under-capacity works	High GD risk profile: Strengthen O&M capacity and resources in all areas
Northern Cape	Additional resources* for small town programmes as well as other backlogs. Replace all bucket sanitation in formal areas.	Upgrade failing WWTWs, improve maintenance of WWTWs, extend capacity of under-capacity works	High GD risk profile: Strengthen O&M capacity and resources in all areas
Western Cape	Additional resources* for urban informal settlements as well as other backlogs.	Extend good performance to all areas	Moderate GD risk profile: Strengthen O&M capacity and resources in selected areas

\* Resource needs to include financial, skilled manpower and dedicated institutional units

#### 4.4.2 Municipal Sanitation Master Plans

A detailed sanitation master plan is to be formulated (and updated regularly) for each WSA, on meeting the backlogs within their area of jurisdiction. Municipalities must secure funding for Sanitation Master Plans.

These should address at least the following:

- Current status and full description of the backlog;
- Technologies in use and their appropriateness for each settlement;
- Proposed projects to address the backlog, including new works, refurbishment and extensions for each settlement;
- Identification and implementation of improved approaches to sanitation in informal settlements and for backyard dwellers;
- How service delivery will be accelerated to meet national targets;
- Sanitation asset management plan;
- Budget requirements and time frames;
- Other resource needs;
- Institutional plan to ensure acceptance, accountability, adequate capacity;
- An operation and maintenance plan; and
- Achieving of resource recovery, effluent re-use, energy efficiency and reduction of water use in Sanitation targets.

Initial plans should be completed by all WSAs by 2019, and updated every 5 years.

#### 4.4.3 Sanitation and Waste Water Treatment Infrastructure Projects to meet Goals

The implementation of sanitation projects (as identified in sanitation master plans) at municipal level requires a re-visit to address current shortfalls and constraints related to project implementation. This includes:

- Implementation processes and procedures are regularly stalled due to a lack of resources, inadequate attention to detail and lack of consultation. The management of project planning and implementation must be tightened significantly to maintain projects within timeframes and budgets;
- There is a requirement for improved monitoring of the implementation of the projects, planning process and methods to address bottlenecks in approval processes; and
- Community participation must be prioritised and there must be a minimum protocol for participation prior to implementation.

Sanitation infrastructure projects should be planned and implemented to meet the following targets as tabled in Table 4-4:

**Table 4-4: Implementation Targets**

<b>Target</b>	<b>Stakeholders</b>	<b>Responsible</b>	<b>Target date</b>	<b>Capital Financial Requirements</b>	<b>Cost unit rates*</b>
Achieving 85% rural coverage	WSAs	WSAs	2021	R 20 bn	R17 500 per household
Achieving 100% rural coverage	WSAs	WSAs	2024	R 20 bn	R 17 500 per household
Achieving 80% bulk sanitation infrastructure – urban	WSAs	WSAs	2021	R 27 bn	R 50m / MI/day
Achieving 90% bulk sanitation infrastructure – urban	WSAs	WSAs	2024	R 27 bn	R 50m / MI/day
Achieving 100% bulk sanitation infrastructure – urban	WSAs	WSAs	2027	R 27 bn	R 50m / MI/day
Achieving 88% household toilets + sewer reticulation in urban areas	WSAs	WSAs	2021	R 20 bn	R 45 000 / household
Achieving 92% household toilets + sewer reticulation in urban areas	WSAs	WSAs	2024	R 20 bn	R 45 000 / household
Achieving <b>96%</b> household toilets + sewer reticulation in urban areas	WSAs	WSAs	2027	R 20 bn	R 45 000 / households
Achieving <b>100%</b> household toilets + sewer reticulation in urban areas	WSAs	WSAs	2030	R 20 bn	R 45 000 / household

\* Note that unit costs include construction costs, P&Gs, professional fees, VAT.

\* Operating costs are still being calculated and verified.

#### 4.4.4 Improving Sustainability

The roles and responsibilities of the key role players in sanitation service delivery are set out in the National Sanitation Policy of 2016. There are a number of interventions required to improve the sustainability of sanitation schemes, including:

- Ensuring that regulations are appropriate, widely distributed and that structures are in place to monitor their application;
- Asset management by WSAs and water services providers (WSPs) must receive more attention. This may include support from agencies external to the WSA or WSP such as Water Boards or specially constituted support agencies at district or provincial level;
- Encouraging innovation for products and approaches that will enhance sustainability;
- Ensuring application of the Wastewater Risk Abatement Planning at all municipal WWTWs;
- Improving community participation in the planning of and responsibility for the use and care of sanitation infrastructure;
- Improving environmental protection through hygiene and user education, resource recovery, and control of discharges.
- A stronger focus on gender, the disabled and youth roles; and



- Improved monitoring of sanitation systems by the WSA and other agencies, including e.g. DWS Regulations and catchment management agencies (CMAs).

DWS will support WSAs to address the above sustainability issues at each municipality where necessary. This is an on-going programme requiring the strengthening of the institutional capacity of DWS to be able to provide this support.

#### **4.4.5 Review of Governance and Institutional Models**

In order to deal with capacity constraints at various levels, alternative institutional models must be considered and assessed for improving governance of sanitation programmes. Public Private Partnerships have been shown to be viable under certain conditions.

Existing governance and institutional models for O&M, asset management and project implementation should also be reviewed in order to optimise service delivery in the sanitation sector.

#### **4.4.6 Review of Regulations, Tariffs and Funding Structures**

Existing regulations, tariffs and funding structures must be reviewed to enable the implementation of projects and the operation of infrastructure in a sustainable manner.

#### **4.4.7 Promotion of RDI Projects**

RDI projects should be promoted and the newest technology should be utilised in all aspects of the sanitation value chain in order to select the most appropriate sanitation technology in each case. Focus areas for research should be the improvement in the energy demands of WWTWs, effluent re-use, resource recovery and reducing water use in sanitation.

#### **4.4.8 Resource Recovery, Effluent re-use, Improving Energy Efficiency at Waste Water Treatment Works and Reducing Water Use in Sanitation**

Sanitation is not simply a waste management programme, but holds considerable potential for resource recovery in the form of water supplies, fertilizers and energy. Future approaches to wastewater treatment must place more emphasis on resource recovery options.

More advanced wastewater treatment works are very energy intensive requiring high energy inputs particularly for aeration. New approaches to treatment that are energy efficient must be researched and implemented into the future.

Water recovery for agricultural, industrial and drinking water use must be assessed, particularly where there are water resource constraints. In addition, solids recovery for agricultural and other use should be improved.

Reduction of water requirements of sanitation systems – particularly low flush systems, must be extended to not only new projects but also retrofitting of established systems.

### **Forward Planning**

- Identifying spatial growth areas and undertaking holistic planning of these areas; and
- Promoting innovative solutions to sanitation where waterborne or dry systems are not sustainable, and effective resource recovery can be implemented.

See Table 4-5 for areas to focus on.

**Table 4-5: Focus Areas**

Focus area	Role players	Target date	Output
Resource recovery from WWTW for agriculture	WSAs; Dept. of Agric; DWS; DoH, private sector	2024	Strategy + 25% increase of resource recovery for agriculture
Water re-use for industry and mining	WSAs, Dept. of Trade & Industry; Dept. of Mineral Affairs, DWS, private sector	2024	Strategy + 25% increase of resource recovery for industrial use
Energy efficient WWTW	DWS; WRC; CSIR, municipalities, private sector	2030	Strategy + 25% reduction of energy use on WWTW
Low water flushing latrines	DWS; WRC; CSIR	2030	Strategy + 25% reduction of water use in sanitation

## 5. OPERATION AND MAINTENANCE OF INFRASTRUCTURE

### 5.1 Introduction

Even though Operations and Maintenance (O&M) are most often used as a grouping of activities, these are two definitively separate business elements.

The effective **Operation** of infrastructure is based upon the requirements to deliver services according to outcomes-based standards in terms of both quantity and quality.

**Maintenance** is implemented according to a programme which includes routine, planned and unplanned maintenance protocols. These practices are to sustain the condition of infrastructure to enable operations according to design limits.



**Figure 5.1: Elements of Acceptable Service**

### 5.2 Present State

#### Overview

The prominence of various incidents where water supply and sanitation services are reportedly not adhering to the expectations of communities, could serve as an indicator of failing water infrastructure. This might be due to unacceptable operations methodologies and/or ineffective maintenance practices resulting from poor Asset Management principles.

Good Asset Management principles dictate for a more detailed approach to be followed in the space of maintenance, where asset management planning informs the maintenance philosophies

to be adhered to. The lack of national asset management and maintenance standards in the South African water sector leaves water supply and sanitation infrastructure and equipment vulnerable to ineffective maintenance practices as it becomes more challenging to manage and regulate.

### 5.2.1 Water Resources Infrastructure

Current water resources infrastructure and technology used in the storage and transfer of bulk water is very diverse, ranging from ageing to highly advanced. This presents an operation and maintenance challenge to meet user demand under the environment of limited resources. Currently, public water schemes/authorities are experiencing an inability to attract adequate numbers of specialised technical staff required to effectively operate and maintain water schemes. The situation is exacerbated by an under-recovery of revenue which further prevents operational plans from being effectively implemented.

Standard government procurement processes are also not conducive for the implementation of effective operation and maintenance philosophies.

Currently for dams, Dam Safety legislation (*Regulations regarding the safety of dams in terms of Section 123 (1) of the National Water Act, 1998*) provides a clear basis for the operation and maintenance of all structures utilised to store water, with the primary objective of ensuring the safety of people and the environment down-stream of the dam.

Dam Safety legislation has been used as a tool in the management of water storage infrastructure as far as asset maintenance is concerned. There is however a lack of set maintenance standards for dams and reservoirs. The law requires the owner of a dam which has been classified to be a safety risk to carry out mandatory evaluations by an experienced dam specialist and for the owner to implement the recommendations of the dam specialist (i.e. Approved Professional Person). It is also a requirement to have an Operation and Maintenance manual as well as an Emergency Preparedness Plan for a dam. These two documents assist the operator to better manage the infrastructure and ensure the safety of all living downstream in the event of failure.

For all state-owned dams, the Department of Water and Sanitation (DWS) takes responsibility for routine safety inspections, deflection monitoring and undertaking rehabilitation based on a risk-based model. To date 42 dams have been restored by the Dam Safety Rehabilitation Programme of the DWS, with projects for 17 more in progress.

### 5.2.2 Potable Water Supply Infrastructure

Interruption in water supply is one of the key public frustrations. Water services legislation sets the expected standard of 48 hours for interruption of water supply; as per Regulation 4 under Section 9 of the Water Services Act.

Electrical and Mechanical equipment failures are mostly attributed to inadequate routine maintenance, which results in unplanned outages and an inability to pump water to reservoir levels.

Another factor affecting water supply infrastructure is vandalism (especially cable theft) which often leads to the disruption in supply for periods longer than the acceptable norm.

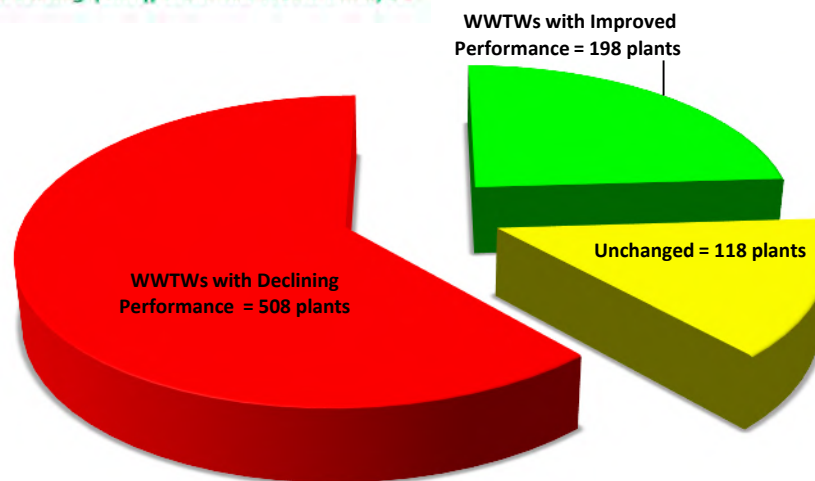
There are also high levels of water losses which could be linked to inadequate pressure management within reticulation systems, which is partially due to the need to supply according to an ever-increasing water demand.

### 5.2.3 Sanitation, Waste Water and Drinking Water Treatment

The deterioration of water resource quality is often as a result of failing sewer collector mains and pump-sets, as well as dysfunctional wastewater treatment works. The Green Drop Regulation processes revealed that most of these failures are due to wastewater treatment facilities being operated beyond design capacity, or being operated by process controllers who lack the necessary skills.

As some water treatment facilities indirectly re-use waste water effluent (rivers and streams with upstream effluent discharge), the deterioration in quality requires that water treatment processes become more complex to compensate for this deterioration in quality. Process control at such treatment facilities is required to be performed by skilled personnel to give effect to risk management controls which in turn need to be informed by water safety planning principles.

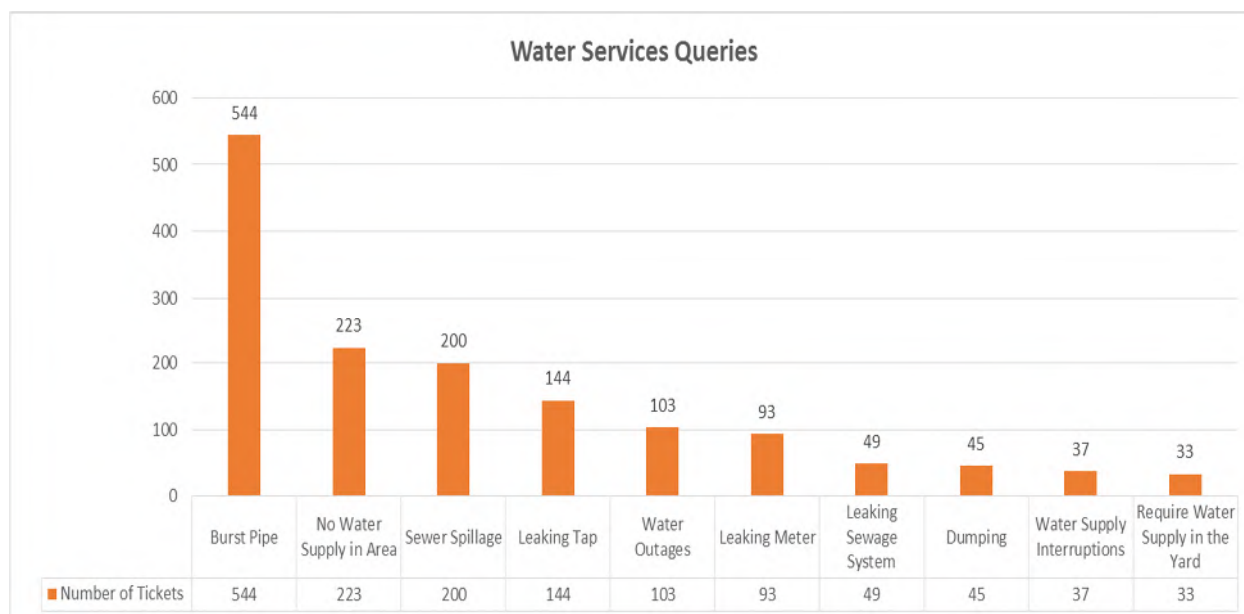
#### Cumulative Risk Rating (CRR)/CRRmax Trend Analysis



**Figure 5.2: CRR/CRRmax Trend Analysis**

Figure 5.2 illustrates the Municipal Wastewater Treatment Risk Rating Performance trend as measured in 2015 (Green Drop Progress Report 2015). The cumulative risk rating performance measurement is based upon the wastewater risk abatement planning (W<sub>2</sub>RAP) concept which was jointly developed by the Department of Water and Sanitation and the Water Research Commission. The purpose is to have a uniform yardstick for wastewater performance measurement and to set risk abatement / reduction targets for each municipal treatment facility. From the 2016 assessment, 508 of the 824 (62%) facilities are found to be in decline with only 198 (24%) been found to have improved.

The DWS currently has a facility where customers can make water services queries. Data from the nature of the queries is presented in Figure 5.3 below to provide a general idea of the trend performance of water services infrastructure.



**Figure 5.3: Summary of Water Services Queries to the DWS Customer Service (June 2016 – June 2017)**

It is evident from the calls the Department’s Customer Service (Toll free Line) received in a period of 1 year that the vast majority of citizen concerns refer to Assurance of Supply or Reliability of supply (62%; considering that “Burst Pipe”, “No Water Supply”, “Water Outages” and “water services Interruptions” are all indicators relating to this category). The responsible citizenry also reported unacceptable sewer operations (17% of calls) which indicate that operation and maintenance practices for this component of the water services business requires improvement.

#### 5.2.4 Asset Management

Asset Management principles dictate for a more detailed approach to be followed in the space of maintenance, where asset management planning informs the maintenance philosophies to be adhered to. The lack of national asset management and maintenance standards in the South African water sector leaves water supply and sanitation infrastructure and equipment vulnerable to ineffective maintenance practices which is challenging to manage and regulate.

### 5.3 Problems, Challenges & Drivers for Change

#### 5.3.1 Overview

It is evident from the above that much improvement is needed in the operation and maintenance practices of water services infrastructure to ensure reliability and quality of supply as required by the Constitution, as well as meet the targets of the SDGs and the MTSF. There are, however, some challenges to meeting these targets.

#### 5.3.2 Human Resources and Capacity Building

Human resources are of primary importance to implement stipulated standards for the rendering of acceptable services. Water services institutions must therefore be required to adequately invest in building level of capacity required to render Acceptable Services.

The aspect of capacity building should be addressed on two (2) fronts:

- Through rigorous retention strategies and

- By strengthening certain key areas through recruitment or head hunting of skilled professionals.

The continuity of effective and efficient operations and maintenance should be ensured by means of training programmes for existing staff to keep abreast with latest technologies and operational practices.

### 5.3.3 Financial

It is important that the financial management of water institutions are well informed of the operational expenditure (OPEX) programme budgetary requirements to inform tariff setting and subsequent budget allocations. As per directive of the *Department of Cooperative Governance and Traditional Affairs (CoGTA)*, municipalities are required to allocate at least 10% of Operational Budgets for maintenance work. This plan will go beyond to require the minimum of 10% expenditure on maintenance work.

Equally important is the need to streamline Supply Chain Management processes to be aligned to the latest National Treasury Regulations for infrastructure related procurement.

### 5.3.4 Technology and Equipment

The development of technology allows for more advanced equipment to monitor functionality and operational efficiency on a continuous basis. All water institutions should be encouraged to invest in this to enhance performance monitoring and through this have a more proactive maintenance approach.

It is also paramount that Operations Management has access to credible and real-time information to ensure the most effective approach towards delivering an acceptable level of service.

## 5.4 Desired Future State

### 5.4.1 Overview

The desired state for water operation and maintenance is to have a (1) *reliable*, (2) *acceptable*, (3) *sustainable* and (4) *affordable* service rendered by an effective institution. For this to be achieved, clearly defined Norms and Standards are required to guide the sector in unison towards investing in infrastructure and capability to operate and maintain according to these national expectations.

In 2003, *Norms and Standards for Water Services* were promulgated under Section 9 of the Water Services Act (Act 108 of 1997), to guide the municipal water sector towards a desired state of water supply. These standards were implemented, but with limited success in the more rural areas, mostly due to the lack of municipal working capital and the lack of strong regulation in the sector.

The implementation of incentive-based regulation programmes (Blue Drop, Green Drop and No Drop certification programmes) brought some improvement in the drinking water quality, wastewater services and water conservation disciplines of municipal water services. This indicates that the desired state of operations should be based upon the service outcome expected, and not necessarily on detailed aspects of operations. This principle supports the regulatory approach of setting standards within the limits of regulatory enforcement capability and



affording operations management the opportunity of optimisation through innovation. A case could be made for maintenance to have detailed standards developed for the following reasons:

- Maintenance Managers need a set of standards to measure the implementation compliance against, especially in cases where work is outsourced. These standards could be used to formulate specifications for maintenance work to be done on water supply and sanitation installations and equipment;
- Sub-standard maintenance work does not only lead to expensive secondary work, but also exacerbates the risk of an unreliable service; and
- Inadequate maintenance leads to an increase in operational cost which detrimentally affects the affordability of service.

From a Water Services perspective the *Water Services Infrastructure Asset Management Strategy* serves as a solid foundation to guide towards improved practices towards sustaining operability of water and sanitation systems.

#### 5.4.2 Desired Future Water Operations and Maintenance Performance Standards

The following is the desired and documented existing performance standards for each water and sanitation Operations and maintenance segment:

**Table 5-1: Water Operations and Maintenance Performance Standards**

<b>Operations Segment</b>	<b>Standard</b>
<b>Storage</b> (Dams: Storage of raw water)	<p><b>Existing:</b></p> <p>Operate all dams according the requirements of:</p> <p>National and Local Water Resource Operating Rules;</p> <p>Dam Safety Legislation (Dam Safety);</p> <p>Emergency Preparedness Planning requirements;</p> <p>Resource Management Planning Requirements; and</p> <p>Water Resource Catchment and Dam Basin Management Principles (Minimising Siltation or Mitigating the Risk of Losing Storage Capacity due to Siltation)</p> <p><b>To be Developed:</b></p> <p>Maintenance Standards for mechanical outlets</p>
<b>Storage</b> (Reservoirs: Storage of potable water)	<p><b>Existing:</b></p> <p>Operate Potable Water Reservoirs to comply with Norms and Standards for:</p> <p>Regulations under Section 9 of the Water Services Act (Act 108 of 1997):</p> <ul style="list-style-type: none"> <li>- Water supply not to be interrupted for more than 48 hours due to unplanned outages;</li> <li>- The quality of potable water supply should not be compromised due to storage associated risks (SANS 241);</li> </ul> <p>Operate on water balance principles to allow for adequate:</p> <ul style="list-style-type: none"> <li>- Operational storage;</li> <li>- Fire Storage; and</li> <li>- Emergency storage.</li> </ul>

<p><b>Measurement</b> (Raw Water Measurement and Potable Water Metering)</p>	<p><b>Existing:</b></p> <p>Regulation 11 under Section 9 of the Water Services Act:</p> <ul style="list-style-type: none"> <li>- Requires water quantities supplied to each bulk zone in the reticulation network and the determination of unaccounted for water</li> </ul> <p>Regulation 13 under Section 9 of the Water Services Act:</p> <ul style="list-style-type: none"> <li>- Water Services Institution to ensure that all user connections are measured by a suitable water volume measuring device.</li> </ul> <p>Dam Safety Regulations apply for large weirs with storage capacity.</p> <p><b>To be Developed:</b></p> <p>National Standards required to guide Water Metering to be in-situ verified and calibrated to adhere to <math>\pm 3\%</math> (raw water) and <math>\pm 2\%</math> (potable water) meter reading accuracy levels.</p> <p>In the light of increased water scarcity, there is a need to intensify the ability of water institutions to impose Tariff Structures (in line with current Regulation 6 under Section 10 Regulations; Step Tariffing) and Credit Control to promote water measurement.</p>
<p><b>Conveyance &amp; Reticulation</b> (Pipes, Tunnels and Canals)</p>	<p><b>Existing (Potable water):</b></p> <p>Water Conservation and Demand Management targets. (<i>WUE to provide</i>)</p> <p>Water Balance forms part of monthly operational targets (as per Regulation 11 under Section 9 of the WS Act).</p> <p>Maintaining safe potable water quality levels (SANS 241 as per Regulation 5 under the WS Act).</p> <p>Pressure Management required maintaining below 900kPa (Within Reticulation networks) as per Regulation 15 under Section 9 of the Water Services Act.</p> <p>Repair Leaks within 48 hrs; as per Regulation 12 under Section 9 of the WS Act.</p> <p><b>To be Developed:</b></p> <p>Standards need to be set for the operations of raw water conveyance systems, i.e. canals and pipe-lines, on water balancing to operate towards minimising water losses.</p> <p>Set Asset Management principles for the determination and prioritisation of rehabilitation (Risk-based Rehabilitation Priority Determination Methodology)</p> <p>National standards for shut down (outage) procedures for the purpose of maintenance (incl. opportunity, planned and unplanned maintenance projects).</p>
<p><b>Abstraction &amp; Transfer</b> (Pump-stations)</p>	<p><b>To be Developed</b></p> <p>Pumping capacity which is equal to the maximum daily demand (plus fire requirements)</p> <p>Redundancy required catering for unforeseen breakdowns.</p> <p>Back-up energy required for crucial domestic supply pump facilities.</p> <p>Abstraction must be monitored continuously to ensure that the resource yield is not exceeded (especially with regards to use of groundwater).</p> <p>National Maintenance Standards required for Mechanical and Electrical engineering work at pump-stations.</p>
<p><b>Water Treatment</b> (Conventional; Desalination and Reclamation treatment facilities)</p>	<p><b>Existing:</b></p> <p>Potable Water Quality at SANS 241 standards. Regulation 5 under Section 9 of the Water Services Act (amended)</p> <p>Maintain Demand of the water supply area in terms of Quality.</p> <p>Reclamation and Desalination plants are also required to treat potable water to SANS 241 standards.</p> <p>The water treatment process is subjected to the water quality management requirements stipulated in SANS 241.</p>

	<p>Ensure correct level of process control skill to ensure effective treatment of water as stipulated by Regulation 2834 (Regulation 17)</p> <p>Risk Management Requirements as per Water Safety Planning standards (Blue Drop Certification Programme Requirements).</p> <p><b>To be Developed:</b></p> <p>Regulation 2834 to be reviewed to cater for new treatment technologies, such as Desalination and Reclamation water treatment facilities.</p> <p>National Maintenance Standards required for Mechanical, Electrical and Civil Engineering work for all types of water treatment works.</p> <p>Norms and standards for the design of treatment facilities according to the economic spectrum of the specific area of service.</p>
<b>Wastewater Treatment</b>	<p><b>Existing:</b></p> <p>Treat wastewater to comply with the Authorisation water quality limits set for the receiving water body.</p> <p>To regulate influent to comply with the design limits of the wastewater treatment facility as per Regulation 9 under Section 9 of the WS Act;</p> <p>To monitor wastewater collection systems for leakages and pump spillages for less than 48 hour turn around as per Regulation 11 under Section 9 of the Water Services Act.</p> <p>Ensure correct level of process control skill to ensure effective treatment of water as stipulated by Regulation 2834 (Regulation 17)</p> <p>Wastewater Risk Abatement Planning (as per Green Drop Requirements).</p>
	<p><b>To be Developed:</b></p> <p>Minimum Requirements for wastewater treatment works design to allow for operational cost requirements meeting the economic strength of the town/city served.</p> <p>National Maintenance Standards required for Mechanical, Electrical and Civil Engineering work for all types of water treatment works.</p> <p>Guidelines for:</p> <ul style="list-style-type: none"> <li>- The unlocking of Green Economy opportunities from wastewater treatment facilities to be used as a source for OPEX funding.</li> <li>- Utilising wastewater effluent as a potential water source; and prescribing minimum requirements for pre-treatment preceding reclamation.</li> </ul>

All water institutions (and private owners where relevant) must take responsibility to operate and maintain water related infrastructure according to the set norms and standards.

The Department of Water and Sanitation will take responsibility to develop policy and regulations and to promulgate these after consultation in the sector.

The Department must enforce regulations (including Norms and Standards) according to the Regulatory Framework (as per the Strategic Framework of 2003) and revitalise/expand innovative approaches such as the incentive-based regulation programmes (Blue Drop, Green Drop and No Drop programmes). Clear timeframes will be required to inform the sector on when new regulations will be promulgated and by when regulatory programmes will be implemented.

## 5.5 Action Plan

The following actions are identified to achieve the desired future indicated above.

<b>No.</b>	<b>Action</b>	<b>Responsibility</b>	<b>Target</b>	<b>Output</b>
1	<p>Develop and Review Norms &amp; Standards for Operations &amp; Maintenance in the South African water sector.</p> <p>*This action is dependent on the finalisation of the primary legislation i.e. National Water Bill</p>	<p>Department of Water &amp; Sanitation (DWS) (together with South African Bureau of Standards (SABS))</p> <p>The Department will be required to convene parallel work-streams, to fast-track the development and review of Regulations listed under section 8.6.</p>	March 2019	A set of secondary legislation in form of Norms, Standards and Regulations, detailing the expected benchmarks for Operations and Maintenance.
2	Develop a Regulatory Framework which will be used to monitor compliance with the set norms, standards and regulations.	DWS	March 2019	<p>A Regulatory Framework which will guide on:</p> <p>Incentive-based Regulation Compliance monitoring; Reporting Requirements; Consequence Regulation</p> <p>This will serve as a revision of Chapter 7 of the Strategic Framework for Water Services; and to include the Water Resource Regulation approach.</p> <p>This will also stipulate a wide-ranging compliance expectation (incl. dam safety, water services and water resource related requirements).</p> <p>It will include the introduction of a Technical Specifications Review for Municipal Infrastructure Development to ensure that only appropriate technology is planned for and implemented.</p>
3	<p>All water institutions to produce a plan towards compliance with promulgated Regulations, Norms and Standards for Operations and Maintenance.</p> <p>This shall be regarded as a 3-year plan towards absolute compliance.</p>	Water Services Authorities; Water Boards; Water User Associations; Irrigation Boards; DWS; etc.	<p>Start: March 2019</p> <p>Target: July 2019</p>	<p>The O&amp;M Regulation Compliance Plan should detail:</p> <p>The O&amp;M Status; The Gap between the current and desired practices; The Plan to close the gap (funding requirements and resources to be used) Target dates for compliance.</p> <p>These plans will then be submitted to the Department for approval and subsequent yardstick for regulatory monitoring.</p>
4	A National Wastewater Treatment Performance Turnaround Plan to be developed and implemented	DWS (and Water Services Authorities and Providers)	Target (Plan): October 2018	Significantly reducing municipal WWTW performance cumulative risk rating (CRR), and facilitate improvement in both effluent

<b>No.</b>	<b>Action</b>	<b>Responsibility</b>	<b>Target</b>	<b>Output</b>
	*The revival of the Green Drop Certification Programme as a means to set wastewater operational performance targets and facilitate improvement through incentive-based regulation.			quality and the receiving water environment.  Annual Milestones to be set for each municipal WWTW.
		DWS	Target: Report on viability by March 2019	Investigate the viability of establishing a National Sanitation Agency (to take responsibility for wastewater treatment operations and maintenance in areas where WSAs are challenged to effectively execute this function.
5	Water Institutions to do a mandatory risk-based assessment of their assets as part of a National Asset Management Baseline Exercise.  *This will be a precursor to a required continuous Asset Management responsibility as per the to-be developed National Asset Management Standard.	Water Services Authorities; Water Boards; Water User Associations; Irrigation Boards; DWS; etc.  To be included in the Executive's Mandate of each institution.	March 2019	Risk-based Asset Management Assessment Report, which will be used to inform: MTEF CAPEX and OPEX funding requirements; Predictive modelling of potential failure; Replacement, Refurbishment and Maintenance programmes/plans
6	Develop an accredited qualification (post graduate) Water Infrastructure Operations Management	EWSETA & DWS	October 2019	A recognised post-graduate qualification which will ensure that institutions can rely on adequately skilled management, to optimally operate and maintain water infrastructure and services.  This will include the negotiations with recognised tertiary institutions to commence with a first intake in January 2020.
7	Develop a Strategy to minimise the impact of Vandalism on Water Infrastructure (Water Infrastructure Vandalism Combatting Strategy)	DWS, DTi; CoGTA, SALGA; SAPS;	March 2019	A strategy which will guide the sector on how to deal with the growing occurrence of vandalism and to combat any unlawful public activity which is putting continued water supply and related services at risk.

## 6. WATER DEMAND MANAGEMENT

South Africa has developed most its surface water resources with nearly all of the readily accessible yield already allocated to users, with limited further opportunities to augment future supply. A growing population and increasing economic activity have resulted in a simultaneous growth in water demand. These, together with a higher than average per capita water use, and high levels of water loss due to leakage, elevate the urgency for the implementation of water conservation and water demand management (WC/WDM) strategies.

Water Conservation and Water Demand Management (WC/WDM) is an integral part of broader strategies needed to reconcile the available supply with the demand for water. It is key to ensure sustainable use of our water resources, and to ensure sufficient water is available for current and future requirements. WC/WDM is also a fundamental step in promoting water use efficiency and is consistent with the National Water Act (Act 36 of 1998) which emphasises effective management of the nation's water resources (DWA, 2004). This builds on the principles of the national water policy (DWA, 1997). The principle states that "Water resources shall be developed, apportioned and managed in such a manner as to enable all use sectors to gain equitable access to the desired quantity, quality and reliability of water. Water Conservation and other measures to manage demand shall be actively promoted as a preferred option to achieve these objectives."

This chapter in the Master Plan aims to:

- Ensure that all sectors use water efficiently and do more with less;
- Raise the importance and the need for a change of attitude and behaviour in terms of how water is treated and conserved by all South Africans through education and awareness programmes;
- Ensure all water use sectors set water use efficiency improvement targets and implement programmatic WC/WDM projects to achieve these set targets;
- Align the water use authorisation process with WC/WDM priorities and encourage interventions to improve water use efficiency; and
- Strengthen capacity within the DWS and the water sector as a whole to implement WC/WDM programmes through institutional development, training and capacity building initiatives.

### 6.1 Present State

#### 6.1.1 Overview

Water use in South Africa is largely dominated by agriculture / irrigation, which accounts for around 62% of all water used in the country. Domestic and urban use accounts for about 27%, while mining, large industries and power generation account for some 7.5%. Commercial forestry plantations account for about 3% of total use through reducing runoff into rivers and streams.

#### 6.1.2 Agriculture Sector

The irrigation sector is by far the largest water user in South Africa. Any percentage reduction in water use in this sector will therefore have a significant effect on the total water requirements.



Currently, about 8.5 million people are directly or indirectly dependent on agriculture for employment and income (GCIS, 2011). The sector contributes about 3% to the GDP and 7% to formal employment. The sector is made up of commercial farmers and subsistence farmers with about 1.3 million hectares irrigated.

The Department, through the Strategic Water Partnership Network (SWPN) has implemented the Water Administration System (WAS) Release Module at a number of irrigation schemes including the Western Canal of the Hartbeespoort Irrigation Board (IB), Sand-Vet Water User Association (WUA), Orange-Riet WUA & Vaalharts WUA, Impala WUA, LORWUA and Loskop IB. With the WAS Release Module, it is possible to release the correct amount of water from a dam (source) according to applications (demand), thereby reducing potential for wastage.

75% (59 out of 78) of the large irrigation schemes are currently submitting monthly Water Use Efficiency Accounting Reports. The results indicate that the average water loss in these schemes is about 27%. It was determined that the seepage and evaporation losses in concrete canals, which is unavoidable, is about 12% of the total loss.

### **6.1.3 Water Services Institutions and Local Government Sector**

#### **6.1.3.1 Current Water Use**

The National Water Balance indicates a total System Input Volume (SIV) of 4 046.46 million kl/a, which indicates a per capita consumption of 237 l/d, which is significantly above the international benchmark of 180 l/c/d. Gauteng Province has the highest per capita authorised consumption at 305 l/c/d followed by Kwazulu-Natal (225 l/c/d), with the rest of the provinces at around 200 l/c/d.

The International Water Association (IWA) water balance for water losses and non-revenue water (NRW) indicates that both items are growing to a higher value in spite of WC/WDM work and projects being implemented. In 2012, NRW was recorded as 38% (WRC Report TT 522/12), but it has since deteriorated to 41% in 2016 (DWS, 2017a).

The current national weighted average NRW is 41.0% of the SIV and seven of the nine provinces have NRW in excess of 30 %, which is considered poor performance. When comparing the provincial NRW, the highest is noted for Eastern Cape, Limpopo and North West, which may be expected due to the high number of rural areas and the challenges associated with billing and metering in these provinces.

#### **6.1.3.2 Status of Existing Municipal WC/WDM Programmes**

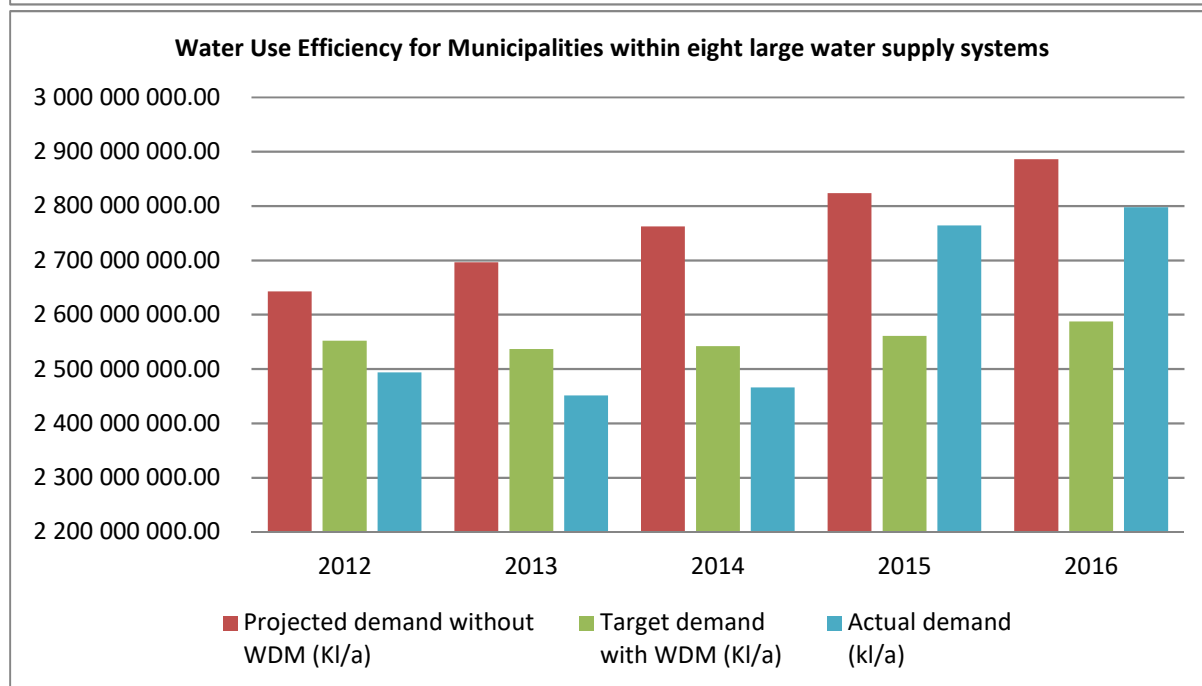
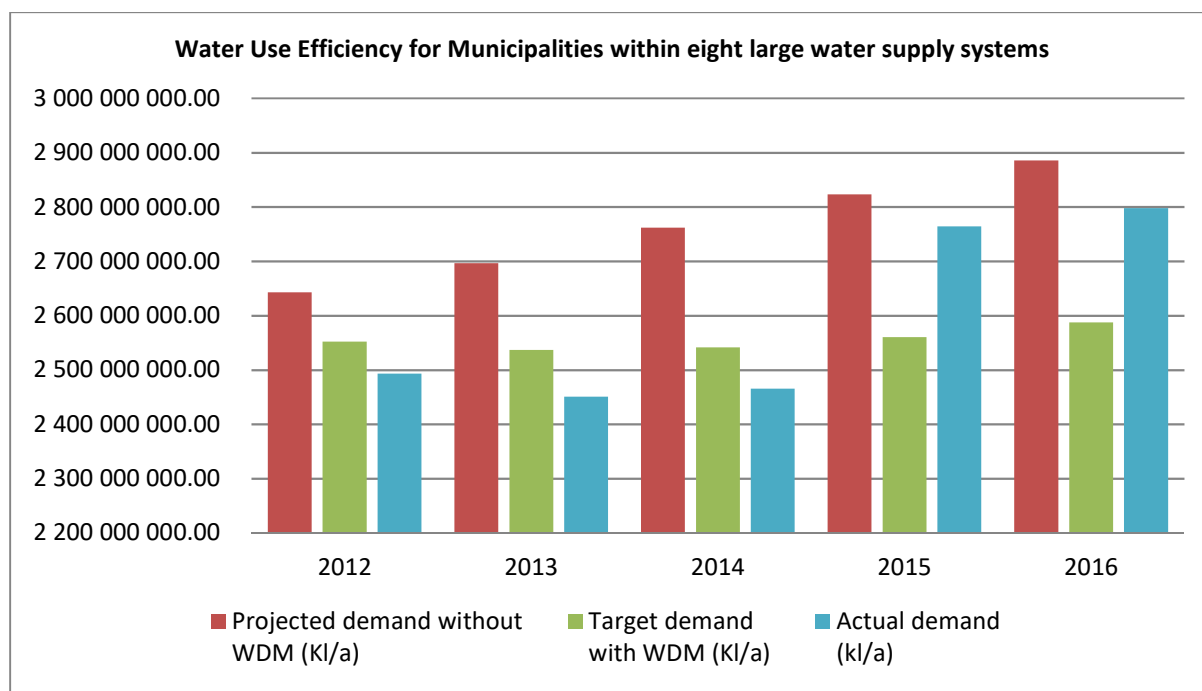
The status of municipal performance regarding WC/WDM remains a concern, especially within the large water supply systems (WSS) supplying metropolitan areas and large cities in the country.

The municipalities in the 8 large Water Supply Systems are situated in areas of high economic significance, further raising the need to increase their efforts to achieve the targets set under the various water reconciliation strategies to ensure water security.

Municipalities generally place too much emphasis on new infrastructure and insufficient focus on the implementation of WC/WDM projects. Budgets are allocated towards new infrastructure projects through grant funding, including the Accelerated Community Infrastructure Program (ACIP), Municipal Water Infrastructure Grant (MWIG), Regional Bulk Infrastructure Grant (RBIG) and Municipal Infrastructure Grant (MIG).

The Department of Water and Sanitation (DWS) continuously monitors and analyses the progress made with the implementation of WC/WDM and targets set during the updating of Reconciliation Strategies, at municipal level, within the eight large water supply systems (WSS).

A total of an estimated 8.6% savings were achieved between 2012 and December 2016 compared with a target of 11.3%. Savings of 3.6% were achieved between June 2016 and December 2016 due to water restrictions being imposed in most of the water supply systems due to drought. The Western Cape WSS, Kwa-Zulu Natal Coastal Metropolitan WSS and Greater Bloemfontein WSS have reached their targets, while the remaining five WSS's demand graphs are generally following the population growth demand scenarios without WC/WDM (DWS, 2017).



**Figure 6.1: Historical Trend of Water Use Efficiency within the Eight Large Water Supply Systems**

During base year 2012 the actual demand was below target demand and projected demand without WC/WDM (high growth scenario). The same trend applies for both 2013 and 2014. However, for the years 2015 and 2016 the actual demand was higher than the target demand which confirmed WC/WDM was not effective enough and did not impact on the actual growth in demand.

### **6.1.3.3 2015 No Drop Full Audit Results: Metropolitan Municipalities**

There are eight metropolitan municipalities (metros) in South Africa with a combined annual demand of 2 158.8 million m<sup>3</sup>/annum, serving a population of 21.5 million. Metros represent 40% of the South African population and 47% of urban water consumption.

The last comprehensive baseline assessment of non-revenue water (NRW) and water losses in South Africa was published in 2015 as the No Drop assessment, a first order assessment of water loss, water use efficiency and non-revenue water in Municipalities. The No Drop component focused on 3 KPAs: water balance (30%); strategy, planning and implementation (30%); and performance and compliance (40%).

In 2015, none of the metros received No Drop Certification (i.e. scored >90%). The City of Cape Town achieved a good performance, closely followed by Ekurhuleni, eThekweni and City of Tshwane, which all have above average scores. Nelson Mandela Bay, City of Johannesburg, Mangaung and Buffalo City all have scores below the average of 69%.

The IWA water balance for metros for 2013/14 FY indicates a total metro (SIV) of 2 158.78 million kl/a, which is 2.4 % above the available supply from the combined water resources.

The total metro NRW is 923.5 million m<sup>3</sup>/a (34.5 % of the SIV). Six metros (three quarters) have NRW in excess of 35%. This clearly shows on average the metros are not performing well compared with the international benchmark at 10-20% NRW. The average water use per capita per day within metros is 267 l/c/d, which is high compared to international benchmarks.

The Infrastructure Leakage Index (ILI) is the preferred real water loss indicator of the IWA and provides an indication of current physical losses versus the expected physical losses. The average ILI for all metros is 5.4, which is considered average.

### **6.1.3.4 Behaviour change around water usage**

Evidence has shown that most technical interventions without adequate social engagement and education of communities often lead to failures of good technical interventions. The social pillar is thus driven mainly to ensure community buy-in and support of technical programmes aimed at reducing water losses and wastages within communities. The WC/WDM education and awareness campaigns that the Department has implemented are as follows:

#### **“Be water wise” The truck / puppet shows campaign**

This campaign is a road show campaign. The Truck Campaign is aimed to create awareness and educate South Africans about water use efficiency. It became successful with the help of all relevant stakeholders involved such as municipalities and other relevant stakeholders. The Truck Campaign consists of the Truck which is used to carry water use efficiency messages. The Truck gets to be branded with the DWS logo and water saving tips. The department also distribute water use efficiency promotional material to community members, at all different stops during this campaign. Most of the promotional material consists of brochures, water bottles, cups, 25l

buckets, school bags etc. All these carry very powerful messages of water use efficiency. The Department appointed the Water Ambassadors, who are celebrities and professional actors. These water use efficiency ambassadors do industrial theatre performance which is an integral part of the campaign. The performance that is conducted by water use efficiency ambassadors is aimed at creating awareness and educating people on how water is being wasted on daily basis and how people can save water by giving them water saving tips to avoid unnecessary water wastages. The community interacted very well with the water use efficiency ambassadors.

### **Door to door Campaign**

The Department and municipalities officials conduct door to door campaigns educating and creating awareness for water use efficiency. The program of this campaign is mostly dependent on the municipality that has invited the department. The promotional materials are also distributed, such as water saving tips and how to fix leaking taps. The municipal officials in this campaign provide the plumbers and do live demonstration on how to fix leaking taps and toilets in communities visited.

### **School Campaigns**

The department runs school competitions to involve learners in solving water issues, especially within the water use efficiency spectrum. The schools project is called South African Youth Water Prize, which is a science & technology based project. The competition begins at provincial level and proceeds to the national level. The national winner represents South Africa in the Stockholm Junior Water Prize (SJWP) in Stockholm, Sweden to compete with learners from 30 countries annually.

### **Education and Awareness Workshops in the Agricultural Sector**

It is estimated that the water losses through canals of the irrigation schemes are between 35 to 45%. Efficient use of water by the sector has the potential to play a significant role towards making more water available for use not only within the agricultural sector, but also for the other water use sectors. It is therefore important to conduct education and awareness in this sector to ensure that the agricultural sector implements WC/WDM measures. The Department of Water and Sanitation, hosts workshops with the irrigation schemes on water use efficiency and WCWDM.

Education and awareness is not the function of national government only, all sector institutions, private sector organizations and civil society should be institutionalising the promotion of WC/WDM.

#### **6.1.4 Industries, Mining and Power Generation Sectors.**

##### **6.1.4.1 Manufacturing**

The manufacturing sector contributed 15.5% to the GDP and 13.3% to jobs in 2009 (GCIS, 2011). The NDP has set a target of 350 000 new jobs for this sector by 2020. Water is an input in the manufacturing processes and it is also used for cooling. The manufacturing sector has been identified in the NDP as a pillar sector to drive economic growth and social development of the

country. Although the sector is earmarked for future growth in water demand, there is still a need for WC/WDM in the sector.

#### **6.1.4.2 Mining**

The Mining Sector, according to the Chamber of Mines of SA, contributed 8.8% directly and 10% indirectly to the GDP of SA in 2009 (GCIS, 2011). It creates about 1 million direct and indirect jobs.

The development of new mines in water scarce areas requires forward planning to make arrangements for the transfer of water and development of new sources. The water allocation to mining industry currently represents about 2.5 % of total water allocation in South Africa. The efficiency of water usage by different mining sub-sectors has not yet been systematically determined, however data from a study commissioned by DWS in partnership with the Chamber of Mines in 2012 does provide some indicative water use efficiency benchmarks for common minerals mined in South Africa.

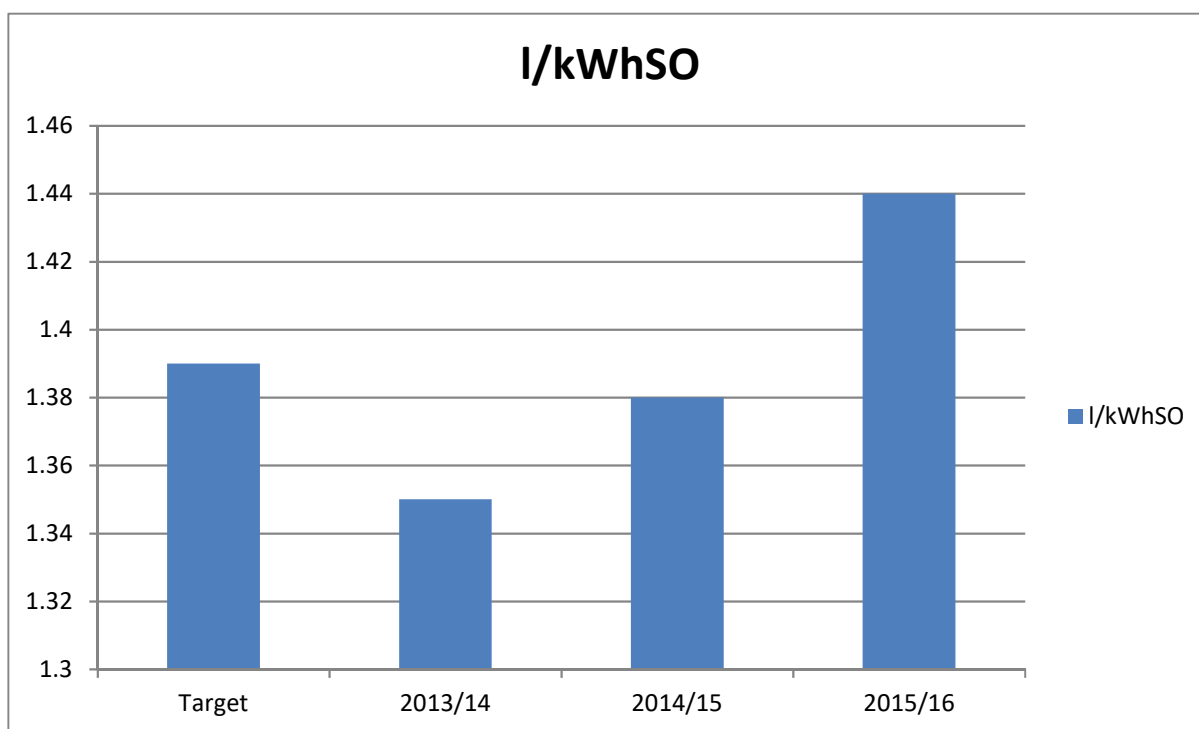
There are many opportunities for WC/WDM initiatives in the mining sector. These, along with a range of technical interventions developed in association sector partners like WRC and CSIR aimed at improving water usage in mining, as well as water treatment and re-use options such as the eMalahleni Water Reclamation project and others, further illustrate room for improvement.

#### **6.1.4.3 Power Generation Sector**

The energy sector, although only using 2% of water, contributes about 15% to the GDP of South Africa and employs 250 000 people (GCIS, 2011). The energy sector, including Eskom, is highly dependent on reliable supplies of water for the generation of electricity (steam generation and cooling processes), and an elaborate and sophisticated network of water transfer and storage schemes have been developed specifically to support this sector and ensure high levels of reliability.

At present, Eskom's coal based power plant fleet consists of 10 base load power plants (used during normal demand) and 3 return to service (RTS) power plants (used during peak demand). These power plants have diverse technical parameters and use a combination of cooling technologies which is bound to provide different water usage profiles.

Eskom has set itself a target of 1.39 l/kWhSO. It performed well against the target for the 2013/14 and 2014/15 financial years. Consumption for the 2015/16 year was however undesirably outside of the set target as shown in Figure 6-2 below.



*Figure 6.2: Eskom's Performance (Water Intensities for the past three years)*

## 6.2 Problems, Challenges & Drivers for Change

The National Development Plan (NDP) sets out the priorities for water demand management and projects the importance for a reduction in water demand by 2030. The NDP specifies an average reduction in water demand of 15% below baseline levels in urban areas by 2030, where the baseline is taken as year 2012.

Achieving demand reductions on this scale will require active programmes to reduce water leakage in distribution networks, and to increase the efficiency of water use by domestic and commercial water users. The NDP further requires targets to be in place for 2012, 2017 and 2022 horizon.

Unfortunately, WC/WDM is still not treated as a priority hence there is still lack of proper planning, implementation, reporting, regulation and the very high per capita consumption.

In the manufacturing and mining sectors, water is often considered cheap compared to the investment required to implement WC/WDM. Aggressive measures to conserve water and manage demand are often only implemented when water becomes scarce.

One of the biggest challenges in ensuring the effectiveness of water conservation and water demand management programmes is the paradigm shift required amongst all South Africans to understand the importance of conserving the nation's water resources. Traditionally, there are stereotypes, mind-sets and social beliefs that result in high water wastage. It is thus important to ensure community buy-in and support of technical programmes aimed at reducing water losses and wastages within communities.

## 6.3 Desired Future State

The National Development Plan (NDP) sets out the priorities for water demand management and projects the importance for a reduction in water demand by 2030. The NDP targets an average reduction in water demand of 15% below baseline levels\* in urban areas by 2030, where the



baseline is taken as year 2012. The Plan acknowledges and refers to the detailed suggested targets that have already been set for different catchments through the Reconciliation Strategies and All-Town Strategies. Achieving demand reductions on this scale will require active programmes to reduce water leakage in distribution networks, and to increase the efficiency of water use by domestic and commercial water users.

A Water Conservation and Water Demand Management Master Plan framework must be developed setting out actions, initiatives and interventions at high a level to substantially increase Water Use Efficiency across all water use sectors. The objectives of the plan shall be:

- To ensure that all sectors use water efficiently and effectively to enhance existing WC/WDM programmes across all sectors;
- To raise the importance and the need for a change of attitude and behaviour in terms of how water is treated and conserved by all South Africans through education and awareness programmes;
- To ensure all water use sectors set water use efficiency improvement targets and implement programmatic WC/WDM projects to achieve these set targets;
- To align the water use regulations and authorisation process with WC/WDM priorities and encourage interventions (based on appropriate pricing strategies) to improve water use efficiency;
- To establish legislative environment promoting the implementation of water use efficient technologies and devices, based on the latest research and development, throughout the sector, but with specific emphasis to the agricultural and domestic use sectors; and
- To strengthen capacity within the DWS and the water sector as a whole to implement WC/WDM programmes through institutional development, training and capacity building initiatives.

## 6.4 Action Plan

### 6.4.1 Agricultural Sector

Proposed programme of high level key WC/WDM activities, measures, projects and programmes for the Agricultural Sector are outlined in Table 6-1 with clear roles for stakeholders to be achieved by 2030.

**Table 6-1: High Level Key WC/WDM Issues and Measures to be implemented in the Agriculture Sector**

<b>Key issues</b>	<b>Description of the challenges</b>	<b>Measures/Intervention</b>	<b>Outcome</b>	<b>Responsible</b>	<b>Timeline</b>
Identification of priority schemes for intervention	Areas / schemes need to be identified where measurement / monitoring and infrastructural interventions will have the biggest impact	A study is required to identify priority schemes, and this study must be reviewed every 5 years. The study must identify where measurement devices and monitoring equipment is required, and prioritise schemes where infrastructural interventions is required.	Proper water balancing at priority schemes and reduction in losses	DWS	2019 and every 5 years after.

<b>Key issues</b>	<b>Description of the challenges</b>	<b>Measures/Intervention</b>	<b>Outcome</b>	<b>Responsible</b>	<b>Timeline</b>
Water measurement and real time monitoring system at major irrigation schemes	Lack of measurement at critical point in major irrigation schemes to determine the distribution efficiency and real time monitoring system.	Undertake a study to determine the cost of installation of measurements at the critical points of major irrigation schemes and real time monitoring systems at the schemes.	Cost of measurements and real time monitoring systems installation and the implementation plan accompanied by signed implementation agreement between responsible authorities	Study: DWS (WUE), Agreement: DWS and Water Use Association, Government Water Schemes and Irrigation Boards  DWS (Water Pricing) DAFF, DLRD, Irrigation Schemes and DWS	2020
Conditions of canal infrastructure	Ageing canal infrastructure. Poor O&M.	Refurbishment/rehabilitation programme undertaken for the irrigation schemes, starting with priority schemes	Improve condition of infrastructure	DWS (Water Pricing) DAFF, DLRD, Irrigation Schemes and DWS	2020
Lack of incentive based pricing/tariff structure	Pricing based on scheduled quota doesn't encourage water use efficiency.	Policy developed to charge farmers based on volumetric use and to provide incentives for farmers to invest in modern, water saving irrigation technologies.	Volumetric based charge to incentivise Water Conservation		2025
Water efficient irrigation technologies and implementing good water management practices	No monitoring of soil moisture content, scheduling of irrigation and optimum operation of irrigation systems	Replace flood systems with water efficient technologies (drip, micro-sprinkler). Provide technological assistance to enhance optimal management practices	Improved productivity and efficiency in the use of water on the farm	DWS (Water Pricing)	2025
Capital investment required to implement the programme	R 25 Billion/10 Years			DWS (Water Pricing)	
<b>Capital investment required to implement the programme</b>				<b>R 25 Billion/10 Years</b>	

#### 6.4.1.1 Water Services Institutions and Local Government Sector

Proposed programmes of high level key WC/WDM activities, measures, projects and programmes for the Water Services sector are outlined in Table 6-2 with clear roles for stakeholders to be achieved by 2030.

**Table 6-2: High Level Key WC/WDM Issues and Measures to be implemented in the Water Services Sector**

<b>Key issues</b>	<b>Description of the challenges</b>	<b>Measures/Intervention</b>	<b>Outcome</b>	<b>Responsible</b>	<b>Time line</b>
High UAW losses and NRW and losses	Water losses and NRW unacceptably higher than international benchmarks	Reduce non-revenue water percentage to 15% or less on average	current levels minus 15% Reduced non-revenue water percentage to	LA, COGTA, SALGA, DWS, NT	2030

<b>Key issues</b>	<b>Description of the challenges</b>	<b>Measures/Intervention</b>	<b>Outcome</b>	<b>Responsible</b>	<b>Time line</b>
		Entire sector, emphasis on class A and B1 municipalities	15% or less on average		
High per-capita water use	Per-capita use is unacceptably high	Reduce per capita consumption to world average consumption of approx 173 l/c/d by enforcing municipal bylaws to regulate domestic use.  Investment in water efficient technologies and devices.	Reduced per-capita water use	Municipalities, COGTA, SALGA, NT and DWS	2019
					2018
Lack of implementation of WC/WDM Plans	Lack of adequate funding	5% of water capital budget set aside for WC/WDM related O&M activities	Adequate funding for WC/WDM	Municipalities, COGTAs SALGA, NT and DWS	Year 2022
	Lack of skilled personnel and capacity	Appoint and train suitable personnel on WC/WDM: 6 civil engineers., 24 technicians., 96 artisans = 126 /100000 people.	Skilled personnel on WC/WDM	SALGA, COGTA, DWS and Municipalities	2020
	No institutional prioritization of WC/WDM	Strategic prioritization of WC/WDM in the Municipalities	WC/WDM - strategic priority, incl. in BP, PA, 2017-KPIs for MM	DWS and Municipalities	2020
	Lack of adequate planning,	Include WC/WDM in the planning processes such as WSDP and IDP	All statutory planning processes include WC/WDM	DWS and Municipalities	2018
	Lack of O&M of WS systems	Standard operating procedure to include O&M activities related to WC/WDM measures.	Improve O&M of infrastructure	Municipalities	2020
Lack of metering, billing and cost recovery	Same	Installation of meters for the entire water value chain, establish proper billing system and cost recovery	Universal metering, effective billing for all customers	COGTA, SALGA and Municipalities	2018
Inadequate reporting	Inadequate or no water balance reporting	Include IWA water balance as part of all mandatory reporting	Quarterly IWA water balance	Municipalities	2020
Lack of capacity to enforce Regulation 509	Same	Institutional realignment to provide for WC/WDM regulation	Institutional capacity developed	DWS	2025
<b>Capital investment required to implement the programme</b>				<b>R 10 Billion/ 10 years</b>	

#### 6.4.1.2 Industries, Mining and Power Generation Sectors

Proposed programme of high level key WC/WDM activities, measures, projects and programmes for the Industries, Mining and Power Generation Sector are outlined in the Error! Not a valid bookmark self-reference. with clear roles for stakeholders to be achieved on or before 2030 as specified.

**Table 6-3 High level key WC/WDM Issues and Measures to be implemented in the Industries, Mining and Power Generation Sector**

<b>Key issues</b>	<b>Challenges</b>	<b>Measures/ Interventions</b>	<b>Outcome</b>	<b>Responsible</b>	<b>Time line</b>
Inefficiency of water usage by the IMP sectors	No adequate implementation of meaningful WC/WDM initiatives by the sector	Implementation of WC/WDM measures and investment in water efficient technologies/devices (Very high priority)	Reduction in total water used per unit production i.e. specific consumption by 5-10% over a period of 10 years, in line with WUE national benchmarks for various mining commodities.  Reduction in total water used per unit production for the power generation sector in line with the current sector targets (5 – 10 % over a 10 year period)	Mining, and industry stakeholders Eskom / Power Producers	2027 and beyond
Lack of key performance standard	No agreed key performance standard for the industries	Develop key performance standard for various industry sub sectors .i.e. benchmarks, KPI's and best management practices	WUE KPIs and benchmarks developed for selected wet industries	DWS and industry stakeholders	Year 2020
Lack of reporting and monitoring tools	No reporting and monitoring system in place (all industrial sectors)	Develop WUE reporting and monitoring system for the mining sector and wet industries (High priority level)	Web-based Standardised Water Accounting Framework (SWAF) for mines functional by 2020 and for wet industries by 2022	DWS	2022
Lack of enforcement tools	Weak WC/WDM enforcement tools	Develop specific WC/WDM License conditions and Regulations for industries	Develop specific WC/WDM conditions and incorporate into the water use licenses by 2018. Regulations governing WC/WDM implementation by the industry developed and promulgated.	DWS	2018

Weak Partnerships and collaborations	Strengthen existing partnership with various sector partners	Formalise partnership agreements with sector umbrella bodies and other relevant institutions	Implementation of the recently signed MoU between the DWS and Chamber of Mines MoU in place between DWS and key wet industries umbrella bodies including the energy sector Implementation of the current MoU between DWS and Eskom	DWS and Industry	2020
Promotion of water stewardship	Need for industries to support	CEO mandate, water footprint and PPP social partnership with communities.	More involvement of industries in communities	DWS and Industries	
<b>Capital investment required to implement the programme</b>				<b>R 5 Billion/ 10 years</b>	

## 7. WATER QUALITY MANAGEMENT

### 7.1 Background

#### 7.1.1 What is meant by “Water Quality”

*Water Quality* refers to the chemical, physical and biological characteristics of water and is a measure of the condition of water relative to a water quality compliance standard, or relative to the water quality requirements of one or more biotic species or receiving water users.

Although scientific measurements are used to define the *quality of water*, it's not a simple matter to say that *"this water is good"* or *"that water is bad"*. The quality of water that is required for industrial purposes, for instance, is not necessarily the same quality of water that is required for drinking purposes. Therefore, water quality, should be compliant to a set standard, or suitable for its intended use, be it for agricultural, domestic, industrial, recreational or spiritual purposes, or its suitability to maintain a healthy aquatic ecosystem.

### 7.2 Present State

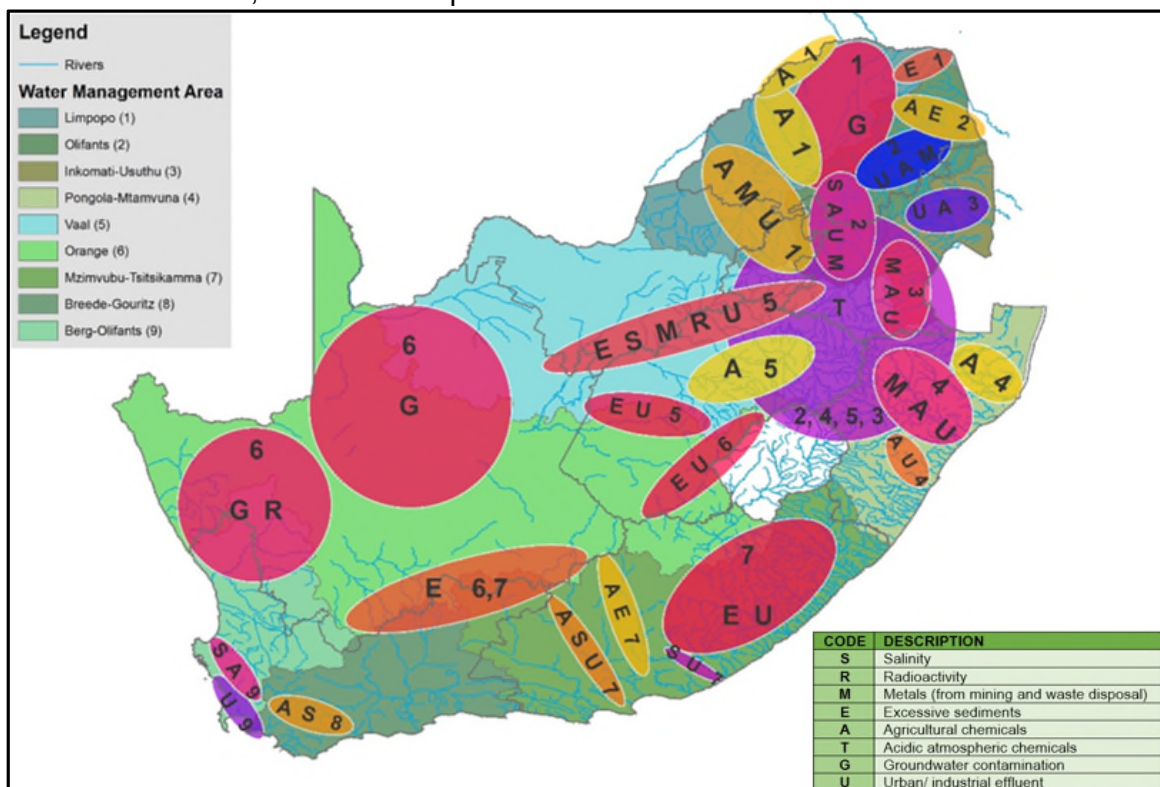
#### 7.2.1 National and Catchment Perspective

Water quality and water quantity issues are inextricably linked and the management of water quality cannot be done in isolation from the management of abstraction, storage and use. One of the elements of *Water Quality Management* is recognising that water resources have a certain capacity to assimilate waste up to a point above which such water resources becomes unfit for use. The volumes of water abstracted from our water resources have three impacts on water quality:

- firstly, growing abstraction decreases the amount of water available in the water resources, resulting in reduced dilution capacity and increased concentrations of pollutants in receiving water resources;

- secondly, a portion of the abstracted water is usually returned to the water resources at the tail end of the use processes, usually in a worse quality than when abstracted; and
- thirdly, effective water conservation and water demand management intervention, not only reduces abstraction and return-flow volumes, it also results in concentrated return-flows which favour more cost-effective treatment solutions.

Water quality problems are manifested at various scales (Figure 7.1). Salinization, sedimentation, nutrients enrichment and microbial pollution (associated with urban effluent) probably occur at a national scale while acid mine drainage, agrochemicals and nutrient enrichment (associated with industrial effluent and irrigation return-flows) occur at regional or site-specific scales. South Africa faces a wide range of water quality challenges impacting on both surface water and groundwater, originating from both point source discharges such as industrial processes and municipal waste water treatment works, and from non-point sources due to run-off from land.



**Figure 7.1: Different types of Water Quality problems across South Africa (Ashton, 2012)**

Recent assessments have shown that 83% of the country's national monitoring sites reflect some form of water quality challenge.

### A Sector Perspective

Currently, much of the water quality of the country's water resources is influenced by wastewater discharges and other land-based activities. Major impacting sources include agricultural drainage and wash-off (irrigation return-flows, fertilisers, pesticides and runoff from feedlots); urban wash-off and effluent return-flows (bacteriological contamination, salts and nutrients); industries (chemical substances); mining (acids, salts, metals and radioactivity); and areas with insufficient sanitation services (microbial contamination). The quality of groundwater is influenced by mining activities, leachate from landfills, human settlements and intrusion of sea water.



There is a considerable range of water quality issues, as the economy develops the pressures to stay abreast of new forms of pollution will only increase and monitoring and /or further investigation to improve our understanding of these pollutants and their impacts will be strategically critical.

Five significant issues are shown to require high prioritisation in terms of the societal and economic impact and require a strategic, adaptive and action oriented *Water Quality Management* approach. These five priority issues are: (1) eutrophication; (2) salinization; (3) acid mine drainage and acidification; (4) sedimentation; and (5) urban runoff pollution. Each of these five issues emanates from various sources and has a range of factors that exacerbate their impact.

These primary water quality challenges all have multi-sectoral characteristics and speak to the overlapping or adjacent mandates of a range of government institutions. For that reason, the requisite future management responses to these challenges will need to go well beyond the statutory and regulatory mandate, measures, controls, instruments and processes of the Department of Water and Sanitation (DWS) alone. The future management of these challenges will need strategic regulatory collaboration and partnerships between the DWS and various other state institutions across all three spheres of government, the Catchment Management Agency (CMAs), water boards (likely to be replaced by Regional Water Utilities in future), the private sector and organised civil society.

### “Mega trends” potentially affecting water quality

Six “*mega-trends*” have been identified, which can be expected to unfold in South Africa during the next few decades and which could lead to new or accelerated *Water Quality* challenges in many locations across the country. These are as follows: (1) climate change; (2) hydraulic fracturing; (3) renewable energy; (4) the water-energy-food security nexus; (5) rural-urban migration and growth of inadequately serviced densely populated settlements; and (6) water re-use. These trends will require new and adaptive policy approaches, will require increased levels of cooperative governance between sectors and will require ongoing monitoring.

### 7.2.2 Problems, Challenges & Drivers for Change

South Africa faces a wide range of water quality challenges impacting on both surface water and groundwater. These impacts are likely to be affected by several future trends, including increased demands for limited water supplies, increasing pressure on water resources as a result of population growth and development, changes in temperature and rainfall due to climate change, increased urban impacts due to rapid urbanisation and increased needs for food and energy production.

Deteriorating water quality has the potential to significantly limit the economic growth potential of the country. The deterioration of water quality in rivers, streams, dams, wetlands, estuaries and aquifers impacts on the economy, on human health, and on the healthy functioning of aquatic ecosystems. Deteriorating Water Quality reduces the amount of water available for use as more water must be retained to maintain the dilution capacity in our river systems. It increases the costs of doing business as many enterprises are forced to treat water before using it in their industrial processes. The deterioration in Water Quality also impacts on human well-being, with productivity falling as more work days are lost due to water-related illnesses and, finally, it threatens several economic sectors by impacting on crop yields, making crops vulnerable to

import restrictions in key trading partner countries. Some of the impacts of Water Quality deterioration are immediately visible, such as in the case of major fish kills, while others are more insidious and long-term. Combined, however, they are having a significantly negative impact on socio-economic development in South Africa.

Historically, *Water Quality Management* has been the sole mandate of the Department of Water and Sanitation (DWS). However, there are other government departments whose mandates have a profound impact on Water Quality, most critically those of the Departments of Environmental Affairs (DEA), Mineral Resources (DMR), Agriculture, Forestry and Fisheries (DAFF), Health (DH), Human Settlements (DHS), Education (DE), Co-operative Government and Traditional Affairs (CoGTA), National Treasury (NT), Trade and Industry (DTI), together with provincial counterparts where relevant, and municipalities. Recognising these operational challenges, effective and integrated *Water Quality Management* is a government-wide task, to be implemented under strong leadership of the DWS, with both the private sector and civil society playing a role.

### 7.3 Desired Future State

#### 7.3.1 High-level Water Quality Management Master Plan Targets

Three high-level outcomes-based targets to be progressively realised by 2030 are set for the *Water Quality Management* component of the National Water and Sanitation Master Plan (Figure 7.2). The three high-level targets were selected on the basis of the Department of Water and Sanitation's (DWS's) constitutional mandate and its statutory obligations in terms of applicable national water legislation. The High-level Master Plan Targets for *Water Quality Management*, further, stand in support of those components of SDG 6 that have direct Water Quality relevance. Each of the three high-level targets represents milestone objectives that are only realisable upon the harmonious implementation of multiple preceding strategic actions. These three high-level targets pertain to (1) resource Water Quality management; (2) source control; and (3) integrated *Water Quality Management*, and are further contextualised below.

**South Africa must restore raw water quality**

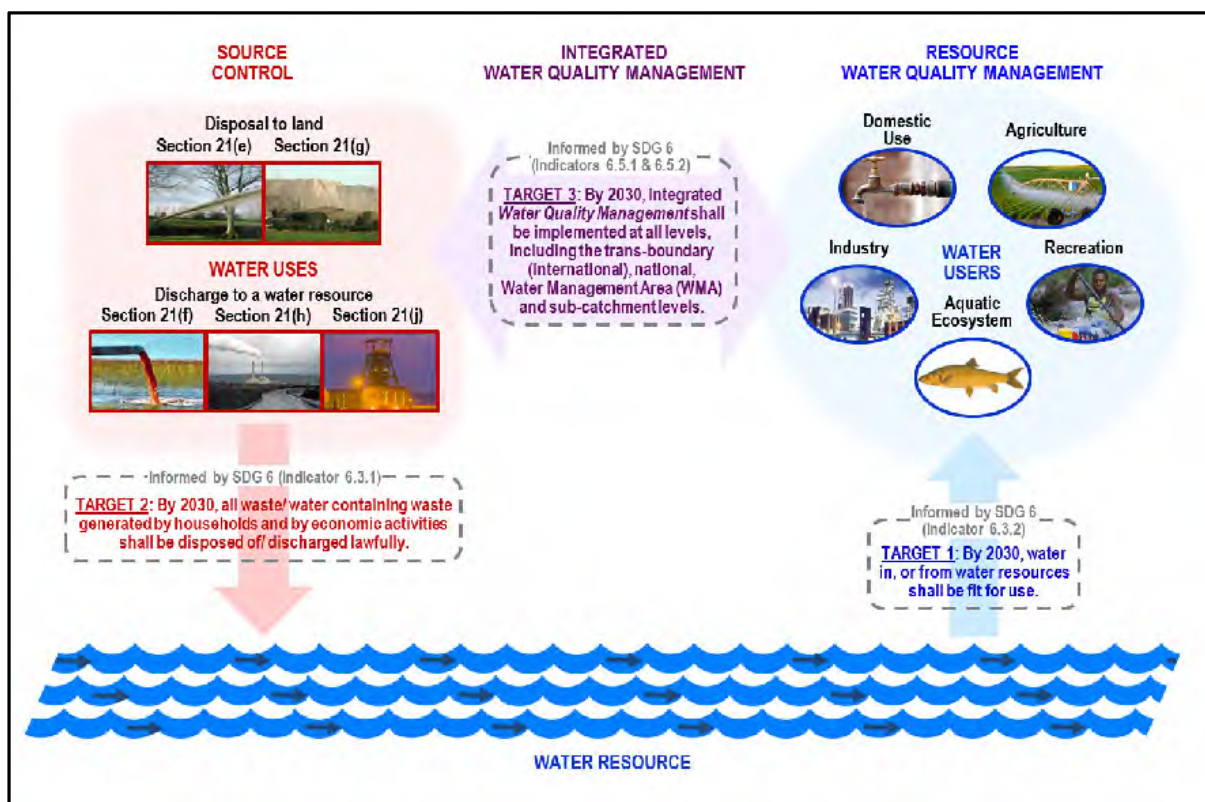


Figure 7.2: High-level Water Quality Management Master Plan Targets

### 7.3.1.1 Resource Water Quality Management Target

#### TARGET 1: By 2030, water in, or from water resources shall be fit for use<sup>1</sup>

For water resources to be able to continuously sustain economic growth and social development, the quality (or “*resource quality*”) of such water resources needs to be maintained within certain pre-determined parameters. These resource parameters, or Resource Directed Measures (RDMs), are represented by the Resource Management Class, Resource Quality Objectives (RQOs) and the Reserve. Collectively the RDMs, and more specifically the resource Water Quality objectives components of RQOs, provide the ultimate performance indicators to (1) benchmark the **fitness-for-use** of water resources against; and to (2) measure the effectiveness of *Water Quality Management* measures that are being applied with respect to specific water resources. It is, thus, essential that resource Water Quality objectives must be determined for all significant water resources; that those objectives be given effect to through appropriate source controls, such as through water use licensing (as per **Section 7.3.1.2** below); and that suitable Water Quality monitoring be carried out to gauge *Water Quality Management* performance as a potential precursor to possible corrective action.

The purpose of Target 1 is to progressively ensure that all water resources are fit for use. Table 7-1 provides an interpretation of High-level *Water Quality Management* Master Plan Target 1.

**Table 7-1: High-level Water Quality Management Master Plan Target 1**

<i>Target text</i>	<i>Normative interpretation</i>
“By 2030...	Implies the progressive realisation of the set target over time by the specified year.
...water in, or from water resources...	Implies custodianship over all surface water, groundwater and estuaries.
...shall be fit for use.”	<p>Implies compliance to the fitness-for-use criteria, as determined for receiving water resources. Such fitness-for-use criteria are represented by Resource Quality Objectives (RQOs), determined in terms of Section 13(1)(b) of the National Water Act, 1998 (Act No. 36 of 1998), or in the absence thereof, by in-stream <i>Water Quality</i> objectives that are set, based on the South African Water Quality Guidelines. Fitness-for-use may relate to the <i>Water Quality</i> requirements of the aquatic ecosystem, or the domestic-, agricultural-, industrial- and/ or recreational water user sectors.</p> <p><b>Note:</b> Source control measures to ensure fitness-for-use of receiving water resources may relate to the management of point- and diffuse source impacts. Target 2 (<b>Error! Reference source not found.</b>) focusses on the control of point-sources of potential pollution.</p>

### 7.3.1.2 Source Control Target

#### **TARGET 2: By 2030, all waste/ water containing waste generated by households and by economic activities shall be disposed of/ discharged lawfully and safely<sup>2</sup>**

The control and management of sources of water pollution must be guided by the National Environmental Management Act, 1998 (Act No. 107 of 1998) as well as the Resource Directed Measures (RDMs) determined for potentially affected water resources. The precautionary approach is always applicable and will be balanced against socio-economic needs. Preventing pollution in the first place will always be encouraged while pursuing the best practicable environmental option. Should some Water Quality degradation be inevitable, waste minimisation will be encouraged. The precautionary approach will be applied to point sources of pollution by enforcing uniform national minimum requirements or standards. The degree to which they may be enforced or relaxed will depend on the degree to which the water resource is used, *i.e.* Water Quality stress coupled to the desired level of protection required for the water resources in question.

All water uses that may affect the Water Quality of a water resource, *i.e.* the disposal of waste or the discharges of water containing waste to a water resource, **shall be permissible** in terms of the National Water Act, 1998 (Act No. 36 of 1998) and must be compliant with the conditions of the relevant water use authorisation. Discharges of water containing waste to municipal waste water treatment works shall be compliant with the relevant bylaws of such municipalities. Compliance monitoring shall be essential and unlawful and/ or non-compliant water uses shall be addressed through appropriate corrective action and/ or timeous enforcement.

The effective regulation of water use and the effective control of potential sources of water pollution are prerequisites to maintaining and improving the Water Quality in the country's water

resources. Target 2 is focussed on improving the Water Quality regulatory environment. Table 7-2 provides an interpretation of High-level *Water Quality Management* Master Plan Target 2.

**Table 7-2: High-level Water Quality Management Master Plan Target 2**

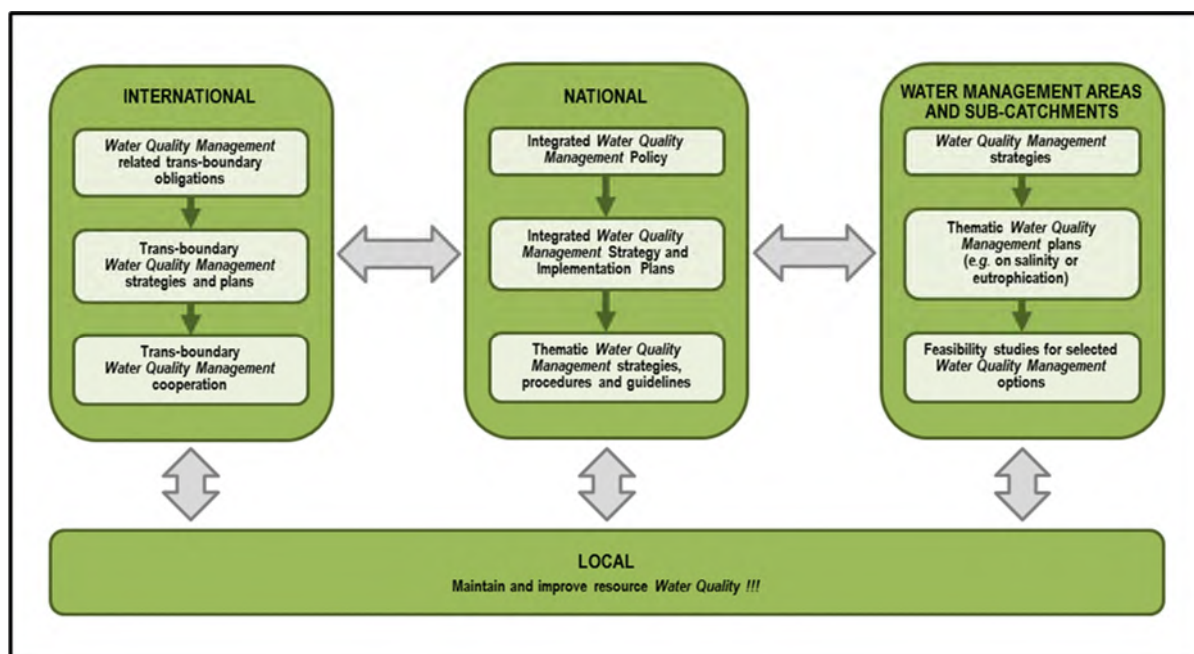
<i>Target text</i>	<i>Normative interpretation</i>
“By 2030...	Implies the progressive realisation of the set target over time by the specified year.
...all waste/...	Implies disposed waste that may potentially detrimentally affect (a) water resource(s).
...water containing waste...	Implies discarded effluent that is no longer required by the owner or user. Such effluent includes effluent discharged to a municipal waste water treatment works or to a water resource, or reused by another user without further treatment.
...generated by households...	Implies sewage and faecal sludge emanating from the domestic sector.
...and by economic activities...	Implies industrial effluent and waste emanating from activities identified in the Standard Industrial Classification of all Economic Activities (1993), as amended and supplemented.
...shall be disposed of/ discharged lawfully...	Implies (1) the implementation of the <i>Water Quality Management</i> Hierarchy of pollution prevention, waste minimisation, and the differentiated utilisation of the capacity of receiving water resources to assimilate waste, as per Section 2(4)(ii) and (iv) of the National Environmental Management Act, 1998 (Act No. 107 of 1998); (2) where relevant, that such water use is permissible in terms of the National Water Act, 1998 (Act No. 36 of 1998); (3) where relevant, such water use is compliant with the conditions contained in the applicable authorisation; and (4) where relevant, that such water use is compliant with the stipulations of the applicable bylaws.
...and safely.”	Implies that the conditions that are attached to such lawful water use should link to the resource quality requirements of receiving water resources. See Target 1 (Table 7-1).

### 7.3.1.3 Integrated Water Quality Management Target

**Target 3: By 2030, integrated Water Quality Management shall be implemented at all levels, including the trans-boundary (international), national, Water Management Area (WMA) and sub-catchment levels**

Integrated *Water Quality Management* (IWQM) aims to achieve specific objectives at a particular management unit, taking into consideration the defining principles and background conditions relevant to that specific management unit, whether the management unit in question be at the level of an internationally shared river basin or at the level of an individual water user, or somewhere in between (see Figure 7.3).





**Figure 7.3: International, national and catchment Water Quality Planning (adapted from DWS, 2015)**

Operationally, IWQM involves applying knowledge from various disciplines, as well as the insights from diverse stakeholders, to devise and implement efficient, equitable and sustainable solutions to Water Quality and development challenges. Coherent and integrated *Water Quality Management* is only achievable when Water Quality challenges are addressed holistically within catchments through a process of Water Quality planning to attain desired Water Quality outcomes.

The establishment and implementation of *Water Quality Management* strategies and thematic plans at the Water Management Area (WMA) and/ or sub-catchment level stands central to the integration of management efforts, and is to provide input to the development and implementation of Catchment Management Strategies and future revisions of the National Water and Sanitation Strategy.

Target 3 aims to establish structure towards the integrated management of Water Quality and stands in support of the aims of Targets 1 and 2. Table 7-3 provides an interpretation of High-level *Water Quality Management* Master Plan Target 3.

**Table 7-3: High-level Water Quality Management Master Plan Target 3**

Target text	Normative interpretation
"By 2030..."	Implies the progressive realisation of the set target over time by the specified year.
...integrated Water Quality Management...	Is that distinct component of Integrated Water Resource Management that promotes the coordinated and holistic management of <i>Water Quality</i> to achieve specific objectives within a particular management unit, taking into consideration the defining principles and background conditions relevant to that specific management unit, in order to maximize the resultant economic and social benefit in an equitable manner without compromising ecologically sustainable development.
...shall be implemented...	Refers to the Johannesburg Plan of Implementation (2002) objective, <i>i.e.</i> to develop Integrated Water Resource Management and Water Efficiency plans. The aforementioned include <i>Water Quality Management</i> and considering Targets 1 (Table 7-1) and 2 (Table 7-2).



...at all levels,...	Refers primarily to vertical levels of governance, from trans-boundary cooperation between co-basin states to National Government to Catchment Management Agencies (CMAs) to local government, including water users and stakeholder participation.
...including the trans-boundary (international),...	Implies the development and implementation of cooperation agreements to address <i>Water Quality</i> matters of mutual interest in respect of surface water and/ or groundwater basins (aquifers) that cross international borders or are shared among two or more co-basin states.
...national,...	Implies the development and implementation of <i>Water Quality Management</i> approaches that apply uniformly across South Africa, including national <i>Water Quality Management</i> policy and strategy.
...Water Management Area (WMA) and sub-catchment levels.	Implies the development and implementation of <i>Water Quality Management</i> approaches that address catchment specific challenges and concerns, including the development and implementation of catchment <i>Water Quality Management</i> strategies and thematic plans.

## 7.4 Action Plan

### 7.4.1 From high-level drivers to a uniform National Strategic Response

The Department's views on Water Quality has evolved to an approach of integrated *Water Quality Management* that amongst others recognises the roles to be played by the Department of Water and Sanitation (DWS), as sector leader, other role-players in the various spheres of government, private sector and civil society. The revised and updated national *Water Quality Management* policy and strategy framework (see Figure 7.4), includes the *Integrated Water Quality Management Policy* [DWS, 2017(b)] and the *Integrated Water Quality Management Strategy* [DWS, 2017(c)] for South Africa.

The Integrated Water Quality Management Policy (2017) sets out the *Water Quality Management* Vision, Core Mission Statements of Intent, Policy Values, underlying Policy Principles and Policy Responses for managing the quality of water in our surface and underground water resources.

The Integrated Water Quality Management Strategy sets out those national strategic actions which are required to be undertaken in order to realise the Vision and Core Mission Statements of Intent for Water Quality in South Africa. It articulates the broader process of integrated *Water Quality Management* and provides five *Strategy Goals*, eleven *Strategic Issues*, twenty one *Strategic Objectives*, and the sixty prioritised *Strategic Actions* that need to take place over the short-, medium- and long-term [DWS, 2017c].

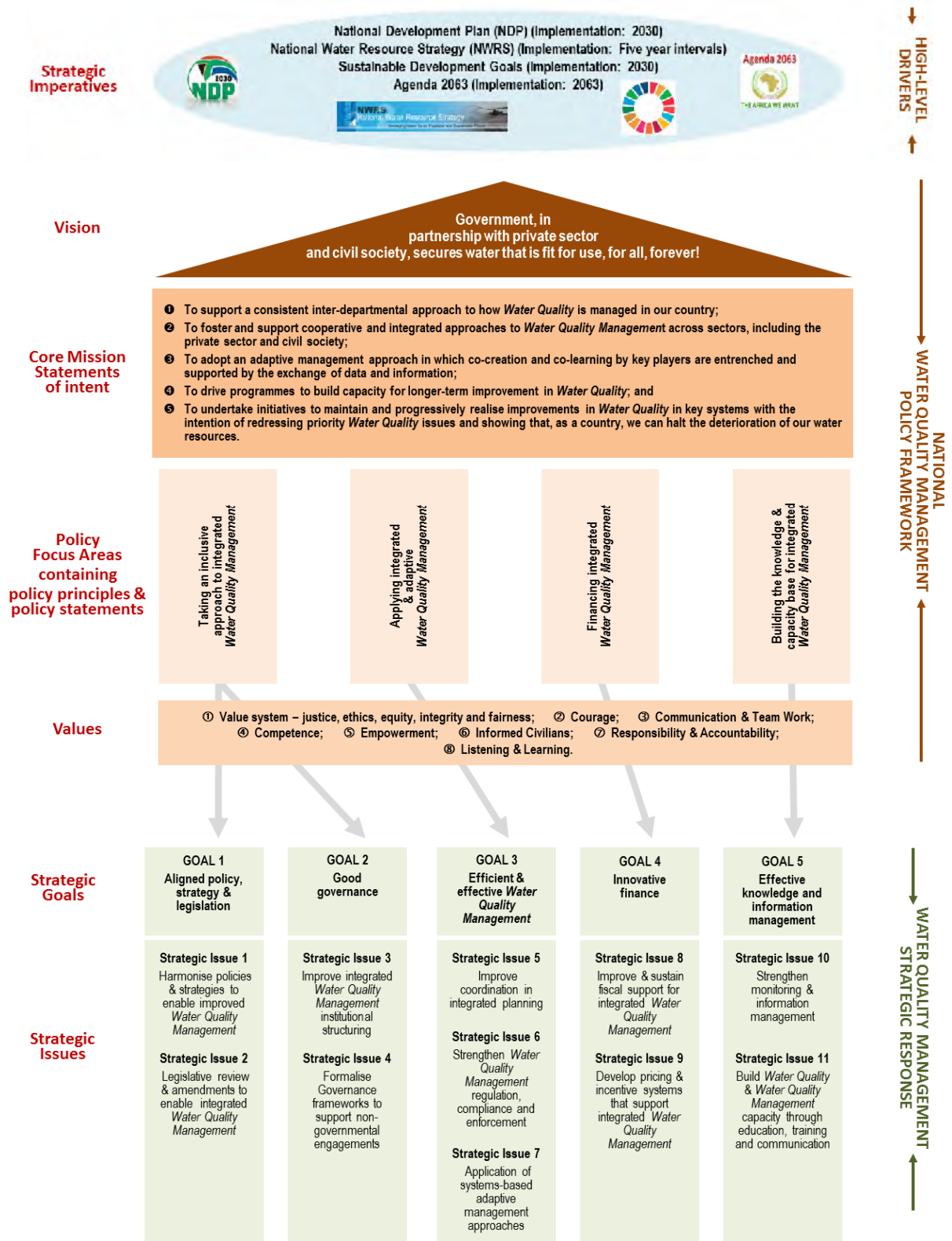


Figure 7.4: From high-level Water Quality Management Drivers to Policy Framework to Strategic Response

### 7.4.2 Plan of Action to maintain or improve Water Quality

Selected *Strategic Objectives* from the Integrated Water Quality Management Strategy [DWS, 2017c], in support of achieving the set High-level *Water Quality Management* Master Plan Targets, were imported as strategic actions. The Integrated *Water Quality Management*

Implementation Plan [DWS, 2017d] and the associated Monitoring and Evaluation Framework [DWS, 2017e] provide operational resolution on priority actions that were identified for implementation over the next three years. Selected strategic and priority initiatives to better resource *Water Quality* are to be considered for inclusion into the departmental Annual Performance Plans (APPs).

**Table 7-4: High-level Water Quality Master Plan Targets and the required strategic actions**

<p><b>TARGET 1:</b> By 2030, water in, or from water resources shall be fit for use.</p>	<p><b>Strategic actions</b></p>	<p>Resource Water Quality objectives (i.e. RQOs, or otherwise in the absence of RQOs having been set, in-stream <i>Water Quality</i> objectives based on the South African <i>Water Quality</i> Guidelines) must be determined <b>(SO7b)*</b>;</p> <p>Resource <i>Water Quality</i> monitoring must be done <b>(SO10a)*</b>;</p> <p>An appropriate information management system must be accessible and be maintained <b>(SO10b)*</b>;</p> <p><i>Water Quality</i> information must be assessed <b>(SO10c)*</b>;</p> <ul style="list-style-type: none"> <li>Adaptive systems-based catchment <i>Water Quality Management</i> must be implemented <b>(SO7a)*</b>; and</li> </ul> <p>Develop and implement a diffuse pollution source strategy <b>(SO1a)*</b>.</p>
<p><b>TARGET 2:</b> By 2030, all waste/water containing waste generated by households and by economic activities shall be disposed of/ discharged lawfully and safely.</p>	<p><b>Strategic actions</b></p>	<p>Responsible authorities must develop (an) information management system(s) to support an integrated licensing approach <b>(SO10b)*</b>;</p> <p>Bylaws must be efficient and where absent, developed, and implemented <b>(SO2b)*</b>;</p> <p>Streamline licencing processes so that they are efficient and effective <b>(SO6a)*</b>;</p> <p>The conditions in water use authorisations ensure that receiving water resources are fit for use <b>(SO6a)*</b>;</p> <ul style="list-style-type: none"> <li>Validate &amp; verify registered water use with a direct <i>Water Quality</i> impact <b>(SO6a)*</b>; and</li> </ul> <p>Undertake targeted/ strengthened compliance monitoring and enforcement of key polluting sectors <b>(SO6b)*</b>.</p>
<p><b>TARGET 3:</b> By 2030, integrated Water Quality Management shall be implemented at all levels, including the trans-boundary (international), national, Water Management Area (WMA) and sub-catchment</p>	<p><b>Strategic</b></p>	<p>Harmonise and implement policies and strategies impacting upon Water Quality Management <b>(SO1a)*</b>;</p> <p>Adopt an integrated sectoral planning approach at trans-boundary and national levels <b>(SO5a)*</b>;</p> <p>Adopt an integrated sectoral planning approach in catchment/ regional plans <b>(SO5b)*</b>;</p> <ul style="list-style-type: none"> <li>Pilot and implement the Waste Discharge Charge System (WDCS) <b>(SO9b)*</b>;</li> </ul> <p>Ensure that inter-sector departmental structures support integrated Water Quality Management <b>(SO3b)*</b>.</p>
<p>*Relates to the <i>Strategic Objectives</i> (SOs), as captured in the Integrated Water Quality Management Strategy [DWS, 2017c].</p>		

### 7.4.3 Enabling requirements for Implementation

For Government to make strides towards providing water that is fit-for-use to all citizens, the strategic actions listed in Table 7-4 need to be actively supported by appropriate enabling actions.

**Table 7-5: High-level Water Quality Management Master Plan Targets and the required enabling actions**

Enabling actions	Contribute towards legislative review and amendments to enable integrated <i>Water Quality Management (SI2)*</i> ;
	Improve <i>Water Quality Management</i> related governance <b>(SI3)*</b> ;
	Formalise governance frameworks to support non-governmental engagements <b>(SI4)*</b> ;
	Ensure fiscal support for integrated <i>Water Quality Management (SI8)*</i> ;
	Support <i>Water Quality Management</i> related research <b>(SI8)*</b> ; and
	Build WQ and WQM Capacity through Education, Training and Communication <b>(SI11)*</b> .
*Relates to the <i>Strategic Issues (SIs)</i> , as captured in the Integrated Water Quality Management Strategy [DWS, 2017c].	

**Error! Reference source not found.** contains budget estimates for the individual action items. Implementation is dependent on the availability of resources (human capital, financial, etc.).

#### 7.4.4 Implementation Monitoring and Evaluation

Table 7-6 proposes a monitoring and evaluation framework for implementation tracking according to a set of indicators and associated required progress. Water Quality benchmarking, is a crucial element of implementation monitoring and evaluation. The High-level Master Plan indicators (Table 7-7) are to indicate *Water Quality Management* implementation progress for the National Water and Sanitation Master Plan. The Departmental APP is to monitor the roll-out progress with respect to the supporting interventions, actions and projects and their sub-actions.

**Table 7-6: Implementation Schedule**

TARGETS/ SUPPORTING INTERVENTIONS, ACTIONS & PROJECTS * SO <sub>n</sub> = Strategic Objective [DWS, 2017c]	YEAR/ QUARTER																																																			
	2018				2019				2020				2021				2022				2023				2024				2025				2026				2027				2028				2029				2030			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
<b>High-level Master Plan Target 1</b>	← 13 YEARS →																																																			
By 2030, water in, or from water resources shall be fit for use.																																																				
1.1 Determine resource <i>Water Quality</i> objectives (SO7b)*																																																				
1.2 Implement an integrated and functioning <i>Water Quality</i> monitoring network (SO10a)*																																																				
1.3 Develop information systems that are current and accessible to support adaptive <i>Water Quality Management</i> (SO10b)*																																																				
1.4 Undertake routine assessments to inform adaptive <i>Water Quality Management</i> (SO10c)*																																																				
1.5 Apply adaptive systems-based management at catchment level (SO7a)*																																																				
<b>High-level Master Plan Target 2</b>	← 13 YEARS →																																																			
By 2030, all waste/ water containing waste generated by households and by economic activities shall be disposed of/ discharged lawfully.																																																				
2.1 Develop information systems that are current and accessible to support regulation; and undertake validation & verification of water use (SO10b)*																																																				
2.2 Streamline licencing processes so that they are efficient and effective (SO6a)*																																																				
2.3 Undertake targeted/ strengthened compliance monitoring and enforcement of key polluting sectors (SO6b)*																																																				
<b>High-level Master Plan Target 3</b>	← 13 YEARS →																																																			
By 2030, integrated <i>Water Quality Management</i> shall be implemented at all levels, including the trans-boundary (international), national, <i>Water Management Area (WMA)</i> and sub-catchment levels.																																																				
3.1 Harmonise and implement policies and strategies impacting upon <i>Water Quality Management</i> (SO1a)*																																																				
3.2 Adopt an integrated sectoral planning approach in catchment/ regional plans (SO5b)*																																																				
3.3 Ensure that <i>Water Quality Management</i> interventions are financially supported by the fiscus (SO8a)*																																																				
3.4 Pilot and implement the Waste Discharge Charge System (WDCS) (SO9b)*																																																				
3.5 Ensure that inter-sector departmental structures support integrated <i>Water Quality Management</i> (SO3b)*																																																				
3.6 Adopt an integrated sectoral planning approach at trans boundary and national levels (SO5a)*																																																				



**Table 7-7: The High-level Master Plan Targets, enabling Actions and High-level Master Plan Indicators, and their relationships to the Sustainable Development Targets and Indicators**

<b>Sustainable Development Goal 6: To ensure the availability and sustainable management of water and sanitation for all.</b>		<b>High-level Master Plan Targets</b>	<b>Interventions, Actions and Projects 3</b>	<b>High-level Master Plan Indicators</b>
<b>Relevant Targets</b>	<b>Relevant Indicators</b>			
<b>By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally (Target 6.3)</b>	Proportion of bodies of water with good ambient water quality (Indicator 6.3.2)	<b>TARGET 1: By 2030, water in, or from water resources shall be fit for use.</b>	<p>Determine resource <i>Water Quality</i> objectives (SO7b);</p> <p>Implement an integrated and functioning <i>Water Quality</i> monitoring network (SO10a);</p> <p>Develop information systems that are current and accessible to support adaptive <i>Water Quality Management</i> (SO10b);</p> <p>Undertake routine assessments to inform adaptive <i>Water Quality Management</i> (SO10c);</p> <p>Apply adaptive systems-based management at catchment level (SO7a); and</p> <p>A diffuse pollution source strategy must be developed and implemented (SO1a).</p>	<p>Proportion of water in, or from water resources with <i>Water Quality</i> that is compliant to the relevant in-stream <i>Water Quality</i> objectives (i.e. the RQOs).</p> <p><b>Base line:</b> Maintained resource <i>Water Quality</i></p> <p><b>2020:</b> 50% compliance to RQOs</p> <p><b>2025:</b> 75% compliance to RQOs</p> <p><b>2030:</b> 100% compliance to RQOs</p>

<sup>3</sup> Relates to the Strategic Objectives (SOs), as captured in the Integrated Water Quality Management Strategy (DWS, 2017c)



<b>Sustainable Development Goal 6: To ensure the availability and sustainable management of water and sanitation for all.</b>		<b>High-level Master Plan Targets</b>	<b>Interventions, Actions and Projects 3</b>	<b>High-level Master Plan Indicators</b>
<b>Relevant Targets</b>	<b>Relevant Indicators</b>			
	Proportion of wastewater safely treated (Indicator 6.3.1)	<b>TARGET 2: By 2030, all waste/ water containing waste generated by households and by economic activities shall be disposed of/ discharged lawfully and safely.</b>	<p>Develop information systems that are current and accessible to support regulation; and undertake validation &amp; verification of water use (SO10b);</p> <p>Bylaws must be efficient and where absent, developed (SO2b)*;</p> <p>Streamline licencing processes so that they are efficient and effective (SO6a);</p> <p>The conditions in water use authorisations must ensure that receiving water resources are fit for use (SO6a)*</p> <p>Validation &amp; verification of water use must be undertaken (SO6a)*; and</p> <p>Undertake targeted/ strengthened compliance monitoring and enforcement of key polluting sectors (SO6b)</p>	<p>Proportion of waste/ water containing waste generated by households and by economic activities that is disposed of/ discharged that- Considered the hierarchy of water quality management decision-making as per Section 2(4)(ii) and (iv) of NEMA 107:1998 (Is permissible in terms of the NW 36:1998); and</p> <p>Is compliant to the standards and conditions in the relevant authorisations.</p> <p><b>Base line:</b> To be determined</p> <p><b>2020:</b> 50% (1), (2) &amp; (3)</p> <p><b>2025:</b> 75% (1), (2) &amp; (3)</p> <p><b>2030:</b> 100% (1), (2) &amp; (3)</p>
<b>By 2030, implement integrated water resources management at all levels, including through trans-boundary cooperation as appropriate (Target 6.5)</b>	Degree of integrated water resources management implementation (0-100) (Indicator 6.5.1)	<b>TARGET 3: By 2030, integrated Water Quality Management shall be implemented at all levels, including the trans-boundary (international), national, Water Management Area (WMA) and sub-catchment levels.</b>	<p>Harmonise and implement policies and strategies impacting upon <i>Water Quality Management (SO1a)</i>;</p> <p>Adopt an integrated sectoral planning approach in catchment/ regional plans (<b>SO5b</b>);</p> <p>Ensure that <i>Water Quality Management</i> interventions are financially supported by the fiscus (<b>SO8a</b>);</p> <p>Pilot and implement the Waste Discharge Charge System (WDCS) (<b>SO9b</b>); and</p> <p>Ensure that inter-sector departmental structures support integrated <i>Water Quality Management (SO3b)</i>.</p>	<p><b>Base line:</b> A national Integrated Water Quality Management (WQM) Strategy developed and being implemented.</p> <p>1x Water Management Area (WMA) WQM Strategy, including Thematic plans developed and being implemented; and</p> <p>Cooperation with international basin organisations.</p> <p><b>2020:</b> 3x WMA WQM Strategies including Thematic plans developed and being implemented; and</p> <p>continued cooperation with international basin organisations.</p>

<b>Sustainable Development Goal 6: To ensure the availability and sustainable management of water and sanitation for all.</b>		<b>High-level Master Plan Targets</b>	<b>Interventions, Actions and Projects 3</b>	<b>High-level Master Plan Indicators</b>
<b>Relevant Targets</b>	<b>Relevant Indicators</b>			
	Proportion of trans-boundary basin area with an operational arrangement for water cooperation (Indicator 6.5.2)		Adopt an integrated sectoral planning approach at trans-boundary and national levels ( <b>SO5a</b> ).	<p><b>2025:</b> 3x WMA WQM Strategies including Thematic plans developed and being implemented; and continued cooperation with international basin organisations</p> <p><b>2030:</b> 2x WMA WQM Strategies including Thematic plans developed and being implemented; and continued cooperation with international basin organisations.</p>

## 8. WATER ECOLOGICAL SYSTEMS

South Africa is known for its rich biodiversity boasting one of the world's six floral kingdoms and a wide variety of aquatic ecosystems, including seven of the world's freshwater eco-regions. These eco-regions are characterised by a wide range of river ecosystems, wetlands and estuarine types.

**South Africa must protect and restore ecological infrastructure**

The protection of the ecological infrastructure of our natural aquatic ecosystems are crucial for future economic development, water and food security and the assurance of healthy functional water resources, that in the long run will allow for future sustainable development.

The Millennium Ecosystem Assessment categorised four types of **ecosystem services** as being *provisioning, regulating, cultural* and *supportive* as described below:

- **Provisioning:** Products that are obtained from ecosystems such as food, wood, and water;
- **Regulating:** Benefits that are accrued from the regulation of ecosystem services such as water purification, and water regulation (wetlands) disease regulation and climate regulation;
- **Cultural:** Non-material benefits that are obtained from ecosystems and includes spiritual and religious, aesthetic, sense of place and recreational; and
- **Supportive:** Services that are necessary to support all other services and includes soil formation and retention (i.e. riparian vegetation, wetlands) water cycling, nutrient cycling and primary production (migratory routes and connectivity of water resources from source to sea).

The continuous over utilisation and inadequate protection of the ecological systems and infrastructure has led to the majority of aquatic resources changing the characteristics of the rivers towards from perennial to seasonal, from ephemeral to perennial and in many cases, has pushed the rivers and/or other water resources beyond their resilience ability. In these worst-case scenarios, the ecological services and functions of the water resource have been totally lost to such an extent that rehabilitation of these systems is not possible without significant economic implications.

### 8.1 Present State

Water ecosystems comprise river ecosystems, wetland ecosystems, estuarine ecosystems, as well as the contribution from aquifers and have been addressed as such below.

#### 8.1.1 River Ecosystems

River ecosystems are vital for supplying fresh water, South Africa's most scarce natural resource. Rivers store and transport water and, combined with manmade storage and transfer schemes, bring water to urban and rural areas, irrigate croplands, take away waste and provide cultural and aesthetic services. Healthy tributaries help to maintain natural flow pulses and flush pollutants from hard-working larger rivers, contributing to the quantity and quality of water supplies. Contrary to popular perception, fresh water flowing from rivers out to sea is not wasted, but is essential for

maintaining healthy ecological infrastructure such as estuaries as well as coastal and marine ecosystems and the societal benefits received from them.

The main pressure on river ecosystems is the abstraction of water from rivers and other alterations to the timing and quantity of flows, for example because of dams or transfer schemes between catchments. In addition, pollution of rivers is a serious and growing problem, often exacerbated by destruction of natural vegetation along river banks which results in irreversible damage to rivers and their ability to provide ecosystem services. Fifty-seven percent of river ecosystem types are threatened (25% critically endangered, 19% endangered and 13% vulnerable).

Tributaries tend to be in better ecological condition than main rivers, so the proportion of threatened river ecosystem types is higher if only main rivers are assessed, with 65% of main rivers threatened (including 46% critically endangered). Mountain streams are best protected and lowland rivers have the highest proportion of ecosystem types with no protection.

High water yield areas are sub-quaternary catchments in which mean annual runoff is at least three times more than the average for the related primary catchment. These areas constitute only 4% of South Africa's surface area and are the water factories of the country. Currently only 18% of them have any form of formal protection. Given their strategic importance for water security, options for formal protection of high water yield areas should be explored, for example declaring them as Protected Environments in terms of the Protected Areas Act.

Rivers are linear ecosystems and are impacted on by land uses and activities throughout their catchments. Protected areas alone will seldom do the full job of protecting river ecosystems. This highlights the importance of integrated water resource management tools provided by the National Water Act, including the ecological Reserve, Classification of Water Resources and Resource Quality Objectives, which contribute to the protection of freshwater ecosystems. For all rivers, good land-use practices such as keeping natural vegetation intact along river banks can make a vital difference to their ecological integrity.

### 8.1.2 Wetland Ecosystems

Wetland ecosystems are vital for purifying water and regulating water flows, acting as sponges that store water and release it slowly, filtering pollutants and easing the impact of droughts and floods in the process. They also support a rich diversity of species, which have both intrinsic and economic value. The main pressures faced by wetland ecosystems include cultivation, urban development, mining, dam construction and poor grazing management, combined with catchment-wide impacts such as disruption of freshwater flow, pollutants and sediment from surrounding land uses.

According to the National Biodiversity Assessment (2011), 65% of wetland ecosystem types are threatened (48% critically endangered, 12% endangered and 5% vulnerable), making wetlands the most threatened of all ecosystems. Only 11% of wetland ecosystem types are well protected, with 71% not being protected at all, reflecting the fact that wetland ecosystems have not been systematically taken into account in establishing and expanding land-based protected areas. There is clearly scope for the protected area network to play a bigger role in protecting South Africa's wetlands.

Wetlands are exceptionally high-value ecosystems that make up only a small fraction of the surface area of the country. Given their strategic importance as ecological infrastructure for

ensuring water quality and regulating water supplies, investments in conserving, managing and restoring wetlands are likely to generate disproportionately large returns.

### 8.1.3 Estuarine Ecosystems

Estuaries are formed where fresh water from rivers runs out to sea, although the mouths of some estuaries periodically close off from the sea. They are often focal points for coastal development and recreation, including water sports, fishing and holiday-making. Estuaries provide nursery areas for many commercially important fish species, and pass through sediments that form and maintain beaches and provide nutrients for marine food webs. Estuaries face multiple pressures from human activities, often resulting from development too close to the estuary as well as the cumulative impacts of land uses throughout the catchment that feeds the estuary. Reductions in the quantity and quality of fresh water that reaches an estuary, for example because of dams higher up in the catchment, as well as sand mining can impact severely on its ecological condition and ability to provide ecosystem services.

Of estuary ecosystem types, 43% are threatened (39% critically endangered, 2% endangered and 2% vulnerable). The proportion of threatened types is highest in the cool temperate region (the west coast, which has relatively few estuaries) and lowest in the warm temperate region (south and southeast coast, including the many small estuaries along the Wild Coast, most of which are in good ecological condition). Only 33% of estuary ecosystem types are well protected and 59% have no protection at all.

### 8.1.4 Groundwater

An aquifer is both a reservoir and a transport channel. Groundwater flow in an aquifer is governed by the aquifer's intrinsic characteristics (shape, size, permeability etc.) but also by its recharge, largely produced by infiltration of precipitation. Most of the groundwater flow eventually ends up in springs and streams. Groundwater recharge and groundwater discharge are thus the links between groundwater and the other components of the water cycle.

Wherever groundwater flows or discharges to the surface, Aquifer-Dependent Ecosystems (ADEs) can occur. Their identification is often difficult, but a type-setting and identification study has been undertaken to guide groundwater management and allocation.

## 8.2 Problems, Challenges & Drivers for Change

### 8.2.1 River Ecosystems

Rivers are the lowest points in any given topography, and often the receivers of cumulative impacts from throughout the landscape. Many pressures on river ecosystems interact and exacerbate each other, including:

- Alteration of flow;
- Pollution;
- Destruction of river banks; and
- Invasive alien species.

**Land management throughout catchments** influences the health of river ecosystems. Water resources cannot be managed in isolation from the land-based activities that surround them.

### 8.2.2 Wetland Ecosystems

Several pressures contribute to the loss and degradation of wetlands, some of them occurring at the wetland site and others related to land management in the wider catchment. The most prevalent on-site causes of wetland loss and degradation are:

- Mining;
- Cultivation (e.g. sugar cane, fruit orchards, wheat);
- Urban development;
- Dam construction; and
- Poor grazing management causing erosion.

The most prevalent off-site causes of wetland degradation are:

- Disruption of the flow regime (changes to the amount and timing of flows of freshwater to the wetland, for example as a result of water abstraction, effluent discharge, and dams in the catchment);
- Deterioration of water quality in associated rivers as a result of polluting activities in the surrounding catchment; and
- Poor grazing management or poor crop production practices in the catchment that result in an increased sediment load being deposited in the wetland.

The health of rivers and wetlands is linked. A river in poor condition is likely to affect the condition of associated wetlands, degrading them to a fair or poor condition. Similarly, destruction of wetlands has an impact on river condition because the wetlands are no longer able to filter pollutants from surrounding land uses to prevent them ending up in the river. Buffers of natural vegetation around wetlands can play a major role in keeping wetlands healthy and well-functioning, even if land uses in the surrounding catchment are not wetland-friendly.

### 8.2.3 Estuarine Ecosystems

The threats to estuarine health and biodiversity can ultimately be grouped as follows:

- Flow modification;
- Pollution (e.g. agriculture, waste water treatment works (WWTW), industrial, sediment);
- Exploitation of living resources (fish and invertebrates);
- Habitat destruction (within estuarine functional zone); and
- Climate change.

Estuaries face pressures from three main sources: activities that take place in and around the estuary, changes to the flow of fresh water into the estuary, and land use practices throughout the catchment that feeds the estuary.

A general trend is that estuaries fed by larger catchments tend to be in poorer health than estuaries in neighbouring smaller catchments. This is partly because larger catchments have larger rivers, and larger rivers tend to be more heavily utilised, attract more coastal development and other economic activity. Smaller estuaries (and their related smaller catchments) generally



tend to be subjected to fewer pressures. If there are no direct development pressures such as urban development on these smaller estuaries, they tend to be healthy.

### 8.2.4 Groundwater

Groundwater contributes approximately 15 % of all the water resources used in South Africa. Large volumes of groundwater are used for irrigation in the drier, more sparsely populated west of the country. Such a volumetric aggregate is however not always a good reflection of the importance of groundwater for a specific sector. Also of importance is that 30% of low flows in rivers originates from groundwater. Land-use exerts a major influence on groundwater in terms of contamination from a wide range of activities and through impacting groundwater recharge processes. The potential negative impacts are enhanced by ignorance and by the unseen nature of groundwater. Groundwater recharge zones are thus in urgent need of protection from pollution and degradation and for this groundwater management needs to be harmonised with land management.

Resource degradation through pollution of underlying groundwater is wide-spread in Africa in both urban and rural areas (Xu and Usher, 2007). This is because of its invisible nature - it takes a long time to notice that it has become polluted and, unlike surface water, it has limited ability to purify itself. In South Africa knowledge of groundwater pollution is only incidental, because monitoring information is only available at a national / regional level, whereas pollution impacts are often very localized and compliance monitoring is not yet functional. A major concern, picked up through the national monitoring, is increasing nitrate levels in boreholes in parts of the Limpopo, North West and Free State provinces.

## 8.3 Desired Future State

The desired state of a water resource is the state that is required to ensure that it functions sustainably i.e. a state where it can provide for all its ecological requirements as well as provide for an agreed level of socio-economic requirements (which include basic human needs) without compromising its ability to provide **goods and services**. Ecosystems that can achieve a state consistent with its Recommended Ecological Category (REC) are referred to as being in a desired state. This is the goal for managing all water resources in South Africa. However, practically this cannot be achieved for some water resources due to irreversible anthropogenic actions to support socio-economic objectives e.g. dam building. Therefore, in these instances the desired state may be not be the REC, but maintaining the Present Ecological State (PES) and not allowing any further degradation. The RECs and PESs have been determined for a large majority of water resources in South Africa through RDM studies (i.e. Reserve, Classes and Resource Quality Objectives).

### 8.3.1 Rivers and Wetlands

#### 8.3.1.1 *Free-flowing rivers are an important part of South Africa's natural heritage*

A free-flowing river is a long stretch of river that has not been dammed. It flows undisturbed from its source to the confluence with another large river or to the sea. Today there are very few large rivers that remain dam-free, or 'free-flowing' in South Africa and globally. Free flowing rivers are rare features in South Africa's landscape and are an important part of the country's natural heritage. They offer considerable social, economic and conservation value, supporting the livelihoods of people in the catchment. Poor rural populations with close livelihood links to the

river are likely to be impacted most and benefit least from dams. The flagship free-flowing rivers identified as NFEPA should receive top priority for maintaining their dam-free status.

### **8.3.2 Freshwater Ecosystem Priority Areas (FEPAs) are a valuable national asset**

Managing FEPAs in a good condition is not just about conserving freshwater plants and animals – but should also be regarded as a comprehensive approach to sustainable and equitable development of water resources. Keeping strategically-chosen freshwater ecosystems in a good condition serves a dual purpose of meeting government objectives for both sustainable water resource development (National Water Act) and freshwater biodiversity conservation (Biodiversity Act). The current and REC for all river FEPAs needs to be maintained or improved.

### **8.3.3 Health tributaries and wetlands support the sustainability of hard-working rivers**

With effective planning, freshwater ecosystems in a catchment can be designed to support multiple levels of use, with natural rivers and wetlands that are minimally-used supporting the sustainability of heavily-used rivers, wetlands and estuaries that often form the economic hub of the catchment. Healthy tributaries can improve water quality by ‘flushing’ pollutants when they join their main stem rivers, and they also replenish water supply in the main stem. Wetlands filter pollutants and sediments from the surrounding landscape thus preventing them from entering the river. They also regulate flow of water from the surrounding landscape which helps to reduce the effects of flood (by slowing down run-off) and droughts (by reducing evaporation).

### **8.3.4 Estuaries**

#### ***8.3.4.1 Freshwater inputs are critical to estuarine and marine environments:***

Fresh water flowing to estuaries and the sea provide important inputs such as nutrients, sediments and carbon, which in turn maintain important ecological processes that keep marine resources healthy. Healthy marine and coastal ecosystems sustain commercial and recreational fish stocks, and provide a source of food to poor coastal communities that depend directly on marine resources for food. A certain amount of water is also required to scour the mouth of most estuaries – without this scouring effect, sediments build up at the mouth and the risk of back-flooding during storms increases. Artificial breaching of an estuary mouth to minimise this risk is expensive and damages estuarine ecosystems. Therefore, water running out to sea should not be considered wasted. All-important estuaries must be Classified, RQOs and Reserves have been determined and are monitored for compliance with the Classes, RQOs and the Reserve.

### **8.3.5 Groundwater**

#### ***8.3.5.1 Groundwater resources and aquifer-dependent ecosystems are protected to secure a sustainable supply of water for human survival and socio-economic development, while maintaining essential groundwater environmental services***

Key groundwater resources and aquifer-dependent ecosystems must be Classified, RQOs and Reserves have been determined and are monitored for compliance with the Classes, RQOs and the Reserve.

#### ***8.3.5.2 High water yield areas play a critical role in securing South Africa’s water supplies***

High water yield areas and high groundwater areas generally occur in mountain catchment areas. These are the ‘water factories’ of the catchment and generate a large proportion of the water for

human and ecological use. Maintaining these areas in a healthy state will allow for the use of clean water downstream that can also maintain ecosystem functioning and biodiversity.

### ***8.3.5.3 Groundwater sustains river flows particularly in dry seasons***

Groundwater abstracted from river beds, close to streams, and from shallow alluvial aquifers has a very direct influence on river flow, and should not be viewed as an additional water resource. Such groundwater plays an important role in sustaining wetlands and river flows ('base flows') and supporting refuge pools in the dry season. Apart from the human benefits of maintaining river flows in the dry season, refuge pools in seasonal rivers support water dependent animals that would otherwise not survive when the rivers dry up. Healthy riparian areas, which filter pollutants that drain from the land, are also often maintained by groundwater. It is only when groundwater has very weak links to surface water (such as in deep, confined aquifers) that it may be possible to abstract it without significantly impacting on river flow; however, long-term impacts are not well understood.

## **8.4 Action Plan**

### **8.4.1 Actions for Rivers and Wetlands**

#### ***8.4.1.1 Strengthen freshwater inventorying and monitoring programmes***

A nationally coordinated strategic inventory and monitoring programme for both rivers and wetlands, building on the model and structures set up through the River Health Programme. It should be implemented at a provincial level, and should have a funding strategy for this to be a sustainable and long-term monitoring programme. The monitoring programme should respond to the requirements of SDG sub-indicator 6.6.1 on ecosystem protection as well as monitoring compliance with the Classes, RQOs and the Reserve.

#### ***8.4.1.2 Rehabilitation of priority wetland ecosystems***

Priority wetland FEPAs that are currently in a condition lower than A or B should be rehabilitated to the best attainable ecological condition.

#### ***8.4.1.3 Pilot formal mechanisms for the management and protection of FEPAs and high-water yield areas***

Formal protection of high water yield areas e.g. Strategic Water Source Areas must be explored, such as declaring parts of them as Protected Environments in terms of the Protected Areas Act or the National Water Act.

#### ***8.4.1.4 Strengthen collaboration of DWS and DEA around managing and conserving freshwater ecosystems***

Formalising cooperation around ecosystem management, provides tools on which to focus such combined efforts. The established Inter- Departmental Liaison Committee for Freshwater Ecosystems provides an opportunity for the various key role-players in freshwater ecosystem management and conservation to establish shared objectives and to collaborate actively, and to understand respective roles and responsibilities in more detail.

## **8.4.2 Actions for Estuaries**

### ***8.4.2.1 Determine ecological water requirements for all estuaries within 10 years and implement flow requirements within 5 years of their classification***

Critical estuaries must be Classified, RQOs and Reserves have been determined and monitored for compliance with the Classes, RQOs and the Reserve.

### ***8.4.2.2 Finalise and implement the National Estuary Monitoring Programme***

This multi-tier, multi-parameter (include biotic and abiotic components) programme is based on current best practice and with sufficient funding, and support from other organs of state, could go a long way in addressing data deficiencies for SDG 6.6.1 reporting.

## **8.4.3 Actions for Groundwater**

### ***8.4.3.1 Groundwater resources and aquifer-dependent ecosystems are protected to secure a sustainable supply of water for human survival and socio-economic development, while maintaining essential groundwater environmental services:***

All-important groundwater resources and aquifer-dependent ecosystems must be Classified, RQOs and Reserves have been determined and are monitored for compliance with the Classes, RQOs and the Reserve.

### ***8.4.3.2 Finalise and implement the Regulations for Hydraulic Fracturing (“fracking”):***

Due to the uncertainty of the magnitude of impacts on the subsurface water resources due to fracking activities, the Minister of Water and Sanitation has declared fracking as a controlled activity in terms of the National Water Act and therefore requires a Water Use Authorisation prior to commencement. The development of Regulations governing fracking will ensure these activities are undertaken with due regard to the sustainability of water resources.

**Table 8-1: Eco-protection Plan**

<b>Key issue</b>	<b>Description of challenges</b>	<b>Interventions, Actions and Projects</b>	<b>Expected outcomes</b>	<b>Responsible</b>	<b>When</b>
Unsustainable management practices on water resources	Contamination of water resources; Over-abstraction of water; Destruction of ecosystem habitats; Land use pressures.	To ensure sustainable management of water resources through resource directed measures and source directed controls:  Determine Classes, Resource Quality Objectives and Reserves for all significant water resources;  Monitor water resources for compliance with Classes, RQOs and Reserve	Protection targets for water resources are determined;  Ecological health of water resources are improved	DWS  DWS	2030  Annually
Deterioration in the ecological state of water resources	Loss of wetlands; Contamination of water resources; Over-abstraction of water; Destruction of ecosystem habitats; Land use pressures.	To protect and maintain freshwater ecosystems priority areas in good condition:  Monitor extent of wetlands, estuaries, lakes, dams, and rivers (SDG 6.6.1.a);  Monitor quantity of water in rivers, lakes, dams, wetlands, estuaries and groundwater (SDG 6.6.1.b);  Monitor water quality of rivers, wetlands, lakes, dams, estuaries and groundwater (SDG 6.6.1.c);  Monitor ecosystem health of wetlands, lakes, dams, estuaries and rivers (SDG 6.6.1.d).	Compliance with SDG 6.6.1 targets  Baselines established from which improvement or deterioration in extent, quantity, quality and ecological health can be determined with time.	DWS (in collaboration with DEA, SANBI, WRC, CSIR and CMAs)	2017, annually
Deterioration and loss of ecological infrastructure	Loss of strategic water source areas; Loss of wetlands	Rehabilitation and protection of ecological infrastructure including Strategic Water Source areas:	Legal protection of SWSAs	DEA /DWS	2020

<b>Key issue</b>	<b>Description of challenges</b>	<b>Interventions, Actions and Projects</b>	<b>Expected outcomes</b>	<b>Responsible</b>	<b>When</b>
		<p>Identify and use legal mechanisms to protect strategic water source areas;</p> <p>Invest in strategic water source areas;</p> <p>Identify and rehabilitate priority degraded water ecosystems, the rehabilitation of which is necessary to achieve strategic objectives including Resource Quality Objectives</p>	<p>Unlock funding for protection and maintenance of SWSAs</p> <p>Improved ecosystem health</p>	<p>CMAAs / DEA</p> <p>DWS/ SANBI</p>	<p>On-going</p> <p>On-going</p>
Awareness on importance of ecosystems	Lack of community awareness on importance of the goods and services provided by ecosystems.	<p>Create awareness among communities, business and decision makers about the value of water and ensure commitment to sustainable water use practices:</p> <p>Conduct community education and awareness campaigns in every catchment;</p> <p>Provide information on ecological state of water ecosystems;</p>	<p>Informed public on sustainable practices</p> <p>Informed public on state of water resources / ecosystems</p>	<p>DWS / CMAAs</p> <p>DWS / CMAAs</p>	<p>Annually</p> <p>Annually</p>
Data and Information Management on ecosystem health	Lack of a comprehensive monitoring programme on ecosystem health as well as data.	<p>Monitor ecological health of our water resources through an integrated information management system:</p> <p>Monitoring system in place to inform management;</p> <p>Monitoring rates of change in ecological state</p>	<p>State-of-the-art monitoring programme for ecological health in place;</p> <p>Ability to determine trends</p>	<p>DWS / CMAAs</p> <p>DWS / CMAAs</p>	<p>On-going</p> <p>Annually</p>



## 9. POLICIES, LEGISLATION AND STRATEGIES

### 9.1 Present State

The water sector is guided by the following national policies as approved by Cabinet:

- White Paper on Water Supply and Sanitation (1994);
- White Paper on a National Water Resources Paper for South Africa (1997);
- White Paper on Basic Household Sanitation (2001);
- Strategic Framework for Water Services (2003);
- National Water Policy Review (2013); and
- National Sanitation Policy (2016).

These policy documents are given legislative force through the Water Services Act, 108 of 1997 (Act no 108 of 1997) and the National Water Act, 36 of 1998 (Act no 36 of 1998). The National Water Act (NWA) addresses the water resource component while the Water Services Act (WSA) addresses the water services component. In addition, many small-scale water users obtain water through customary law and practices in communal areas.

A draft Bill incorporating both the Acts into a single piece of legislation has been compiled over the last few years but has not yet been consulted on or tabled in Parliament.

A number of important strategies and operational policies have been compiled since the enactment of the national policy and water acts in order to flesh out and implement the legislation and policy. These include:

- The National Water Resource Strategy 2 (NWRS2) (2013);
- Policy position on water use in Bio-Fuel production in South Africa (2015);
- Mine Water Management Policy (2017);
- Integrated Water Quality Management Policy (2017);
- Water and Sanitation Sector Policy on Climate Change (2017);
- Infrastructure Ownership and Management Draft Policy (2017);
- Wetland Policy (2017);
- Sustainable Hydropower Development Policy (2017 and
- Mechanisms for Partnerships in the Water and Sanitation Sector – Water Stewardship Policy (2017).

Further policies have been initiated recently and are in various stages of completion:

- Water for Development: Sustainable Livelihood;
- International Water Obligations;
- Water Scarcity and Security in the Water Sector;
- Water for Mining and Industry;
- Groundwater Management and Use;
- Water Mix;

- Uncertainties and Risks of Water Related Hazards, such as Floods: Droughts, Pollution, etc.;
- National Water and Sanitation Resources and Services Strategy; and
- The adoption of Sustainable Development Goals (SDGs).

## 9.2 Problems, Challenges & Drivers for Change

The Department's policy mandate includes the full value chain of water resources, water services and sanitation services. While the legislation and policies are well aligned with the Constitution and older legislative framework the policies are still relatively silent on the National Development Plan and the adoption of the Sustainable Development Goals (SDGs). A further challenge lies in balancing the use of scarce water resources for economic development, urban use, and rural development, poverty eradication and ecological protection.

The Department is responsible for delivery in relation to water resources, while its mandate in relation to water services is one of setting and monitoring adherence to national norms and standards, monitoring delivery of services, establishing and regulating water boards, and providing oversight and support to municipalities.

However, there are still grey areas in responsibility and accountability and the policy and legislative framework is not conducive to promoting appropriate and effective regulation of the whole water and sanitation business value chain.

The current legislative split between water resources and water services does not provide a single cohesive legislative framework which addresses the entire value chain in the water sector and there are gaps in relation to regional bulk infrastructure in particular, as well as the role of the department in regulating water services delivery.

Institutional arrangements are currently fragmented among a large number of water boards, catchment management agencies and municipalities and although consolidation is envisaged, it has not been effectively actioned through the revision of policy and legislation.

In addition, poor alignment of policies and strategies between government departments and spheres of government is exacerbating rather than improving the ability of the Department to deliver on its mandate. Thus, for example, water quality and wetlands continue to deteriorate, at least in part due to poor alignment of approaches between DWS and the Department of Minerals, DAFF, and the failure of municipalities to deliver on their mandate for waste water treatment. The failure of alignment between agricultural, land and water reform processes has seen land transferred to beneficiaries without water rights, and the collapse of once productive farms through land reform.

The policies are also not sufficiently clear on the risk and the remedies associated with climate change.

## 9.3 Desired Future State

A consolidated Water Act is required which covers the full value chain. A draft Bill has been prepared in this regard, but it has not yet been published for comment.

An updated and consolidated National Water and Sanitation Strategy is required that is aligned with the new consolidated Water Act.

Rationalised and consolidated policies and institutional arrangements are needed that are aligned with the National Development Plan, and that are sufficiently robust to accommodate the new lower growth economic paradigm and the risks associated with climate change. A decision is needed urgently on the desired institutional arrangements for the water sector, with implementation delivered in a focused and timeous manner.

#### 9.4 Action Plan

<i>Action</i>	<i>Responsibility</i>	<i>Timeframe</i>	<i>Estimated cost</i>
Revision of Legislation			
Commission research on customary water use in South Africa and implications for legislation	WRC	30 March 2018	R300 000
Finalise draft Bill	DDG: Regulation	30 January 2018	-
Consult on draft Bill	DDG: Regulation	30 March 2018	R2 000 000
Revise Bill and table in Parliament	DDG: Regulation	30 June 2018	-
National Water and Sanitation Resource and Services Strategy (NWSRSS)			
Draft			
Consult			
Revise and publish			
National Sanitation Policy			
Develop implementation plan and awareness programme			
Water and Sanitation Sector Policy on Climate Change			
Develop implementation plan and awareness programme			

## 10. REGULATION AND AUTHORISATION

Regulation can be defined as “the means by which any activity, person, organism or institution is guided to behave in a regular fashion, or according to rule.”<sup>4</sup> Under this definition, the regulatory framework for water resources consists of a great number of players and processes, some falling within the formal regulatory process, i.e. regulation as practiced by the state, and some falling within a more informal regulatory process, for example through the media, community pressure groups, consumer behaviour, and so on.

Water resources regulation is a form of social regulation, aimed at the protection and equitable use of a common pool resource – water. Within water resources regulation, however, there three different types of regulation are defined in this study:

- technical regulation;
- governance regulation; and
- economic regulation.

## 10.1 Present State

### 10.2 Water Resource Use Regulation

Water resources regulation in South Africa operates in a different context from many other countries, in that there is a profound social and economic transformation requirement. This has implications for the types of tools that are used, and how they are applied.

The regulatory framework for water resources has four key elements – policy, legislation, organisational arrangements and instruments. There are a range of regulatory instruments that can be used to achieve the objectives determined by policy and legislation. Broadly there are four categories of regulatory instruments: command and control, economic and market instruments, information as regulation, and voluntary instruments such as negotiated agreements and community based policing.

Whatever regulatory instruments are used, some form of enforcement of those instruments is required, be it ensuring compliance with command and control requirements, ensuring payment for water use, or ensuring the accuracy of information provided. In all cases, failure to conform to the required regulatory actions must see sanctions being imposed

At present, DWS is responsible for overseeing much of the development and operation of the raw water infrastructure, including setting the prices for this water and it is the “shareholder” of water management institutions (existing and those being established), water boards and the supporter of local government in the delivery of water services. The degree of involvement of DWS in the water cycle/value chain and the slow pace of legislation and policy implementation has led to calls from sector stakeholders for a review of regulatory functions and discussions on regulatory independence.

All role-players/stakeholders in the water sector ultimately take decisions or conduct activities that impact on the key activity areas (KAAs), the cluster of key activity areas and ultimately the water and sanitation business value and other stakeholders. The stakeholders and the KAAs that they have an impact on, or an interest in, from a regulatory perspective, are summarised in Table 10-1 below.

#### 10.2.1 Regulatory Complexity

The existing regulatory framework (legislation, regulations, policies, strategies, by-laws etc) and each of its KAAs is highly complex in that multiple stakeholders/ role-players are involved and different regulatory authorities; regulatory domains and mechanisms apply at different levels. For example, the different functions of a water board are regulated by various Directorates within DWS, Water Services Authorities, CMAs, National Treasury and others. This leads to a situation where there is a lack of clarity with regard to roles and responsibilities which do not provide a coherent platform for effective and efficient regulation.

In addition, multiple regulatory domains and levels of regulation exist within the water and sanitation business value chain (including environment, social, economic and health).

### 10.2.2 Regulatory Capacity

A key requirement for effective regulation is that the regulatory authority should have the necessary authority and capacity to effectively **enforce** regulatory requirements and decisions. Given the complexity of the existing regulatory framework (legislation, regulations, policies, strategies, by-laws) for the water cycle/value chain and each of its KAAs, the capacity of the various regulatory authorities to ensure effective compliance, monitoring and enforcement is questionable.

**Table 10-1: Regulatory Stakeholders/Role Players**

KAA	STAKEHOLDERS/ROLE-PLAYERS WITH REGULATORY IMPACTS/INTERESTS																							
	DWS	DEA	DMR	DTI	COGTA	CMA /WUA	WB/ WSP	Water Service Authority	Provincial Government	National Treasury	Donor Catchments	International Interests	NWRIA/ TCTA	Agriculture	Industry	DOH	DRDLA	D o Housing	Civil Society/ NGOs	DST/WRC	Communities	End-User	SAPS/ DOJ	Rural institutions
Climate and rainfall patterns	X	X			X	X			X		X			X	X					X	X	X		
Land use patterns	X	X	X		X	X		X	X		X			X	X		X	X	X	X				X
Raw WR Quantity	X	X	X	X	X	X	X	X	X		X	X	X	X	X				X	X	X	X		X
Raw WR Quality	X	X	X	X	X	X	X	X	X		X	X		X	X	X			X	X	X	X		X
Inter catchment transfers	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X		X					
Storage Dams	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X		X
Abstraction	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X			X	X	X	X	X	
Purification	X	X		X		X	X	X	X	X						X			X	X	X	X		X
Distribution	X	X			X		X	X	X	X				X	X	X		X	X		X	X		X
Reticulation	X	X			X		X	X	X	X						X		X	X		X	X		
Consumption	X	X	X	X	X			X	X		X	X		X	X	X			X	X	X	X		
Waste Collection	X	X			X	X	X	X	X	X	X			X	X	X		X	X	X	X			



<b>Treatment of waste water</b>	X	X			X	X	X	X	X	X	X				X	X		X	X	X	X	X	X	
<b>Discharge of Treated of waste water</b>	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Water Reclamation</b>	X	X	X	X	X	X	X		X					X	X				X	X		X		

### 10.2.3 Separation of Regulation and Oversight

Functions of regulation and oversight must be well defined to eliminate confusion. This separation is important as sector stakeholders often confuse the oversight functions of Departments that work closely together, namely: DWS , CoGTA, DMR and so on, with respect to the institutions that they have Executive Authority for, with the functions of regulation. This blurring of the roles is can lead to sector stakeholders interpreting functions and actions of entities within the sector value chain as conflict of interests.

### 10.2.4 National/provincial/local regulation

The regulatory mandates, authorities and functions of National Government vis Provincial and, in particular, Local Government for matters relating to regulation of elements of the water cycle (water resources and water services) are confusing and this creates uncertainty as water services authorities, municipalities are the local regulator. Local level regulation is exercised via contracts and service level agreements. There is uncertainty about the role of the water services authority and whether DWS can regulate it, or whether that is only an oversight and support role. This needs to be clarified. Most municipalities do not differentiate between the role of water services provider and water services authority and do not effectively ring fence water service activities and the associated direct and indirect costs.

### 10.2.5 Regulatory Independence

The question of regulatory independence and the potential for conflicts of interests arises throughout the water and sanitation business value chain and the associated regulatory domains. As the shareholder of water boards should DWS regulate the entities that it owns? As a supporter of local government should DWS regulate the effectiveness of its own support?

Linked to this issue is the well recognized principle of regulatory governance that requires effective separation of regulatory, policy and operational responsibilities. There may be a strong case for a separate water sector regulator.

### 10.2.6 Fragmented Regulation

The existing regulatory framework for the water and sanitation business value chain is currently very fragmented and this inevitably leads to regulatory gaps and even possibly discriminatory regulatory practices.

On a broader basis the different regulatory functions exercised by different National government agencies/institutions are focussed on specific segments of the value chain and exclude the upstream and downstream impacts.

Discriminatory regulatory practices arise where different entities in the value chain are responsible to different National Departments (Executive Authorities). An example would be in the instance of a Multi Jurisdictional Service District entity is created by municipalities (in terms of municipal legislation, to supply water services to WSAs in a specific region, or a Section 21 Company set up to provide water services in a defined area (such examples exist). These entities generally serve the same purpose as a water board but as they are not established in terms of the Water Services Act they are not subject to the same regulatory requirements.

### 10.2.7 Regulation of natural Monopoly institutions

Due to the nature and characteristics of the sector the institutional arrangements are effectively natural monopoly institutions, including the NWRI, CMAs, Water Boards and Municipal entities. Such institutions need to be regulated in order to ensure that they operate effectively, efficiently and sustainably while providing affordable services across the value chain to the benefit of end users.

### 10.2.8 Economic Regulation

The NW&SMP recognises that at present there is insufficient effective economic regulation of the water and sanitation business value chain's decisions and activities from source to tap. Some aspects of economic regulation are targeted at specific institutions operating in the value chain.

### 10.2.9 Sector Information

Effective regulation of the value chain is underpinned by the need to have access to accurate and reliable information on an ongoing basis. The capacity of relevant institutions to collect and collate such information and report on an ongoing basis and the capacity of the regulatory authorities to interpret and respond to appropriately and timeously to the information is clearly a major challenge for effective regulation of the sector.

Information in the sector needs to be categorised as a critical resource if effective regulation is to be possible.

### 10.2.10 Legislative Overlaps/Inconsistencies

Due to the complexity of legislative frameworks and regulatory authorities that apply to the value chain there are a number of areas where there is duplication of roles and legislative inconsistencies and overlaps that lead to ambiguity and uncertainty. The regulatory roles of DWS as the sector leader and regulator and CoGTA as the regulator of Provincial and local government is an example.

The NWA is not aligned to other legislation eg NEMA, PAJA etc.

## 10.3 Problems, Challenges & Drivers for Change

It is widely recognised that the water resources challenges facing the world today will need to be solved through improved water resources management. There are a number of pillars to improved water resources management, of which regulation is one. While a number of water resources regulatory instruments already exist, and are in use in South Africa, such as water use licensing, deteriorating raw water quality and high levels of water theft, amongst other things, indicate the failure of current regulatory practices to adequately address water resource challenges. Water management can only be effective if the water sector regulatory frameworks are effective.

### 10.3.1 Blanket Implementation of Regulation

There are a number of reasons why the blanket implementation of regulation on all water users is inappropriate in South Africa. Firstly, limited human and financial resources mean that the state needs to take a targeted approach in order to exercise the strictest regulation on those who have the greatest impact or potential impact on water resources, both in relation to abstraction, quality, habitat destruction, and so on.

Secondly, inequitable economic development in the country means that the transformational state should take a different approach to micro- and small-scale water users, for example, than to large, established water users. The state should be protecting and supporting the water use of small users, including through strict regulation of large impact users to ensure that they don't negatively impact on small users either through high levels of pollution or through over-abstraction from water resources shared with small users.

### 10.3.2 Differentiated Approach

The consideration of literature and practice from around the world shows that the regulatory arena is no longer simply an arena of state action through the implementation of command and control regulations. The regulatory terrain has become far more complex and the suite of tools far more sophisticated in recent years. A number of players are now involved in regulation, including government, the private sector, nongovernment organisations, the media, and ordinary citizens. This understanding opens a number of opportunities for new approaches to regulation that draw on the broader capacity within society.

This is important in a context of limited state resources such as pertains in South Africa currently. The state also has, now, a wide range of regulatory instruments from which to choose, of which four categories have been highlighted in this report: command and control, economic and market mechanisms, voluntary agreements, and information disclosure. What is clear from the international literature is that the most effective approach is based on a mix of these regulatory instruments, chosen according to the specific context within which they are to be applied.

It is, however, in the selection of the appropriate tools, and in the development of the appropriate regulatory policy, that significant challenges are to be found. The first of these challenges is recognizing that regulation is a site of contestation, and that there is a need to balance the competing interests that are striving to ensure that regulation serves their interests.

Table 10-2 indicates the results of the primary water sector regulatory authorities/activities in terms of establishing the extent to which they complied with/met the requirements of the established universal principles for good regulation.

**Table 10-2: Results of the Primary Water Sector Regulatory Authorities**

<b>Regulator</b>	<b>Regulatory Principles</b>							
	<b>Clear roles</b>	<b>Transparency</b>	<b>Accountability</b>	<b>Non discriminatory/ Fairness</b>	<b>Independence/ Autonomy</b>	<b>Participative</b>	<b>Effective Monitoring &amp; Enforcement</b>	<b>Minimal Regulation</b>
DWS (WRM)	In the current context DWS does not comply with this principle. Some progress is being made in separating policy, oversight operations and regulation by establishing institutions such as CMA's the NWRIA and internal restructuring- though the timeframe for this is problematic.	Partial compliance. Processes (water use licensing, raw water pricing etc) are in place but effectiveness and transparency of regulatory decisions is questionable	Accountable to Parliament.	DWS practises and processes are perceived to be discriminatory and inconsistent by different primary water users.	In the current context DWS does not comply with this principle. Subject to direct political control. Areas of conflict of interests exist.	Good compliance, DWS has a strong history of participative practices and the structural tools are embedded in policy and legislation.	In the current context DWS does not comply with this principle. There are serious capacity constraints, compounded lack of focus and lack of consistency. Overlap with Water services Regulation	Regulatory focus is appropriate for a water stressed country such as SA. Gaps however exist. There is no economic regulation of WRM decisions and the downstream impacts of these.
DWS (Water Services)	In the current context DWS does not comply with this principle. Constitutional and municipal mandates constrain the ability of DWS to effectively regulate water services.	Partial compliance. Regulatory frameworks in place.	Accountability is problematic. DWS and CoGTA and NT have regulatory responsibilities /accountabilities with regard to municipal performance and water services delivery	In the current context DWS does not comply with this principle.	In the current context DWS does not comply with this principle. Subject to direct political control. Areas of conflict of interests exist.	Good compliance, DWS has a strong history of participative practices and the structural tools are embedded in policy and legislation.	In the current context DWS does not comply with this principle. There are serious capacity constraints, compounded lack of focus and lack of consistency.	Regulatory focus is inappropriate. It is not holistic, regulatory gaps exist and multiple regulatory functions (DWS and others) are not aligned.
WSA's	Clearly set out in the Constitution of SA and Municipal Legislation (Structures Act, Systems Act and MFMA)	Partial compliance. Requirements for transparency are embedded in policy, legislation etc. Capacity /willingness of WSA's to	Accountable to Parliament via CoGTA, DWS (elements of water services)	Required by the Constitution and municipal legislation	Local political structures take decisions	Participative practices and the structural tools are embedded in policy and	In the current context WSA's (generally) do not comply with this principle Poor information and	Scope of regulation Clearly set out in the Constitution of SA and Municipal Legislation and WSAAct .

		subject regulatory decisions to truly transparent processes are questionable	and NT (MFMA).			legislation. In practise the degree of participation varies.	reporting and significant institutional, technical and managerial capacity constraints make it difficult to monitor compliance. Lack of separation of WSA and WSP functions also an issue.	Gaps exist.
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### 10.3.3 Alignment to Regulatory Enablers

The SA water sector regulatory authorities/activities when evaluated in terms of the extent to which they complied with/met the requirements of the established enablers or prerequisites for good regulation fared reasonably well with certain areas still facing significant challenges. Table 10-3 expanded on in the benchmarking report.

**Table 10-3: Regulatory Enablers**

<b>Regulator</b>	<b>Regulatory Enablers</b>				
	<b>Clear Mandate-</b>	<b>Coherent Policy &amp; legislation</b>	<b>Regulatory Capacity and Skills</b>	<b>Institutional Capacity</b>	<b>Access to information</b>
DWS (WRM)	The mandate of DWS is clear. The slow pace of establishment of CMA's to execute the mandate/DWS capacity constraints, is a significant constraint.	Coherent policy and legislation is in place. Alignment and cooperation with other Govt departments such as DEA (NEMA) and DOH and DMR needs improvement.	Significant challenges exist in terms of this enabler. DWS structures Capacity and skills Regulatory focus Delegations	Significant challenges exist in terms of: Establishment of CMA's Transformation of WUA's DWS regulatory structures NWRIA establishment Sustainability	Access to accurate regulatory is poor.  Eg determination of hydrological reserve, allocations and use (WAR) illegal use etc.
DWS (Water Services)	The mandate is clear but in practises the multiple roles of DWS (sector leader / custodian / supporter / regulator) and DPLG & WSA's for service provision leads to confusion and ineffectiveness	Coherent policy and legislation is in place. Alignment and cooperation with other Govt departments such as CoGTA and DOH needs strengthening. Some legislative amendments could improve coherency.	Significant challenges exist in terms of this enabler. DWS structures Capacity and skills Regulatory focus Delegations	Significant challenges exist in terms of: The capacity/skills challenges faced by public sector entities and in particular municipalities, is a huge constraint to effective regulation.	Access to accurate regulatory is a major constraint to effective regulation.
WSA's	Clearly set out in the Constitution of SA, Municipal Legislation and the WSAct.	Comprehensive policy and legislation is in place for the effective regulation of water services.	Significant challenges exist in terms of this enabler.	capacity/ skills challenges faced by municipalities	Access is constrained

### **10.3.3.1 DWS (WRM)**

#### **Positive Improvement Trends**

Not yet demonstrated but DWS, in collaboration with others, has undertaken a number of key initiatives directed at improving the quantity and quality of water resources. Two specific positive examples are:

#### **Working for Water**

The Working for Water (WfW) programme was spearheaded to eradicate the invasive alien plants. This programme works in partnership with local communities, to whom it provides jobs, and also with Government departments including the Departments of Environmental Affairs and Tourism, Agriculture, and Trade and Industry, provincial departments of agriculture, conservation and environment, research foundations and private companies.

#### **Working for Wetlands**

Another excellent example of social regulation currently undertaken by DWS as one of the key partners is Working for Wetlands (WfWet).

WfWet uses wetland rehabilitation as a vehicle for both poverty alleviation and the wise use of wetlands. It follows an approach that centres on cooperative government and the creation of partnerships between landowners, communities, civil society and the private sector.

A joint initiative of the departments of Environmental Affairs and Tourism (DEAT), Agriculture (DoA) and Water and Sanitation (DWS), WfWet is housed within the South African National Biodiversity Institute (SANBI).

In this way it is an expression of the overlapping wetlands-related mandates of these three parent departments and, in addition to giving effect to a range of policy objectives, also honours commitments under several international agreements, especially the Ramsar Convention on Wetlands.

### **10.3.3.2 DWS (Regulator of Water Services)**

#### **Positive Improvement Trends**

While not yet sufficiently demonstrated, DWS has initiated a number of important initiatives designed specifically to build the capacity and available skills of those institutions that will be regulated, i.e. examples include the municipal water quality testing programme and the recent water quality regulation<sup>5</sup> initiative. The promulgation of the National Water Services Regulation Strategy is also a key initiative that will enhance performance and regulatory effectiveness.

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<sup>5</sup> Blue/ Green Drop water certification programme for municipalities

### 10.3.3.3 Water Services Authorities (WSA's)

#### Positive Improvement Trends

The current status of the South African water sector's regulatory authorities when evaluated in terms of compliance with "best practice" (the UR's and ER's), key challenges, constraints, gaps and opportunities with regard to improved and better integrated regulation of the water sector are summarised as follows;

#### 10.3.4 Regulatory Governance

- Effective regulation (especially economic and technical regulation) of state owned entities requires the appropriate separation of the roles of custodian, policy maker, shareholder, supporter and regulation. The roles and accountabilities of DWS and others need to be redefined and made clear and unambiguous.
- The role of DWS as the sector leader, regulator and supporter of local government is inconsistent and confusing and it could be argued, allow municipal authorities to abdicate their responsibilities. The regulator should not regulate the effectiveness of its own support.
- Stakeholder opinion and perceptions are that there are serious conflicts of interest with regard to DWS as the regulator of the entire water cycle/value chain and some of the associated domains (e.g. economic regulation).
- Areas of self-regulation by DWS should be eliminated as far as possible.
- Areas where there are actual (or perceived) discriminatory regulatory practices need to be either eliminated or made transparent so that stakeholder confidence and regulatory credibility is established/enhanced.
- National governments transformational objectives need to be clearly defined and articulated in appropriate regulatory frameworks.
- Existing regulatory frameworks, in particular, the WRM policies and NWA exist but these have either not been fully implemented by DWS or are not/ functioning at a level that allows for effective regulation. (e.g. establishing CMA's, establishing the environmental reserve and water use licensing).

#### 10.3.5 Policy and Legislation

- There are challenges with regard to the coherency of aspects of policy, legislation and regulatory authorities.
- Existing legislation has not been fully implemented and policy has shifted without the requisite timeous legislative review to ensure coherency. It is clear that legislative amendments will be necessary to address and improve coherency.
- Mechanisms for improved alignment and cooperation with other Govt departments such as DEA, CoGTA Finance and DOH clearly need strengthening in order to streamline implementation and regulatory accountabilities.
- Complex regulatory frameworks (systems, functions/mechanisms) are in place in the sector (it could be argued that there are too many) but these are generally not appropriately integrated and or focused. There are clear needs and opportunities to

improve, alignment, coherence and cooperation between different regulatory authorities and functions.

- A feature of the current regulatory framework is that at a practical level, there is difficulty in separating regulatory mechanisms and responsibilities (legislated responsibilities) from policy and strategies.

### 10.3.6 Regulatory Capacity

- Institutions that have important regulatory mandates such as CMAs have either not been established or where they have been, they lack the institutional capacity to give effect to the key regulatory functions/decisions, in these instances DWS therefore self regulates. This has a profound and material impact on regulatory credibility and effectiveness.
- There is a glaring lack of regulatory structures, focus, capacity and skills to give effect to effective regulation at all levels in the sector.
- Regulatory expertise and skills are not readily available in the country and DWS is not likely to easily attract and or retain the appropriate skills.

### 10.3.7 Institutional Capacity

- There are huge capacity and skills constraints in all of the water management and service delivery institutions in the water value chain. In particular the Municipalities who are charged with the local delivery of water services and management of waste water treatment.
- The viability and sustainability of water management and service delivery institutions in the water value chain is a huge cause for concern as tariffs often do not reflect the true cost of service delivery and insufficient funds are available for effective asset management and expansion. This is clearly an area where regulation and oversight need to be focussed and strengthened.
- The DWS sector institutional realignment and internal realignment initiatives need to ensure that they address key regulatory governance issues such as the multiple and conflicting DWS roles in the sector, improved independence/autonomy of regulatory functions and clear and unambiguous accountabilities.
- This must also extend to clear decisions regarding the roles and functions of National vs Regional Offices.
- Decisions and plans regarding the establishment and capacitating of CMA's the NWRIA and WUA's is a critical requirement.

### 10.3.8 Regulatory Structure/Domains

- There are a number of obvious regulatory domains that are relevant in the context of the water cycle/value chain such as environmental, drinking water quality, economic and technical and social regulation. Each of these domains have unique regulatory objectives and needs and consequently require different approaches/structures if they are to be successful. For example, the need for regulatory independence would be much higher in the economic domain than it would be in the social domain. The relative importance of the regulatory principles and enablers is therefore also a factor of the form of regulation.

Different approaches and models in regulatory design for different regulatory domains are therefore predictable and necessary.

- The internal structures of DWS and associated functions (national and regional) need to complement and align with the regulatory framework that emerges from this process.

### 10.3.9 Compliance Monitoring and Enforcement

- Monitoring and enforcement of regulations in the water sector is generally considered to be poor, primarily due to:
  - Fragmented approaches;
  - Slow decision making;
  - Lack of focus and capacity;
  - Confused roles; and
  - Inconsistency of enforcement.
- The CM&E functions of DWS will need to be structured and aligned to the regulatory framework and will require substantial strengthening, capacity and resources.

### 10.3.10 Positive Developments-

There are a number of areas where there are substantive positive developments for regulation in the water sector and these initiatives need to be complemented, strengthened and optimised in the development of improved integrated regulatory frameworks. These are as follows:

- The development and implementation of the National Water Services Regulatory Strategy;
- The focus and strengthening of the DWS CM&E functions (blue scorpions);
- The establishment of the NWRIA to further separate the operational WRM/security of supply functions from policy and regulation;
- The Dam safety regulation functions which are clearly well established, capacitated and effective;
- The water quality regulation initiative (Blue Drop/Green Drop initiative);
- The working for water and working for wetlands initiatives;
- The current DWS internal restructuring and realignment;
- Realignment of Sector institutions; and
- Legislative reviews, in particular the (NWA and WSAAct).

## 11. GOVERNANCE AND INSTITUTIONAL ARRANGEMENTS

The first democratic government of South Africa inherited a disjointed water sector institutional framework in 1994, largely based on separate development practices. Since the promulgation of the Constitution in 1996, government introduced new water policies and legislation to rationalise the institutional framework, and to provide mechanisms for undertaking constitutional mandates meant to improve the access of citizens to water and sanitation services. The introduction of new water legislation and the establishment of new institutions or restructuring of existing institutions has continued since 1996.

***South Africa must build effective water sector institutions***

### 11.1 Present State

#### 11.1.1 Governing Legislation

The Minister of Water and Sanitation is the Executive Authority for a number of public institutions in the water sector and is accountable to Parliament for the performance of these institutions.

The legislative mandates for the water sector institutions are set out mainly in three pieces of legislation, the National Water Act (Act 36 of 1998), the Water Services Act (Act 108 of 1997) and the Water Research Act, 1971 (Act No 34 of 1971). In terms of the current policy and legislative mandates the Minister has executive authority over 13 institutions (9 water boards, 2 catchment management agencies, the Water Research Commission (WRC), and the Trans-Caledon Tunnel Authority (TCTA).

The CMAs and the WRC are Schedule 3A entities in terms of the PFMA, while Water Boards are listed as Schedule 3B. TCTA is a Schedule 2 entity. The Minister is also responsible for overseeing Water User Associations and the transformation of irrigation boards, however, these institutions are not listed under the Public Finance Management Act (PFMA).

Water sector institutions have a critical contribution to make towards achieving government's transformation and development objectives outlined in the National Development Plan's Vision 2030. They have an essential role in the achievement of sustainable water and sanitation provision to give effect to the fundamental right of every individual to have access to water and to human dignity, as well as socio-economic objectives.

#### 11.1.2 Institutional Reform and Realignment

Government recognises that institutional inadequacies within the water sector carry heavy socio-economic costs for the country. Management of a scarce resource such as water requires constant review of institutional mechanisms to ensure effectiveness and efficiency. In addition, increasing concerns regarding water availability and water quality create a basis for review of how institutional performance and misalignment of institutions contributes to high public discontent. The latest institutional reform and realignment started in 2008 leading to approval of a new institutional roadmap in 2012. The objectives of this roadmap were:

- To clearly define the institutional design for the sector that best serves government's policy objectives and that is supported by sufficient consensus among sector stakeholders;



- To develop an institutional design that is practical and cost-effective, and which provides a clear road map and time-line for implementation; and
- To develop business cases and implementation plans that will facilitate the successful implementation of the required reforms and that will result in improved sector performance, improved delivery of services and better attainment of policy objectives.

The focus of the institutional reform process was on four areas which mostly exhibited signs of poor performance.

These are:

- Development and management of national water resources infrastructure;
- Development and delivery of regional bulk water infrastructure and services;
- Catchment management within the proclaimed Water Management Areas; and
- Localised water resource and infrastructure management.

## 11.2 Problems, Challenges and Drivers for Change

The Diagnosis Report compiled by the National Planning Commission highlighted a number of challenges in the institutional framework for the water and sanitation sector, which remain relevant at the present time. These include a lack of shared vision; differing interpretation of obligations; capacity and coverage of water institutions; regulation of institutions by national government (DWS); poor performance of some institutions; transformation, restructuring and realignment of water institutions; and the number of institutions reporting to the Minister.

Other institutional challenges included slow institutional establishment, varying institutional capacity, viability and sustainability challenges, duplication of effort and resources, even within the same region, lack of regulation and compliance as well as a low skills base.

### 11.2.1 Specific Challenges

#### 11.2.1.1 National Water Resource Infrastructure

National water resources infrastructure include government water works such as dams, inter-basin transfer schemes and bulk water schemes serving different water uses and supporting socio-economic development. These water works are currently developed, operated and maintained managed by the Department of Water and Sanitation including through its agency – the TCTA. Currently, the following challenges are experienced:

- The performance of national government (DWS) with respect to the management of national and regional water resource infrastructure has been poor;
- Functions between DWS and TCTA are duplicated; and
- Financing arrangements across the sector are sub-optimal with the result that assets are being funded out of government budget where these could be financed through water use charges.

#### 11.2.1.2 Managing Water Resources at Catchment Management Level

The National Water Act provides for the establishment of Catchment Management Agencies to manage one or more Water Management Area (WMAs). The number of WMAs were reduced from nineteen (19) to nine (9) in 2013. The establishment of nine CMAs has been slow. By end of 2016, only two CMAs were established and functional. A number of process and institutional

challenges have delayed the process, leading to a review of the initial plan to establish nine CMAs.

On the other hand, the delegation of water management functions to the catchment level has only been partially implemented since the promulgation of the National Water Act in 1998, partly due to a lack of clarity as to whether to proceed with the establishment of CMAs or not. At the same time, however, government's performance of its water management and regulatory functions has been less than optimal. This has compromised government's ability to achieve its developmental and transformation objectives.

### ***11.2.1.3 The management of regional water infrastructure and the future role of regional water utilities***

While most water boards have been established for pragmatic reasons and many have had a history of good performance by both local and international standards, there are three primary drivers for change: (1) The weak performance in the management of water supply and sanitation services by many municipalities compromises the extension of services to those without, and results in (or threatens to result in) unreliable and unsafe services; (2) there are some important gaps in the existing institutional and financial framework – responsibilities for water resources development at the local and regional level, and for regional bulk services outside of the existing water board service areas are not clear; and (3) there have been (and currently exist) governance and performance-related problems for some of the existing water boards.

Regional water utilities offer services to municipalities on a voluntary contract basis. Municipalities have financial and regulatory incentives to contract out services (through concession, lease or management contracts) where they are unable to effectively perform the services themselves. Regional water utilities have regulatory and financial incentives to perform well.

The creation of regional water utilities with an expanded set of functions and within an appropriate regulatory and financial framework is preferred over the status quo. A differentiated establishment of regional water utilities is preferred as it is not considered necessary to establish regional water utilities in all areas (wall-to-wall), but it is rather appropriate to establish them on a case-by-case basis as and where necessary based on a needs analysis specific to the regions concerned.

### ***11.2.1.4 Managing local water resource infrastructure***

WUAs are local-level institutions with voluntary membership intended to support the management of local water resources in the common interest. Most, but not all WUAs, serve the irrigation community. They are intended to include all users of a resource, both consumptive and non-consumptive.

This is an institutional space that is too localised for DWS to manage and the department relies on these institutions to manage local resources and infrastructure (both state owned and private) themselves. Key challenges include:

- WUAs can be delegated additional functions to perform on behalf of the DWS or CMAs if it is more effective for them to do so;
- This space is politically contested because of the historical imbalance in the distribution of land and water rights, with the interests of white commercial farmers continuing to dominate;

- The development and transformation of WUAs, either through the transformation of irrigation boards through broader representivity, or through the establishment of new WUAs comprising resource poor farmers, has been very slow;
- The creation of WUAs to manage government water schemes has been stalled by the issue of staff not wishing to be transferred from government to what are essentially private bodies;
- Slow transformation of irrigation boards has been due to a combination of difficulties in achieving representivity targets, unresolved concerns regarding the transfer of private assets and liabilities to a wider grouping, and bureaucratic delays by the DWSt; and
- There is a lack of financial and technical resources to support new ‘developmental’ WUAs. DWS does not have the capacity (human and financial) to provide support on a large scale.

WUAs are meant to be financially self-sustaining through user charges. However, there is a capital funding gap for WUA-managed state-owned infrastructure (Government Water Schemes [GWS]) created by caps on the raw water tariff and an inadequate financial framework for how this money gets raised and used. The financial framework is also required to clarify who is responsible for the extension of these schemes and how GWSs can be used to subsidise resource poor farmers.

### 11.2.1.5 Regional Bulk Water Services infrastructure

### 11.2.2 Key Drivers for Change

Water sector institutions should be consolidated to achieve, among others, the following outcomes:

- Economies of scale in terms of capacity and service deliver;
- Sufficient institutional capacity to attain sustainability and capability to execute service delivery mandates of affected institution;
- Integrated planning for water sector development’
- Sufficient delegation and decentralisation of water services delivery mandates (functions and roles);
- Economic and financial viability of institution;
- Elimination of inefficiencies and duplication; and
- Enhancement of regulations and compliance.

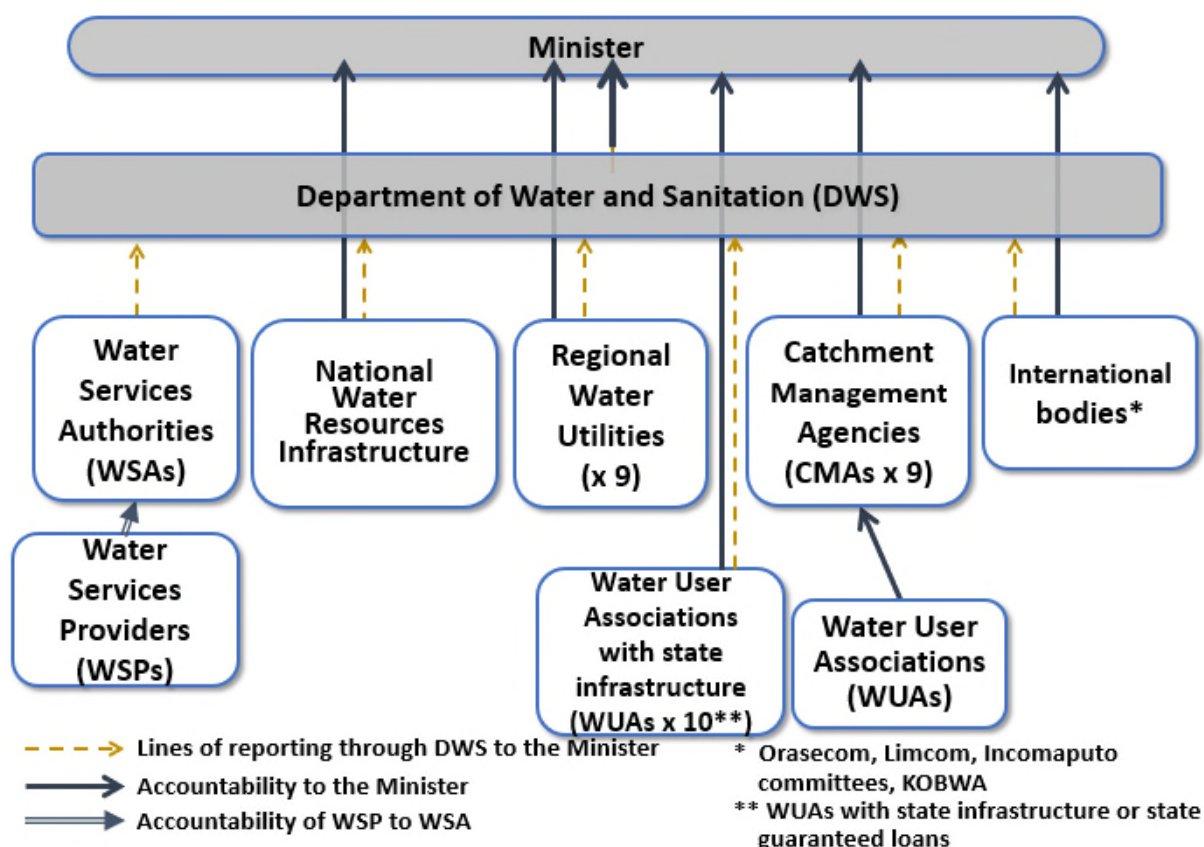
**Table 11-1:**

<i>Issue</i>	<i>Rationale</i>
Transformation and rationalisation of the number of appropriate institutions	Repositioning of the State capability and service delivery
Governance, accountability and transparency	Repositioning of the State capability and service delivery
Alignment with long term strategy of the Dept/Gov	Responding to the call for rationalisation
Financial arrangements	Responding to cost containment measures Adopting a funding model that will be sustainable to ensure improvement in service delivery
Performance	Respond to poor performance and oversight of institutions
Ownership of water and sanitation infrastructure	Transfer of infrastructure to appropriate Organ of State

## 11.3 Desired Future State

### 11.3.1 The Overarching Vision

The vision is to create sustainable water sector institutions that will facilitate effective service delivery while supporting government's transformational objectives. This will be achieved by the separation of policy making, shareholding and regulation to ensure that there will be effective governance in the sector. Institutional integration is also required to ensure that functions are allocated to institutions that are best placed to undertake them, to optimize the sector capacity and, to facilitate economies of scope and scale. See Figure 11.1.



**Figure 11.1: Overarching Vision**

The desired institutional state is envisioned as follows:

1. The overall trusteeship of the water value chain is with the Minister of Water and Sanitation. The Minister is responsible for efficient and effective water institutions to give effect to her public trusteeship of the water and sanitation business value chain;
2. National government, through an appropriate organ of state (government department) sets policy, regulates, and provides support to water management and water services institutions to achieve their constitutional and legislative mandates in the water sector;
3. The ownership, financing, development, management and operations and maintenance of national water resources infrastructure is provided through one Departmental or Government component;
4. The development, financing, management, operation and maintenance of regional bulk water and wastewater services is a responsibility of new Regional Water Utilities;
5. Water resource management for each of the nine newly defined water management areas will be strengthened through developing and consolidating catchment

management capacity into economically and institutionally viable catchment management agencies;

6. Local water resource management institutions are responsible for the management of local water resources and related water supply infrastructure led by users for their mutual benefit;
7. Water research, information and knowledge management will contribute to improved water resource management and sustainable water service provision; and
8. The development and management of the four international river basins is undertaken by trans-boundary water management institutions.

## 11.4 Action Plan

### 11.4.1 Catchment Management Agencies

The plan is to establish one CMA structure in SA under the Schedule 3a of the PFMA, to manage water resources in the country. In terms of an operating model, the CMA will have a national office, wherein the executive and shared services can be housed, and nine business units, each located in the nine WMAs. In terms of governance, the CMA will have its own Board, and the Department will maintain institutional oversight and monitor performance. A significant amount of ground work for the establishment of the single CMA has already been undertaken. In this regard, the water resource management functions have been ring-fenced.

### 11.4.2 Regional Water Utilities

Nine Regional Water Utilities will be established throughout the country. This will include amalgamation of existing water boards and extension of operating boundaries of existing water boards. The process will start developing suitable legislative frameworks for redefining the functions and governance arrangements of Regional Water Utilities followed by completion of due diligence exercises for the amalgamation processes.

### 11.4.3 National Water Resources Infrastructure

A National Water and Sanitation Infrastructure Agency (NAWASIA) will be established to fund, develop, operate and maintain infrastructure of national and regional significance. Such an agency will be empowered to raise capital for infrastructure development. Key support actions will include the development of an appropriate legislative framework, and due diligence leading to consolidation of the TCTA and Water Trading Entity into a NAWASIA.

### 11.4.4 Local Water Resource Management Institutions

New institutions will be established based on a redefinition of functions and institutional restructuring of the existing water user associations and irrigation boards. The new institutions should provide for water user participation in governance, establishment and regulation by the Catchment Management Agency, and ability to perform delegated functions and services.

## 12. HUMAN RESOURCES, SKILLS DEVELOPMENT AND CAPACITY

The water sector is very much inter-sectoral and multi-disciplinary in nature. At an inter-sectoral level, it links with agriculture, health, education, local government, mining, forestry, industry and environment. These sectors are composed of a range of organisations in the public, private and

civil society space. Its multi-disciplinary nature covers a range of responsibilities, from policy and regulation, through planning and management functions, as well as capital works design, construction, operation and maintenance, across urban and rural environments, for all types of consumptive uses, including environmental aspects. These different responsibilities are allocated to a number of water sector institutions, mostly within the public sector such as water services authorities, water services providers, water boards, catchment management agencies and water user associations.

A capable water sector requires human resources capacity for different functions at different institutions – both in terms of numbers to meet demand for specific skills; and competencies in terms of skills, qualifications and experience.

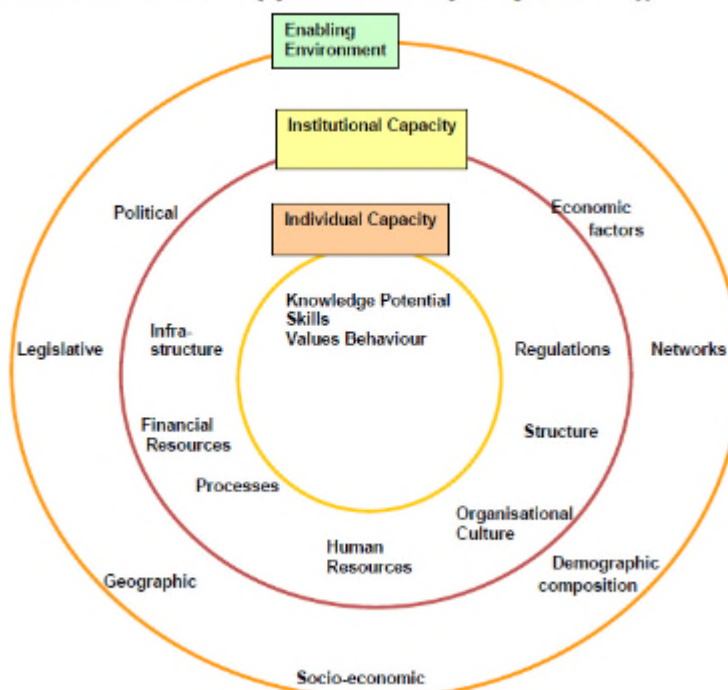
## 12.1 Present State

Government has acknowledged the current and likely future constraints imposed by skills shortages and gaps in the water sector, and the likely impact on institutional functionality and performance. The skills dearth within institutions directly impacts on government's capacity to implement its service delivery programmes, and to execute constitutional mandates. Given the central and catalytic role of water in the economy, the resultant institutional failures impact adversely on socio-economic development programmes and human development generally.

### 12.1.1 Approach to Skills Development and Capacity Building

Skills and capacity building should be defined beyond individual capacity, as the institutional capacity and the enabling environmental have aspects of capacity that should be taken into consideration. This chapter has adopted the Department of Cooperative and Traditional Affairs' (COGTA) definition of Capacity building as espoused in the National Capacity Building Framework (NCBF).

#### Multi-dimensional Approach to Capacity Building

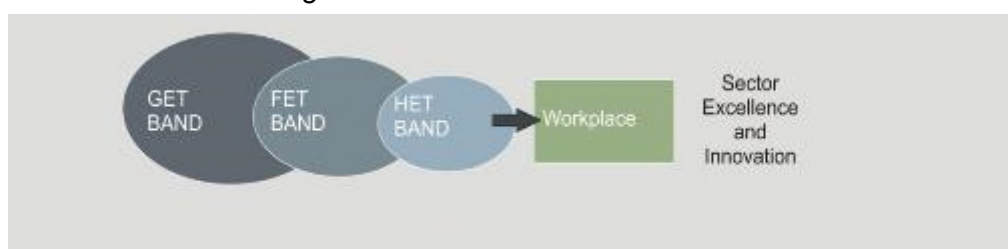


*Figure 12.1: Multi-dimensional Approach to Capacity Building*



This chapter is also based on the pipeline approach that recognises that skills are produced over many years through an education and training system. The system begins at pre-primary level, through the general education and training (GET), further education and training (FET) as well as higher education and training (HET) bands, and covers the occupational learning sphere. The approach proposes a strategic intervention in each of the blocks that constitute the education and training pipeline with the understanding that the effective functioning of the system will produce sufficient numbers of work-ready graduates required by the sector. Figure 12-2 illustrates the pipeline approach to education and training.

A leading example of the utilisation of the pipeline approach is the 2020 Vision for Water and Sanitation Education Programme (VfWSEP) which seeks to address water conservation, demand management and skills shortages in the sector.



**Figure 12.2: Pipeline Approach**

### 12.1.2 The Skills Development Mandate in the Water Sector

The responsibility for the coordination of education, training and skills development across various sectors is vested in the Department of Higher Education through the various Sector Education and Training Authorities (SETAs). The Skills Development Act (No. 97 of 1998, as amended) conferred the primary legislative responsibilities of facilitation of learning programmes (linked to occupations), disbursement of workplace training funds (mandatory and discretionary grants) and skills planning functions to Sector Education and Training Authorities (SETAs).

For the water sector, the Energy and Water Sector Education and Training Authority (EWSETA) is charged with the responsibility of coordinating and facilitating skills development and capacity building in accordance with the Skills Development Strategy, Human Resource Development Strategy II (2010-2030) and the New Growth Path, National Skills Accord (NSA) between government, business and labour. Through its Sector Skills Plan, the EWSETA focuses on determining skills development priorities after thorough analysis.

### 12.1.3 Skills Development

The water and sanitation sector is dependent on high levels of professionals and technicians; however, there is a serious shortage of specific critical skills within various water sector institutions across the water and sanitation business value chain. Skills required include those involved in the abstraction, purification and distribution of water and sanitation (water supply, wastewater and on-site sanitation). Achieving sustainable water resources management requires a multi-dimension approach to how skills and capacity is addressed across the value chain from regulation through to provision, usage, treatment and re-use of water, in both rural and urban areas and across the gender divide.

The EWSETA 2017-2022 Sector Skills Plan highlights challenges such as limited number of people studying in engineering, graduates not having the required practical skills, the quality of Technical Vocational Education and Training (TVET) colleges not being adequate, many current

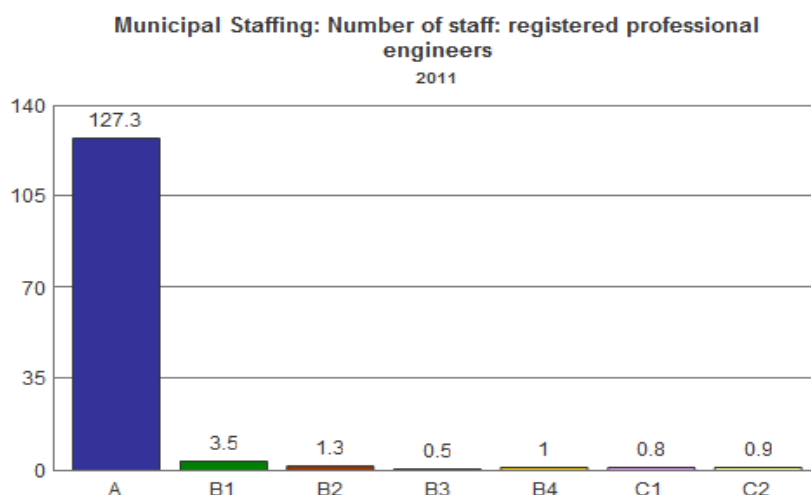
personnel nearing retirement and the shortage of experienced people in the pipeline that can fill these positions; as well as the inadequacy of the sets of qualifications for emerging occupations. As a result of this serious shortage of technical skills, the Department of Water and Sanitation continues to over-rely on consultants in strategic areas like planning and Regional Bulk Infrastructure Programmes.

The skills and capacity required by the Water Services Authorities (WSAs) to deliver and maintain water and sanitation services sustainably also remain inadequate. The publication entitled *Numbers and Needs in Local Government* (Lawless 2005) highlighted that municipalities were short of civil engineers, technologists and technicians, with some 28% of municipalities having no in-house civil engineering capacity at all at that time. The updated *Numbers and Needs* (Lawless 2007) further highlighted the fact that civil engineering levels in municipalities is too low to adequately plan, deliver, operate and maintain local government infrastructure in a sustainable manner. To determine progress made, The South African Institute of Civil Engineers' (SAICE) Professional Development and Project has undertaken a comparison between the 2005 results and the status quo in 2015. As indicated in **Table 12-1** below, the number of municipalities with no civil engineers on their staff has increased from 126 to 202. Twenty-eight have no civil engineering staff at all, while 81 have only technicians.

**Table 12-1: Civil Engineering Metrics – 2005 compared with 2015**

<b>Totals</b>	<b>2005</b>	<b>2015</b>	<b>Number of municipalities with</b>	<b>2005</b>	<b>2015</b>
Civil engineering staff	1 875	2 387	No civil engineering staff	82	28
Civil in metros	1 059*	1 201	No civil engineers	126	202
Civil in districts	240	260	One civil engineering staff member	60	41
Civil in locals	576	926	Only civil engineering technicians	95	81
Population	47.640m	54.432m	Female civil engineering staff	56	153
Households	11.754m	16.122m	Registered civil engineering staff	85	56

The Municipal Demarcation Board's *State of Municipal Capacity Report* (2012) also highlighted the uneven distribution of registered Engineers, which is an essential capacity to manage water and sanitation services. As indicated in Figure 12.3 below, particularly small and rural municipalities are struggling to attract and retain engineers.



**Figure 12.3: Number of Registered Engineers per Municipal Category**

### 12.1.4 Institutional Capacity

Institutional capacity refers to the capacity of sector institutions and entities to plan and manage the execution of sector mandates efficiently and effectively. It includes:

- Powers and functions of various institutions;
- Institutional service delivery models;
- Institutionalised arrangements for planning and delivery of services;
- Regulations and bylaws;
- Financial resources;
- Leadership and governance; and
- Awareness and constituency engagement.

Capacity building in this regard includes all physical and non-physical resources necessary for institutions to undertake their functions and a seamless relationship amongst institutions with a clear division of functions, liabilities, obligations and powers.

### 12.1.5 Environmental Capacity

Environmental capacity relates to external enablers for effective and efficient functioning of water sector institutions. These include sector policies, legislation, strategies, plans, funding and institutional arrangements for effective regulation and seamless accountability. Other issues include the political and socio-economic environments and how water sector institutions are enabled to operate optimally and navigate through challenges such as skills deficit, limited government fiscus, high levels of poverty, demographic trends such as high rural to urban migration, high rate of informal settlements, low levels of cost recovery, and public unrests.

## 12.2 Problems, Challenges & Drivers for Change

The South African water sector has experienced major sectoral, regulatory and institutional reform since 1994. These have had significant impact on the governance, operations and management of water sector institutions and engagement with water users, and on the capabilities and expertise required. The capacity gaps are present at various levels – environmental, institutional and human skills. Environmental and institutional capacity gaps are a result of a multiple factors beyond what the water sector can influence.

### 12.2.1 Human Skills

The following human skills capacity gaps are noted:

- Experienced professionals are leaving public institutions to work in the private sector and in foreign countries due partly to the inability of public sector institutions to attract and retain such staff;
- Mentoring of new entrants into the water sector has become a major challenge due to shortage of experienced personnel in the public sector;
- One of the major challenges experienced with capacity building and skills development interventions in the sector is that impact assessments are hardly ever conducted, allowing little evidence of actual impact;

- Poor primary planning data, which under ideal circumstance should be generated through the workplace skills planning process;
- There is limited number of water and sanitation sector occupations listed in the Organising Framework for Occupation (OFO), as such workplace skills plans from employers are not standardised and reflective of the actual needs/gaps, and this builds into inaccurate prioritisation and allocation of funding for interventions;
- The impending retirement of a large cohort of skilled workers, leaving significant gaps in skills and experience, within Department of Water and Sanitation and the whole sector. Ageing skills force which is exiting the in high numbers against the painstaking slow process of injecting the young skills force;
- Changing capability requirements to meet the emerging demands of climate change, environmental management, new technologies, and the multi-disciplinary nature of sustainable water management;
- Resource constraints, and current low capacity to engage with the water sector, update existing materials, generate new courses relevant to emerging needs and deliver industry-relevant education and training; and
- Low levels of entrants and completions in education and training programmes relevant to the water sector, including sciences and engineering.

Other trends which influence skills availability and retention within the water sector include the following:

- Extensive corporatisation and the contracting out of many functions of water utilities in the 80s and 90s, and a resulting reduction in the level of inhouse training provided by employers;
- Broader issues also directly impact the water sector – the overall shortages of technical skills in the Australian economy, the strong competition for human resources within the infrastructure/ mining sectors in particular and an extended period of low investment in curriculum development;
- Demand from the mining and construction industries for a limited pool of scientists and engineers;
- Changing/evolving job roles, definitions and qualifications make it difficult to choose a specific career path in the water industry;
- Changing expectations from younger members of workforce who expect greater flexibility in working hours, the opportunity to achieve a work/life balance and better optimised career paths than is offered by industry; and
- Variable connectivity of universities with industry resulting in less employment-relevant curriculum.

### 12.2.2 Institutional Capacity

The current performance of various water and sanitation sector institutions throughout the water supply and sanitation business value chain, suggests that some service delivery challenges are directly attributed to institutional weaknesses that are beyond individual capabilities of staff members. The key questions that the water and sanitation sector has to address include the following:

- Whether water management institutions at various levels are empowered enough to fulfil their mandates?
- Whether water management institutions have the most effective governance structures?
- Whether water management institutions have the most effective platforms for stakeholder engagement and participation?

Further analysis is required in assessing institutional orientation and performance in regards to the following critical issues:

- Are water supply and sanitation functions allocated to the most appropriate institutions? This includes the constitutional definitions of potable water and sanitation and the role of water boards, water services authorities and other public entities; and
- Have the division of powers and functions between Category B and Category C municipalities yielded the results desired by the sector? Are there opportunities for rethinking the division of potable water and sanitation at local government level?

The current challenges include leadership and governance models. The performance of the water services sector has shown that institutional capacity at this level is the most deficient. Given the position of local government at the coalface of service delivery, the inability of the water sector to deliver water and sanitation services is often attributed to weaknesses in local government.

### 12.2.3 Environmental Capacity

The water sector continues to evolve, and with this evolution comes constant challenges related to the development and implementation of policy, legislative, regulatory and governance arrangements at national level. This happens in a socio-economic environment which directly challenges sector programme effectiveness – natural resource inadequacies, poverty and inequality, lack of transformation, youth joblessness, limited access to training and development for poor people, low economic development and global challenges such as climate change.

From a water sector perspective key issues relating to how environmental capacity enables effective delivery of water supply and sanitation programmes include:

- Water sector funding models;
- Sector legislation, policies and plans; and
- Governance arrangements

Environmental capacity issues are addressed in other chapters of this Master Plan.

## 12.3 Desired Future State

The future is envisaged as follows:

- A well-skilled and adaptable water sector work force;
- An attractive sector that competes with other sectors for skills and is able to retain skilled staff in the water sector;
- Accountable and strong governance structures focused primarily on monitoring and evaluation of new and existing training/skills development programmes; and
- Funding available for scarce skills throughout the skills development pipeline.

## 12.4 Action Plan

It is tempting to view present needs as urgent, and solutions in a corresponding short-term framework. Both the water sector and the education sector operate in long timeframes, with gestation periods of years and decades. Addressing skills needs across these sectors requires a long-term perspective, balanced with the need for urgent action. There are significant current commitments to education and training places, and recent further commitments announced and clarified. Some of the skills identified by EWSETA Sector Skills Plan 2017-2022 are as follows:

- Develop new skills and leadership in Hydrology and Hydrogeology, Ecologists and Ground Water Specialists, to drive groundwater usage at local level and the storage of surface water in aquifers;
- Build human and institutional capacity to better manage water databases, create communication and awareness and project the cost implications of utilizing alternative sources of water and the development of green processes and technologies;
- Expand high-level knowledge and quality research in areas such as groundwater usage, desalination, water treatment, role of women in water in rural areas and informal settlements;
- Facilitate War on Leaks programme;
- Align skills development interventions to support green jobs and initiatives;
- Mainstream issues of sustainability and environmental ethics into education and training programmes;
- Develop high level of technical and research skills that underpin technological advancement and innovation;
- Up-skill and retain the existing labour force that participate in varying capacities within the sector to address changing skills needs linked to technological advancement;
- Develop industry-research / skills development partnerships with research institutions, science councils and universities of technology in areas identified for innovation; and
- The need to train women involved in accessing and distributing water in rural areas and informal settlements in the safe and efficient usage of water and sanitation.

It is evident that skills development (planning to implementation) must happen within the context of national standardised system which is National Qualification Framework (NQF), its sub-framework quality councils and structured pipeline bands. This form of capacity is exclusive to individual capability and knowledge to fill a particular occupation.

### 12.4.1 Proposed Key Programmes (10 Point Plan)

The principle guiding the proposed actions is in response to, and alignment with, the objectives of this National Water and Sanitation Master Plan. It is understood that a detailed assessment of sector skills and capacity building needs will be concluded after approval of the plan. The following ten-point plan incorporates this thinking, and is therefore not too specific with regard to content:

1. Undertake water and sanitation sector skills capacity needs analysis. The study must investigate current state of skills and map stakeholders throughout the water value chain in terms of mandate, current capacity and required capacity for optimal performance. It must indicate the skills gaps in terms of numbers per occupation, and skills levels within each of the water sector institutions.



2. Develop a skills and institutional capacity development strategy for the sector aligned to the 2030 National Water and Sanitation Master Plan by indicating what skills (competencies and numbers) are needed by the different water sector institutions to achieve the sector goals and priorities identified in the National Water and Sanitation Master Plan, the NDP, the SDGs and the NWRS2. The focus of skills will be at all levels – artisans, administrative, supervisory, management, technical, legal, scientific and financial.
3. Assess and develop appropriate institutional arrangements required to achieve sector goals and priorities. This must take into consideration work done through the institutional reform and realignment project. Focus will be on effective division of powers and functions for potable water supply and sanitation.
4. Undertake a study to identify constraints and capacity gaps in water sector institutions that prevent water sector institutions from achieving sector goals and priorities identified in the National Water and Sanitation Master Plan and the SDGs. Identify interventions to address the constraints and institutional capacity per sector. The sectors referred to are: domestic use (local government), mining, industry and agriculture. The intervention required should be comprehensive to include amongst others, human capital, technical, social, institutional, environmental, financial management and legislative issues.
5. Evaluate various alternative interventions and institutional arrangements to meet current and future water and sanitation capacity demands considering the benefits and challenges of every alternative mechanism or solution. Develop support models and institutional mechanisms to address the identified constraints and capacity per sector.
6. Resource, expand and continue to implement the 2020 Vision of Water and Sanitation Schools Education Programme. Review the programme and focus on the 2030 Vision.
7. Resource, expand and continue to implement the Community Water Education Programme incorporating climate change.
8. Resource and implement the Water Councillor Leadership Programme.
9. Establish partnerships with private sector and international development partners for skills development and institutional capacity building. Assess opportunities for private public partnerships throughout the water and sanitation business value chain.
10. Establish partnership with Non-Governmental Organisations for institutional capacity development.

### 12.4.1.1 Water Conservation and Water Demand Management

<i>Key issue</i>	<i>Description of challenges</i>	<i>Interventions, Actions and Projects</i>	<i>Expected outcomes</i>	<i>Responsible</i>	<i>When</i>
Poor WCWDM strategy implementation	Lack of skills to adequately address WCWDM in WSAs	Develop skills at all management levels to manage water losses	Reduced water losses	DWS, Water Services Institutions SALGA, COGTA, Private Sector, Civil society Organisations	Short, Medium and long term  2030
		Develop processes to deal with unauthorised water connections			

### 12.4.1.2 Monitoring and Evaluation

One of the major challenges experienced with capacity building and skills development interventions in the sector is that impact assessments are hardly conducted. We therefore do not have an idea if impact is achieved or not.

<i>Key issue</i>	<i>Description of challenges</i>	<i>Interventions, Actions and Projects</i>	<i>Expected outcomes</i>	<i>Responsible</i>	<i>When</i>
Monitoring and Evaluation	Limited impact assessment of capacity building initiatives	Develop capacity building indicators and system to monitor progress and assess impact	Impact assessment conducted on capacity building initiatives	DWS, COGTA, SALGA, LGSETA, EWSETA,	Short, Medium and long term  2030

### 12.4.1.3 Mining

<i>Key issue</i>	<i>Description of challenges</i>	<i>Interventions, Actions and Projects</i>	<i>Expected outcomes</i>	<i>Responsible</i>	<i>When</i>
Unabated water usage and inadequate recycling	Lack of recycling of water resources in the Mining Sector	Develop a range of skills from demand determination to regulatory roles in relation to the approval and enforcement of water use licences. <sup>6</sup>	Efficient use of resource. Enforcement of water use licenses	DWS MQA	Short, Medium and long term  2030

### 12.4.1.4 Agriculture

<i>Key issue</i>	<i>Description of challenges</i>	<i>Interventions, Actions and Projects</i>	<i>Expected outcomes</i>	<i>Responsible</i>	<i>When</i>
Unsustainable irrigation practices	Poor irrigation management	Develop adequate skills in irrigation management (irrigation technicians and engineers included)	Efficient use of water resource.	DWS AgriSETA	2030
Effect of Fertilisers on water resources	In appropriate fertilisation practices	Education materials and programmes to address the effects of inappropriate fertilisation	Reduced effect of fertilisers on water resources		Short, Medium and long term 2030

<sup>6</sup> MQA 2017-18 SSP

## 13. INTERNATIONAL WATER COOPERATION

### 13.1 Present State

The purpose of international water cooperation is to strategically develop, promote and manage international relations on water resources between countries through bilateral and multilateral cooperation instruments and organizations in line with the provisions of the National Water Act No 36 of (1998) and to pursue the national interest at both African multilateral and global multilateral organizations and forums in support of the water sector.

South Africa has four internationally-shared river basins, covering about 60% of the country's land area. Two of these basins have an international river basin commission operating in them. The Inkomati and Maputo basins does not yet have such a commission established. These commissions play an advisory role in relation to the management of shared water courses, under the framework provided by the *Southern African Development Community (SADC) Protocol on Shared Watercourses*. The internationally-shared river basins are shown in Figure 13.1.



**Figure 13.1: International Context of Water Resources in RSA**

- Four of the major river basins are shared with six neighbouring countries.
- International river basins cover 60% of the Republic of South Africa's (RSA) land area.
  - Contribute 45% to the country's total river flow.
  - Support ± 70% of RSA's GDP and 70% of its population.
- Several international inter-catchment transfers and inter-country systems have been introduced.
- International river basin institutions
  - ORASECOM (South Africa, Namibia, Lesotho and Botswana)
  - LIMCOM (Zimbabwe, South Africa, Botswana and Mozambique)
  - TPTC (South Africa, Mozambique and Swaziland)

Groundwater aquifers also extend across international borders, resulting in joint responsibility for management. South Africa shares seven aquifers with neighbouring countries. The simplified map of locations of these aquifers is presented in Figure 13.2. Two key projects are underway to promote cooperative trans-boundary groundwater governance and management: the South Eastern Kalahari/Karoo Basin (known as the Stampriet Aquifer System) entering Phase 2 funded by the Swiss Agency for Development and Cooperation (SDC); and Khakhea/Bray Dolomite Basin (known as the Ramotswa Aquifer) nearing the end of Phase 1 funded by USAID.



**Figure 13.2: Aquifer Locations**

South Africa has water sharing agreements with all of the countries with whom it shares water resources, and a number of projects are being implemented under these agreements, including:

- Lesotho: Phase II of the LHWP is nearing readiness for implementation;
- Namibia: The feasibility study on the Violsdrift / Noordoewer project is nearing completion;
- Botswana: Several transboundary water management projects have been implemented; and
- Zimbabwe: A framework has been approved to jointly commission a study to assess the feasibility for South Africa to get water from Zimbabwe Water Sources.

In addition, South Africa has established a number of strategic water partnerships with countries in Africa including

- Ethiopia, Tanzania and Algeria where areas of cooperation have been jointly agreed and the legal instruments will be finalised in 2017. A number of strategic partnerships have also been formalised or are nearing formalisation with countries and organisations outside Africa, including Italy, Iran, Japan, China, Denmark, Cuba, Netherlands, USA, EU, Belgium, OECD, and TICAD.

- South Africa is also an active participant in the SADC water sector, AMCOW, NEPAD and the High-Level Panel on Water (HLPW) where it is represented by the President of the RSA.

### 13.2 Problems, Challenges & Drivers for Change

- South Africa has the ability to play a role in influencing the global water agenda beyond SADC, promoting a discourse that is favourable to developing countries, particularly in the face of climate change. This will also serve to enhance the international standing of South Africa;
- South Africa can play an important role in Africa in the sharing of knowledge and information and in building the capacity of other African states to manage water and sanitation more effectively;
- South Africa has a strong water research and innovation sector, which has already developed methodologies and technologies that are in use internationally. Greater investment in this sector would support its growth into a valuable sector of the economy; and
- There is an opportunity to mobilise funds from the international donor community to support the water and sanitation sector in South Africa.

### 13.3 Desired Future State

Effective action in the international arena should result in:

- Reliability of supply:
  - Effective institutions in place for the management of shared water resources, surface and groundwater;
  - Timely completion of joint infrastructure projects; and
  - Positive engagement with key players on the Zambesi and Congo river options.
- Influencing the global water agenda:
  - South Africa is seen as a strong voice for developing countries and for pro-poor approaches to water and sanitation in the global arena; and
  - An active contribution to the reform of global water institutions.
- Knowledge sharing and capacity building in Africa:
  - Agreements are in place with strategic countries across Africa, in line with DIRCO's strategy, and the strategy of the water sector; and
  - Improved positioning of South Africa in key institutions such as AMCOW.
- Development of the water research and innovation sector:
  - Enhanced export of South African water methodologies and technologies and the development of a vibrant water innovation community in South Africa.
- Improved donor funding:
  - Increased flows of donor support into the water and sanitation sector in South Africa.



## 13.4 Action Plan

The required actions are as follows:

### 13.4.1 Reliability of supply:

- Fast track the establishment of the Limpopo Basin River Commission;
- Ensure the timely construction of Lesotho Highlands Phase II; and
- Engage with relevant players on the Zambesi and Congo river options.

### 13.4.2 Influencing the global water agenda

#### Advance the African Agenda and Sustainable Development (Africa Cooperation)

Contribute to regional and continental sustainable development on shared water courses and the implementation of the SADC shared water courses protocol, regional infrastructure, regional integrated water resources management, groundwater management and climate change.

This focus should be related to further enhancing equitable access of Southern African countries to shared water courses in pursuit of **regional integration** in water and **attainment of national and regional water security** and the **improvement of the lives of ordinary citizens** in South Africa and other parts of SADC.

#### Advance water agenda in the [Global System of Governance](#) and water diplomacy in support of [Political and Economic Relations](#).

South Africa will need to engage, in a fully informed and mature way, with:

- Organisation for Economic Development (OECD); and
- Multilateral Environmental agreements (MEAS) as they relate to water.

#### Effectively engage the global governance system and ensure that issues of adaptation and climate resilience are pursued concurrently with the Sustainable development Goals within a nexus approach.

The demand to enter into new agreements will necessitate prioritisation and strategically defining partners.

#### Engage Brazil, Russia, India, China and South Africa (BRICS)

More analytical work needs to be undertaken with a view to guiding the water sector engagement with IBSA, against the backdrop that this debate will also look at the BRICS engagement. This work will focus on thematic areas for engagement.

#### Engage NGOs in water and sanitation sector

Enhance the role of civil society in the strategic context of partnerships by giving NGOs a role to play in driving controversial agendas and debates, including the effective implementation of some of the advocacy agendas.

### Advance Strategic bilateral, trilateral and polylateral African partnerships (Africa bilateral and bilateral relations outside Africa)

- Prioritise and identify strategic partners from the South and North whilst mapping and matching the partners' strengths, water systems, water competencies, and drivers of the relationships;
- Enter into new agreements with prioritised and strategically defined partners;
- Contribute to the global water dialogue and position water as a catalyst and enabler for economic development in the bilateral strategic engagements; and
- Develop bilateral instruments of engagement aimed at effectively implementing the projects undertaken with these partners.

#### 13.4.3 Knowledge sharing and capacity building in Africa:

- Develop and implement agreements with strategic countries across Africa, in line with DIRCO's strategy, and the strategy of the water sector; and
- Improved positioning of South Africa in key institutions such as AMCOW.

#### 13.4.4 Development of the water research and innovation sector

- WRC, DWS, DTI, with key stakeholders in the research and innovation community to develop and implement a plan for the enhanced export of South African water methodologies and technologies and the development of a vibrant water innovation community in South Africa.

#### 13.4.5 Improved donor funding

##### Enhance technical and development cooperation (International resources)

- Provide leadership on spearheading the SA/EU dialogue on water and sanitation; and
- Give guidance on strategic divisions in the EU relevant for water with a view to influencing the EU to consider water and climate change as key.

##### Develop Country strategies on the top 15 EU countries in order to effectively engage donor countries and map SA needs against the donor strategies of SA.

The timing and responsibilities for the African and global agendas are as follows:

<b>Shared watercourses agenda: Continuous multilateral</b> engagements with neighbour states on shared water courses, through LIMCOM, ORASECOM and TPTC to meet obligations and optimise the benefits for all	2063	DWS, LIMCOM, ORASECOM, TPTC
Strengthen bilateral partnership with Lesotho LHWC	2019	DWS, LHWC
<b>Africa agenda: Bilateral</b> engagements for partnerships of mutual benefit as follows:		
Further strengthening of bilateral engagements on <b>SDG6 goals</b> : with Zambia, Angola, Malawi, Namibia, Tanzania, Zimbabwe on	2030	DWS, ZAMCOM

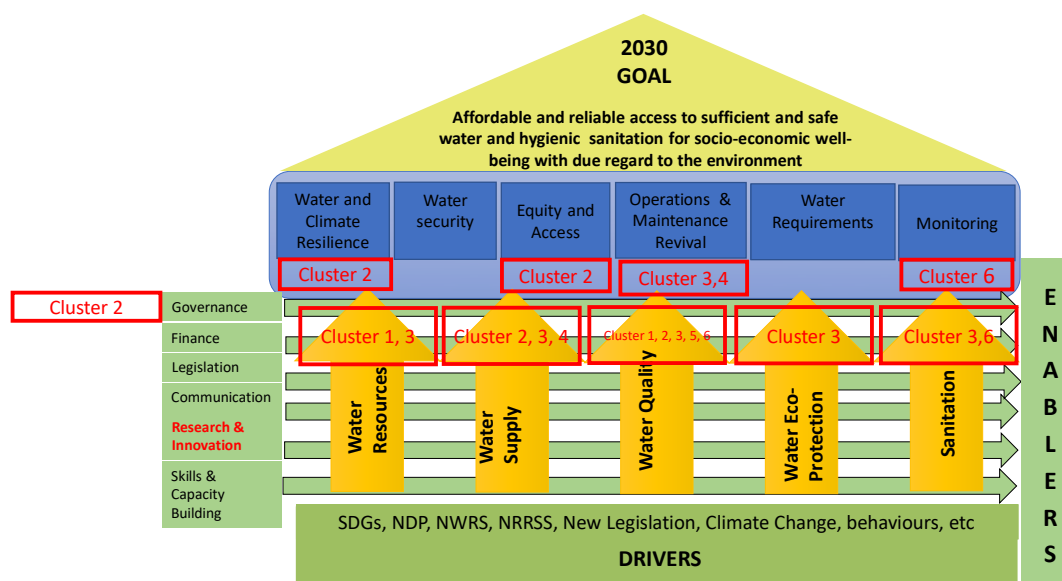
Strengthen bilateral partnerships with near neighbours: Lesotho, Swaziland, Mozambique, Zimbabwe and Botswana. Engage in new partnerships with Zambia, Ethiopia, Tanzania and Algeria.	2017	DWS, DIRCO
<b>Africa agenda: Continuous multilateral</b> engagements with 54 African states, including the 52 AU states, through AU, African Ministers Council on Water (AMCOW), NEPAD and SADC to achieve universal access to safe and affordable drinking water and the Africa Vision 2063	2063	DWS, AMCOW, NEPAD, SADC, AU
<b>SADC agenda: Continuous multilateral</b> engagements with AU and SADC states on advancing regional economic growth, regional integration and poverty eradication, and achievements on NEPAD goals and SDG goals	2063	DWS, AMCOW, NEPAD, SADC, AU
<b>Global agenda: Continuous bilateral</b> engagements for partnerships of mutual benefit. Strengthen existing partnerships with Sweden, Cuba, Netherlands, China, Iran, Denmark and Russia. Establish and engage in new partnerships with Italy, Spain, Korea, Mexico and Australia.	2063	DWS, DIRCO, DTI, Nat Treasury
<b>Global agenda: Continuous multilateral</b> engagements with the global community to position RSA on the global water and sanitation agenda, showcase our abilities and expertise, strengthen our multilateral position, report on achievements of SDG goals, and achieve benefits for RSA and the Africa.	2063	DWS, DIRCO, DTI, Nat Treasury

## 14. RESEARCH, DEVELOPMENT AND INNOVATION

Research, Development and Innovation (RDI) is a cross cutting theme in this National Water and Sanitation Master Plan. This chapter thus feeds into all pillars of the plan and is fundamental to driving the paradigm shift envisioned by the Master Plan. This is because RDI is a driver for securing water now and in future, for South African needs. Robust water RDI planning and implementation thus enables:

- faster and more effective deployment of context-appropriate technologies;
- the provision of evidence that guides policy and implementation thereof;
- opportunities for the export of know-how and technology into the African continent and beyond;
- the development of content that guides education and awareness campaigns;
- the development of new opportunities for business and industry;
- insight on how best to balance protection and use of the environment; and
- facilitates a learning culture in water sector institutions about the challenges, risks, opportunities and solutions of the water sectors.

The red boxes in Figure 14.1 illustrates how the Research, Development and Innovation Chapter of the Master Plan overlaps with all key aspects of the plan.



**Figure 14.1: Overlap of Key Aspects**

The Research, Development and Innovation (RDI) masterplan for Water and Sanitation presents a solid affirmation and commitment from the Department of Water & Sanitation (DWS) to support water-related research, development and innovation. This is with a view to ensuring that there is 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, and the African continent. The DWS will thus continue to support efforts that position the country and its institutions as a global water knowledge node active across the whole water and sanitation innovation value chain.

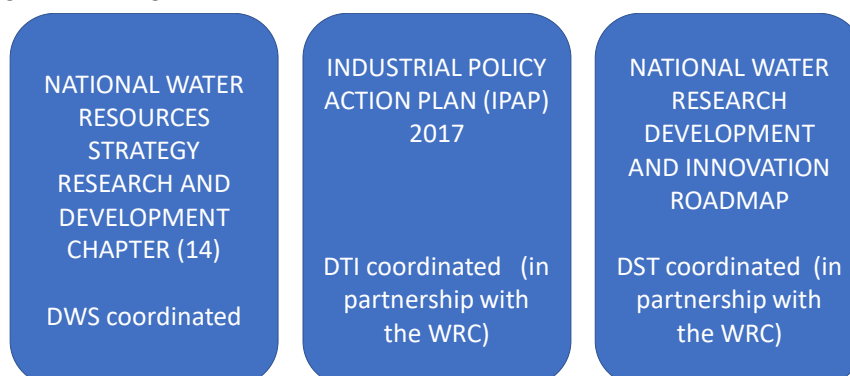
The RDI master plan provides a roadmap for research and development in the water sector and is aligned with the strategic goals of the Department of Water and Sanitation (DWS) as well as other government priorities.

There are three particularly important documents which inform the RDI Master Plan. Firstly, Chapter 14 of the Second Edition of the National Water Resources Strategy (NWRS2) focuses on research and innovation. This chapter highlights the need to develop and implement a national plan for research and innovation, improve the utilization of outputs of research and clarify roles and mandates between various institutions involved in research and development.

Secondly, in response to Chapter 14 of the NWRS2, the Department of Science and Technology (DST), DWS and the Water Research Commission (WRC) collaborated to develop the National Water RDI Roadmap. This was finalised in 2015 and was adopted as the implementation plan for Chapter 14 of the NWRS2. The Water RDI Roadmap is a ten-year innovation plan (2015 – 2025) for RDI in the water sector and thus is the basis for the content and recommendations of the Water RDI Master Plan. The Water RDI Roadmap was developed through an exhaustive, structured process of eliciting responses from the professional community, reviewing the inputs, and assessing their implications. The Roadmap mapping process included participation, input,

review, and revision from key stakeholders in industry, government and organisations within the National System of Innovation. The plan provides strategic direction, a set of action plans and an implementation framework to guide, plan, coordinate and manage South Africa's RDI investment.

Thirdly, a water chapter has been built into the 2017/18-2019/20 Industrial Policy Action Plan (IPAP) of the Department of Trade and Industry in South Africa. This builds on the focal areas of the National Water RDI Roadmap and has a particular focus on desalination and water manufacturing, the next generation of sanitation solutions, and waste water technologies.



**Figure 14.2: Distillation of three documents**

The RDI Master plan thus presents a distillation of the three documents described in Figure 14.2. In so doing it provides:

- An overview of the key activities and instruments that underpin the water RDI sector;
- The key investment themes/clusters that should be prioritized;
- An estimation of envisioned investment required; and
- An overview of the proposed implementation and partnership approach.

### 14.1 Present State

Like the National RDI Roadmap, the Water RDI Masterplan rests on three pillars. Firstly, there is a focus on research activities. Here the intention is to address ongoing research gaps, deepen insight and output in areas where South Africa has a unique global contribution to make and continue to grow capability, capacity and insight in areas key to South African water security.

Secondly, there is a focus on skills. In line with global systems of innovation, the skills focus for the research, development and innovation space is on high-end skills with a particular emphasis on post graduate, post-doctoral and research skills. In addition to ensuring that there are suitably qualified people to drive the system of innovation for water, there is also a need to understand how universities are preparing their graduates for future jobs in the water sector. There is also a need to interrogate how to better orient graduates towards workplace readiness through applied learning in the research and innovation space. Here there are a suite of national skills programmes and learning sites that could potentially be used in a more synergised and coordinated manner. In addition, it is important for these skills to be understood within a wider landscape of artisanal, undergraduate, workplace based learning/ reskilling needs and opportunities.

Thirdly, there is a focus on deploying innovation into practice. This happens in a range of different ways. It could be about packaging the outputs of research in a way that supports decision making or policy making. It could involve the demonstration of a range of technology, and decision

support tools. A range of other knowledge brokering platforms can also be valuable in the innovation deployment space.

The outputs of the plan will thus be measured in terms of the different instruments associated with these three pillars. There are a range of different innovation instruments that support the water system of innovation (Table 14-1).

**Table 14-1:**

<b>Key Innovation Activity</b>	<b>Envisioned implementation instruments</b>	<b>Comments</b>
Research	Research Calls	Research calls to address gaps in knowledge or deepen areas of opportunity/SA Niche
	Research Chairs	The research chair instrument consolidates capacity in a specific area, in a specific institution and drives post graduate support and development. There are <i>various models to look to in terms of</i> funding models including the NRF and industry chairs.
	Centres of Excellence	Centres of Excellence consolidate expertise in a specific area through a hub and spoke institutional collaboration model. They are valuable in driving the development of team expertise in specific areas, providing security to research teams with high potential and driving post graduate development.
Skills	Honours, Masters, PhD and post doctoral Support	Bursary calls and student support to postgraduate and post-doctoral candidates
	Skills landscape mapping and Consolidation of learning sites	Understand the types of training, and training facilities available nationally
Deployment of Innovation	Patenting	Internationally registered patents and collaboration with Technology Transfer Offices
	Technology Demonstration	Showcasing and testing technology or decision support tools at a scale in a real-live setting. This is important to showing how new solutions work and perform in real life setting
	Centres of Competence/Test bed networks	Play grounds or testing sites for suites of technologies being explored and developed
	Communities of practise	Structured platforms for the epistemic community to collaborate, share and network.
	<i>Professional Service Centres</i>	Knowledge Brokering units and workplace based training facilities

## 14.2 Problems, Challenges & Drivers for Change

In this plan, the water community has been categorised into four (4) sectors, which are: **Agriculture, Industry, Public Sector, and Environmental Protection**. The needs or required interventions for each sector have been identified and the appropriate actions for each need are recommended.

The six investment themes are unpacked in Table 14-2.

A ten-year programme for each recommended action is required. This process is being facilitated by the Water RDI Roadmap Implementation Unit. Part of the implementation process demands



the identification of both national and international partners to be engaged for each recommended action (or cluster). This is important, as it informs decisions around co-funding, such as which donors may have overlapping priorities, and around internationalisation of the research outputs.

**Table 14-2: Investment Themes for the Water Master Plan**

<b>Cluster</b>	<b>Objective</b>	<b>RDI Outcome</b>	<b>High level description</b>	<b>Emergent Priorities/ collaborative interventions</b> <i>*note that these priorities are under development through a series of projects. Final output due August 2017</i>
<b>Cluster 1: Unlock Alternative Sources of Water</b>	Increase ability to make use of more sources of water, including alternatives.	Technology development for utilisation of diverse water sources at catchment level, with source localisation and exploitation driven by fitness for use is a key point of excellence in South African practices.	The focus is on unlocking large volumes of water that can assist in achieving the targets of NWRS II) Sources can be derived from all aspects of the water cycle (river, ground, atmosphere, rain, sea and green water) Grey & brackish water (including storm and industrial water reuse) are a key part of this mix	Expand knowledge of the social barriers in the uptake Identify health and environmental risks Develop, pilot and test a suite of alt sources in a relevant location Economics of technology insertion Institutional arrangements to support uptake Monitoring, regulations and compliance
<b>Cluster 2: Govern, plan and manage supply and demand</b>	Improve governance, planning and management of supply and delivery, and management of demand and use.	Focus on improved quality and resilience of planning for the future – ability to respond to changes, including climate change. There is equitable and transparent access to water supplies that are managed at catchment level by DWS co-operatively with DoH, DAFF, DHS, and DEA. Transparency over rights, quotas, allocations, and transfers has been achieved and co-operative governance with respect to planning and management has been improved.	For supply there is a focus on: Governance of water sources Water resources management institutions Climate change adaptation and disaster response Accountability For demand there is a focus on: Regulation and self-regulation Insertion of new solutions into communities Equity is a key issue	Understand the political economy of water Professional service centre for Water resources Professional service centre for Water Services Research into accountability (technical and political) Rural innovation pilots Implementing water smart cities
<b>Cluster 3: Built and Ecological Infrastructure</b>	Improve adequacy and performance of supply infrastructure.	Increased volume and adaptability of storage capacity for raw water and treated effluent is available. Focus on increased levels of protection and reliability of ecological	New ways of approaching water supply and distribution infrastructure Managing ecological infrastructure Combining built and ecological approaches	Technology options for small-scale water infrastructure and management Uptake of effective infrastructure asset management

<b>Cluster</b>	<b>Objective</b>	<b>RDI Outcome</b>	<b>High level description</b>	<b><i>Emergent Priorities/ collaborative interventions</i></b> <b><i>*note that these priorities are under development through a series of projects. Final output due August 2017</i></b>
		infrastructure, and having sufficient ecological reserve.	Waste Water Treatment and drinking water treatment bulk technologies  Asset management	Climate resilient infrastructure planning  Role of ecological infrastructure in effective water management  Sanitation and water treatment optimisation
<b>Cluster 4: Run the Water Sector as a sustainable business</b>	Improve operational performance and run Water as a sustainable "business".	The financial sustainability of the water services system is secured.  Pricing is equitable and the attribution of water use is accurate. Non-revenue water is below 15% and revenues are collected punctually. Operational efficiency has been gained and >90% of water and wastewater treatment works have Blue Drop / Green Drop status.	Economic impacts of poor water quality and drought  Creating the investment case for investing in water innovation  Pricing and Billing  Public-private partnerships  Procurement, Service delivery and Asset management	Financial model for charges and tariffs in the water sector  Water resources assessment to gauge planning and investment  Role of the private sector in the water sector  Professional resource centre for municipalities  The value of water in the economy
<b>Cluster 5: Efficiency</b>	Reduce unintended losses and increase efficiency of productive use.	Non-productive uses of water have been eliminated or minimised.  Evidenced by reduction in: water transport losses, leakages, volume of water use, output to unrecoverable sources, volume and toxicity of pollution, and discharge of poor quality water.	Respond to non-revenue water challenges  Industrial/large scale focus  Consumer/household focus  Industry, Agriculture, Business best practise	Water conservation and demand management  Technology and systems for improved water productivity
<b>Cluster 6: Monitoring and Metering</b>	Improve performance of Pricing, Monitoring, Billing, Metering and Collection.	Improved accuracy has been attained in water use monitoring, and metering management	Intelligence gathering  Big data and smart systems  Responsiveness  Evidence informed investment in infrastructure and solutions  Citizen science	Development of a citizen science monitoring paradigm  Partnership model for disruptive technology and monitoring  Monitoring and evaluating socio economic rights  Emerging contaminants

<b>Cluster</b>	<b>Objective</b>	<b>RDI Outcome</b>	<b>High level description</b>	<b><i>Emergent Priorities/ collaborative interventions</i></b> <b><i>*note that these priorities are under development through a series of projects. Final output due August 2017</i></b>
				Linking monitoring data to Strategic Adaptive management

### 14.3 Desired Future State

The overall investment ambition required to achieve all aspects of the RDI master plan over a 10-year period is R 8.4 billion. The investment required can be itemised according to source of funding, to Cluster of needs / interventions, and to investment instrument. This investment aspiration was calculated as part of the Water RDI Roadmap development process. All detailed costing is available in the Water RDI Roadmap document on the WRC Website.

In 2015 it was estimated that there was an average of R 300 million spent on water research, development and innovation. This illustrates that there is a large deficit (approximately R 500 million a year) on an annual basis, hindering the achievement of the RDI ambition and opportunity in South Africa.

It is essential to recognise that achieving the ambition of the Research, Development and Innovation component of the Master Plan demands coordination and investment from multiple institutions. The traditional RDI funding institutions such as the National Research Foundation and Water Research Commission remain key players in driving the research and high-end skills opportunities and needs of the water sector. These institutions and their associated budgets alone, cannot manage the full investment aspiration for RDI.

Achieving this investment aspiration demands a range of multi-partner collaborative initiatives to drive opportunities in a range of gaps. There is a particular need to look at the cost sharing associated with the later stages of the innovation pipeline (including technology demonstrations and professional service centres) as this is typically the higher cost and more complex funding and partnership space. Getting this right requires inputs from utilities, municipalities, the private sector, donor community and strong investment, leadership and support from the Department of Water and Sanitation in collaboration with partners.

### 14.4 Action Plan

Currently there are three core partners driving the water research, development and innovation strategy nationally and these are the DWS, DST and the WRC. Linked to these core partners there are a range of traditional research role players that are key including the National Research Foundation (NRF), Technology Innovation Agency (TIA), Research Councils, Units and Universities. There are also a range of other organisations that are pivotal in scaling up, testing and deploying new innovations to practise. These include utilities, municipalities, the private sector, non-profit organisations and others.

Currently, there is a Portfolio Management Unit for National Water RDI Coordination and Support housed at the WRC, funded by the DST. The function of the unit includes Water RDI Ecosystem Monitoring and Evaluation, RDI related catalytic intelligence, partnership and opportunity scoping, strategic framing of water RDI opportunities and project management.

This Unit in collaboration with DST, DWS and WRC is positioned to support the partnerships and scoping of mega projects and initiatives that will drive the desired outcomes and investment aspiration of the Water Master Plan.

## 15. FINANCE AND FUNDING

***South Africa must create a financially sustainable water sector***

Chapter content to follow.

## 16. IMPLEMENTATION PROTOCOL

### 16.1 Background

As the National Water and Sanitation Master Plan (NW&SMP) is aimed at among others, but not limited to, developing an integrated approach as the water and sanitation sector leader of addressing water and sanitation challenges to meet the NDP and SDG goals, an implementation protocol in the form of a memorandum of understanding (MOU) is required to foster collaboration with relevant departments and institutions in the three spheres of government. The DWS will sign MOUs with different departments such as:

- Department of Planning, Monitoring and Evaluation (DPME)
- Department of Health (DOH)
- National Treasury (NT)
- Department of Environment Affairs (DOE)
- Department of Public Enterprise (DPE)
- Department of Minerals (DOM)
- Department of Energy (DOE)
- Department of Public Service and Administration (DPSA)
- Department of Higher Education and Training (DHET)
- Department of Cooperative Governance and Traditional Affairs (COGTA)
- Department of Agriculture, Forestry and Fisheries (DAFF)
- Department of Rural Development and Land Affairs (DRDL)
- Department of Tourism (DOT)
- Department of Human Settlement (DHS)
- Office of the Premier (OTP)
- WRC
- Water Boards
- CMAs
- SALGA



## 16.2 Legislative Framework

The implementation protocol in the form of a memorandum of understanding (MOU) is informed by the Intergovernmental Relations Framework Act (IGRFA), Act no.13 of 2005. It was enacted to establish a framework for the national government, provincial governments and local governments to promote and facilitate intergovernmental relations; to provide for mechanisms and procedures to facilitate the settlement of intergovernmental disputes; and to provide for matters connected therewith.

The objective of the Intergovernmental Relations Framework Act is to provide within the principle of co-operative government set out in Chapter 3 of the Constitution a framework for the national government, provincial governments and local governments, and all organs of state within those governments, to facilitate co-ordination in the implementation of policy and legislation, including:

- coherent government;
- effective provision of services;
- monitoring implementation of policy and legislation; and
- realisation of national priorities

## 16.3 Implementation of the MOU

Chapter 3 of the IGRFA under conduct of intergovernmental relations states that where the implementation of a policy, the exercise of a statutory power, the performance of a statutory function or the provision of a service depends on the participation of organs of state in different governments, those organs of state must co-ordinate their actions in such a manner as may be appropriate or required in the circumstances, and may do so by entering into an implementation protocol

The Department of Water and Sanitation will sign the implementation protocol in the form of a memorandum of understanding with relevant national departments and Offices of the Premier. The memorandum of understanding will spell out the roles and responsibilities of each Department/Institution in addressing water and sanitation challenges to meet the NDP and SDG goals of universal access of water and sanitation by all in 2030.

It will further indicate the institutional arrangements in the form of relevant structures that will be established to ensure the realisation of commitments by relevant stakeholders. This agreement will provide the role and responsibilities of the Executive Authority. Senior Managers from Director General/CEO, Executive Directors, Deputy Director Generals, Chief Directors and Directors will form part of the institutional arrangements envisaged to facilitate and monitor the implementation of commitments by relevant stakeholders.

Water and sanitation is central in addressing the triple challenges facing South Africa of inequality, unemployment and poverty alleviation as enshrined in the National Development Plan (NDP). The NDP on role of the state and institutional capability proposes that:

- Ensure a clear system of hierarchy of decision making across economic line functions of departments and spheres of government; and
- Urgently address the constraints of public private partnerships including the institutional arrangements for regulation and execution of such partnerships as well as relevant capacity in government departments and spheres.

The Department of Water and Sanitation will sign the memorandum of understanding and a pledge with relevant departments at a national level including Offices of the Premier. The Offices of the Premier will sign the memorandum of understanding and a pledge with relevant provincial departments. The Member of the Executive Council (MEC) of the Department of Cooperative Governance, Housing and Traditional Affairs will sign the memorandum of understanding and a pledge with all the municipalities. In total, DWS will sign ten (10) MOU's, one (1) MOU with national departments and nine (9) MOU's with Offices of the Premier including 10 pledges. The DWS DG will sign the 10 MOU including pledges with DG's of relevant national departments and Offices of the Premier.

The state-owned companies such as Eskom, South Africa Airways, SANPARKS, and Water Boards will sign agreements with their respective departments.

The memorandum of understanding will become effective upon the signing of the agreement by relevant parties and it will remain effective until the end of the financial year of respective institutions in March and June in 2031.

## 16.4 Roles and Responsibilities

### Department of Water and Sanitation

- To implement the National Water and Sanitation Master Plan by signing memorandum of understanding with relevant stakeholders across three spheres of government'
- Monitor the implementation of the agreements and review where necessary;
- Use existing structures, i.e. water services forum to monitor implementation;
- Use the existing Political Steering Committee structure for political oversight; and
- Report progress to FOSAD.

### Department of National Treasury

- Provide capital spending in general and public investment in particular on water and sanitation, energy, houses and roads;
- Monitor the implementation of the agreements and review where necessary;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Department Cooperative Governance and Traditional Affairs

- Sign memorandum of understanding with nine (9) provincial departments and ensure that each provincial department sign a memorandum of understanding with all municipalities and water entities in pursuit of the National Water and Sanitation Master Plan's objectives;
- Monitor the implementation of the agreements and review where necessary;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Department of Agriculture, Forestry and Fisheries

- To assist the Department to achieve 15% reduction of water losses and water demand by 2030 in agriculture and agro-processing;
- Monitor the implementation of the agreement;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Department of Mineral Resources

- To aid the Department to achieve 15% reduction of water losses and water demand by 2030;
- Monitor the implementation of the agreement;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Department of Energy

- Build standards that promote energy efficiency to contribute towards the attainment of 15% reduction of water losses and water demand by 2030;
- Monitor the implementation of the agreement;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Department of Environmental Affairs

- Realising an environment for sustainable employment and inclusive economic growth by assisting the Department to achieve 15% reduction of water losses and water demand by 2030;
- Monitor the implementation of the agreement;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Department of Planning, Monitoring and Evaluation

- Facilitate the integration and implementation of the National Water and Sanitation Master Plan into the National Development Plan through implementation protocol agreement with relevant stakeholders across three spheres of government;
- Monitor the implementation of the agreement;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Department of Higher Education and Training

- Assist the water and sanitation sector in appropriate research & development; equip the sector with relevant skills and capacity to assist the Department in achieving 15% reduction of water losses and water demand by 2030;
- Monitor the implementation of the agreement;
- Delegate a senior official to oversee the process; and

- Report progress to FOSAD.

### Department of Health

- Collaborate with the Department in the prevention and management of water borne diseases;
- Monitor the implementation of the agreement;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Department of Human Settlement

- Integrated planning on the provision of human settlement and water infrastructure;
- Monitor the implementation of the agreement;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Department of Tourism

- Investment in water saving technology and water saving awareness.
- Monitor the implementation of the agreement;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Department of Public Enterprise

- Sign memorandum of understanding with all state-owned companies in pursuit of the National Water and Sanitation Master Plan's objectives;
- Monitor the implementation of the agreements and review where necessary;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Department of Public Service and Administration

- Custodian of the Sustainable Development Goals improves the expertise of the water and sanitation sector by facilitating relevant training and capacity building;
- Monitor the implementation of the agreement;
- Delegate a senior official to oversee the process; and
- Report progress to FOSAD.

### Office of the Premier

- To facilitate signing of the memorandum of understanding with relevant provincial departments;
- Monitor implementation of agreements and review where necessary; and
- Delegate a senior official to oversee the process.

## 16.5 Disputes

The IGRFA stipulates that any formal agreement between two or more organs of state in different governments regulating the exercise of statutory powers or performance of statutory functions, including any implementation protocol or agency agreement, must include dispute-settlement mechanisms or procedures that are appropriate to the nature of the agreement and the matters that are likely to become the subject of a dispute. Therefore, the MOU will contain dispute settlement mechanisms.

## 17. INFORMATION MANAGEMENT AND DATA PORTAL

This chapter focuses on information management and development of a data portal for the National Water & Sanitation Master Plan (NW&SMP).

Most decision-making is driven by the availability and content of information at hand. The Master Plan is based on existing policies, strategies, studies and spatial information that assist in setting the scene in terms of the current status, desired status and activities to achieve planned outcomes.

### 17.1 Present State

The DWS has a well-established website and document management system that provide users access to information on the DWS's structure, programmes, activities and services. The website is updated daily and serves as the first point of contact with the DWS and consumers, water institutions and those interested in the water and sanitation sector.

The website also communicates new initiatives, inviting comments on draft policies such as the Mine Water Management Policy (currently being workshopped, October 2017) and provides linkages to water entities (water boards, the Water Research Commission and the Trans-Caledon Tunnel Authority).

The document management system consists of a library that provides access, via a search function, to legislated documents, study reports and strategic plans. Users can perform searches based on a geographic area or by entering keywords.

### 17.2 Drivers for MP Web Portal

The purpose of the MP web portal would be to disseminate information on the content and actions from the Master Plan. It further serves to monitor progress on the implementation of the Master Plan activities. The portal is therefore a communication tool not only on the development process of the MP or the content and actions from the completed MP, but also the lifecycle of implementation, review and updates of the MP.

The portal would provide access to information as well as stakeholder engagement activities planned and held to ensure active participation during the development process and thereafter.

### 17.3 Content and Functionality

The content of the MP web portal should reflect the key theme areas of the Master Plan, but would further include elements related to the implementation of the master plan, communication and documentation in support of the MP and its activities.

The MP web portal aligns to the key theme areas) of the Master Plan, namely:

- Water Supply Resilience & Sanitation Provision;
- Equitable Sharing and Access to Resources;
- Revival of Operations & Maintenance and Asset Management; and
- Reduction in Water Demand and losses.

Each of the theme areas from the MP is substantiated by existing strategies, technical studies, development plans and objectives, policies and drivers from current local, regional, national and global agenda in the water (and sanitation) sector.

The portal would provide concise, informative content for each MP theme related to the drivers, vision and enabling activities to achieve the desired future state. Where appropriate, linkages to existing portals and programmes of the DWS would be included.

Supporting documentation would form part of the DWS document management portal or library, with specific reference to the MP.

A preliminary design of the MP portal is illustrated in Figure 17.1. It follows a similar design as the existing DWS web portals to ensure easy navigation and familiarity in the user experience.



**Figure 17.1: Master Plan Web Portal Overview**

The MP web portal may include a GIS component, illustrating aspects related to the MP projects and activities. The hosting of the GIS component should still be determined, whether it is part of the MP portal or part of the existing Spatial and Land Information Management (SLIMS) portal or the National Integrated Water Information System (NIWIS).

Functionality of the portal should encourage users to be interactive when viewing the contents of the portal or engaging on the themes of the MP. Appropriate social media applications would therefore be incorporated.

## 17.4 Action Plan

The existing DWS website provides the platform from which the MP web portal would function. The MP web portal is therefore an extension of the existing website functionality and should enjoy a high level of visibility and ease of access. Technical maintenance of the portal forms part of the DWS website maintenance. Content maintenance of the portal would be assigned to the relevant DWS officials involved in the development and implementation of the MP.

The following activities are envisioned during the development of the MP:

<i>Activity</i>	<i>Responsibility</i>	<i>Due Date</i>
Action prototype MP portal to be accessible via main DWS website	DWS ICT	3 November 2017
Ensure linkages to DWS existing portals	DWS ICT	3 November 2017
Portal design and content for MP development process	DWS MP Portal champion,	20 November 2017
Portal design and content for MP implementation	DWS MP Portal champion,	16 February 2018
Portal maintenance and ICT maintenance	DWS MP Portal champion, ICT	On-going

## 18. STAKEHOLDER PARTICIPATION AND COMMUNICATION

### 18.1 Present State

Described in these pages, South Africa's first National Water and Sanitation Master Plan provides an overall perspective of the situation in the water and sanitation sector in the country, highlighting *key challenges* currently confronting the sector. These challenges must be addressed by *all necessary stakeholders*, if the country is to meet its growth and development objectives by 2030 and beyond.

This Plan contains a consolidation of the actions, together with funding requirements and timeframes, that must be undertaken by *specified stakeholders across the water sector* to not only improve the current (often dire situation) but also such action that is necessary to ensure that the country achieves the desired future state as defined by the vision, goals and targets of Government. This Master Plan firmly positions water as a catalyst for economic growth and development that will place the country on an upward trajectory.

The Plan recognises that the South African water sector must get to grips with a number of key challenges if it is to be on the path to success. A critical success factor both during the development of the Master Plan, and its implementation over the coming years, is the level of participation, input, buy-in and commitment of stakeholders across the diversity of the water sector to doing their part where they live and work, to make South Africa's "new water normal" a reality.

Within the context of government's electoral mandate and pursuant to Government's vision, communication and stakeholder engagement is recognised as essential and central to all key decisions of government, and is positioned as a vehicle for service delivery and public mobilisation towards a common government programme. Recognising this, the Communication and Stakeholder Engagement element employed in the rollout and implementation of the Master Plan adopts a development communication approach. This approach seeks to ensure that sound



knowledge of the action required from each stakeholder grouping across the water value chain, reaches them in the form best suited to their profile, in order to optimise commitment and buy-in. Communication and stakeholder engagement action is targeted at the public and private sector as well as civil society, including citizenry.

The implementation of the Master Plan adopts a development communication and Stakeholder Engagement approach that recognises:

- the diversity of the communication and stakeholder engagement needs of water sector stakeholders across the water value chain;
- that one-size-does-not-fit-all and therefore stakeholder-specific communication tools and vehicles are necessary for maximum uptake;
- that existing channels of communication across the sector must be utilised;
- that un- or under-served (in terms of communication and engagement) stakeholder groupings must be identified and communication mechanisms set in plan to close this gap;
- that Master Plan messaging to strengthen implementation must be taken into all impacted stakeholder communication programmes, including for example programmes of sector departments, private sector institutions, public entities and local governments; and
- that communication and stakeholder engagement must form part of all Master Plan actions and projects.

## 18.2 Problems, Challenges & Drivers for Change

The Master Plan acknowledges that the water sector is complex and the water business across the value chain is often highly technical and not easily understood by citizens and non-technocrats. It is therefore necessary that communicators across the sector adopt a development communication approach to convey key messages and actions articulated by the Master Plan to audiences of varying levels of understanding with sufficient clarity and detail. It is understood that most often communicators and departmental senior management are not sufficiently trained to articulate and simplify water and sanitation messaging, which must be addressed for the successful country-uptake of the actions contained in this National Water & Sanitation Master Plan. In addition, negative perceptions in the media regarding various water and sanitation issues, quite often cloud service delivery messages that Government needs to convey making it challenging to penetrate the media space. It is essential that negative perceptions are managed at that they do not inhibit the implementation of game-changing actions detailed in the Master Plan and so that the country progresses on the “new normal” trajectory, including towards better utilisation of existing and new water sources, improving water quality from source-to-tap-to-source, closing the service delivery gap on the un- and under-served and achieving the necessary financial flows.

An additional challenge that must be addressed is that despite a significant increase in the communications capacity of the state, and the prevalence of communication and marketing units in most sector institutions, there is a lack of a coordinated communication approach between national, provincial and local government including water services authorities and entities with regard to water and sanitation and a lack of consistent messaging on key sector priority issues. There is also fairly limited involvement of private sector and civil society communications capacity in sector programmes. As the successful implementation of the Master Plan is highly reliant on strong partnerships (both existing and newly formed), it is imperative that all relevant

communication and stakeholder capacity is harnessed across the water value chain. This is particularly necessary in light of the fact that mainstream communication campaigns are costly, and their once-off nature may not best serve the need of the rolling nature of the Master Plan, particularly on those key actions which require significant behaviour change at an institutional and personnel level.

A further operational reality is that while the water sector may be relying increasingly on social media to convey messages, the large majority of citizens still rely on traditional forms of communication such as radio and print media, and in-person communication. It is recognised that despite the sustained effort of the Department and all organs of state to strengthen communication and stakeholder engagement, there remains insufficient two-way communication between government and the people it serves, allows information sharing and a platform for users to express their views. This is especially relevant in rural areas and among the poor who do not have access to the necessary facilities to engage with programmes of the state.

### 18.3 Desired Future State

Communication and stakeholder engagement is essential to the attainment of the objectives of this National Water and Sanitation Plan. As the water sector leader, the department will continue to implement communication related to the Master Plan using the following key channels as in Figure 18.1.



**Figure 18.1: Key Channels**

A key communication action will be to ensure the establishment of communication partnerships to support implementation, across the water sector and being guided by the value chain. Therefore, communication channels across the water value chain are required, as well as across

the spheres of government and across water management areas. Also across public, private and civil society sectors.

As the water sector leader, the DWS will package the messaging relating to the Master Plan in such a manner that it's own and the communication efforts of partner institutions across the sector are able to:

1. increase the public's understanding of the value of water in such a way that it leads to a change in behaviour towards water use.
2. implement public education and awareness programmes that will instil a sense of responsibility and an appreciation of the fact that South Africa is a water scarce country.
3. mobilise stakeholders in the country to join spreading the message about responsible water use behaviour.
4. popularise campaigns against practices that compromise water security.
5. reassure South Africans that the country's water quality ranks among the best in the world and therefore it is safe to drink.
6. communicate a strong message of compliance to water laws and to encourage members of the public to report noncompliance of these laws, including theft and vandalism.
7. enable both the media and members of the public in general need to understand the constitutional roles of the national department, municipalities and other water institutions in relation to water supply and water quality.
8. encourage members of the public and equip them with skills and know how to help themselves and identify problems associated with infrastructure malfunction like leaking pipes and taps.
9. restore public confidence in the Department's ability to manage the water resources in an equitable, efficient and sustainable way.
10. popularise and showcase the work of the department and that of the water sector in general in order for stakeholders to actively participate.
11. educate the public on good sanitation and hygiene practices.

Recognising the transboundary nature of water, the Department will also inform SADC on what the purpose of the National Water and Sanitation Master Plan is and encourage cooperation and participation in the development and implementation of the plan. The department will also foster a better understanding of the linkages between the master plan and other international and national legislation, strategies, goals and plans through stakeholder engagement.

#### **18.4 Action Plan**

The focus the communication strategy of the Department as a development tool will be located within the development communications paradigm, which seeks to engage and involve stakeholders, including communities, in critical Government programs for their empowerment and benefit. It will embrace a public education and awareness element both at an informal and formal level to ensure a wider and more impactful reach to the different audiences. In the end, South Africans from all walks of life should realise that each one of us has a role to play.

## Action

### **Marketing and Branding:**

Develop a communication plan that harnesses all relevant sector communication capacity to ensure the broad sharing of the Master Plan and the key actions requiring uptake across stakeholder groupings

Produce user friendly pamphlets of the Master Plan & translate brochures and pamphlets into various languages, using the language policy of the department, for dissemination through sector communication networks in support of implementation

### **Media:**

Develop partnerships with media representatives in order to optimise publicity for the Master Plan

Provide communication support to activities which flow from the Master Plan including the development of a crisis management strategy with water service authorities and disaster management stakeholders

Develop and update a digital marketing strategy to target a broad range of stakeholders including the youth

### **Intergovernmental Relations & Stakeholder Engagement:**

Develop sustainable partnership agreements to foster partnerships to encourage a culture of joint ownership of our water resources and sanitation facilities

Development of a Master Plan communication strategy in alignment with the Department's communication plans which will strengthen communication and stakeholder engagement with regard to the implementation of the Master Plan across the value chain

Ensure that information relating to the Master Plan is communicated through all possible existing and new channels including departmental call-centres and customer service centres

## 19. MANAGEMENT, MONITORING AND EVALUATION

### 19.1 Introduction

Performance information is a mechanism used to assess how well an institution meets its mandate. It is a crucial management tool that coordinates the planning, budgeting, monitoring and evaluation. It therefore facilitates accountability and enables legislators as well as interested and affected parties to monitor progress whilst also identifying areas of improvement. The availability of performance information enhances the decision making of the institution's management as it allows them to pursue result-based management approaches (for example, performance contracting and risk management).

South Africa has had various reforms in the management of performance information. In 2004, government programmes and policies were set out in a Medium Term Strategic Framework (MTSF). Subsequently in an effort to achieve more with the limited available resources, in 2009 the government outcomes approach was introduced. In 2011, the National Development Plan (NDP) was published to provide a long-term plan for government.

Sound indicators that will be the basis for clear and comprehensive monitoring are essential in order to effectively monitor and evaluate any plan. As the National Water and Sanitation Master Plan (NW&SMP) seeks to guide the planning of the water and sanitation sector, it is paramount to understand the relationships between the various government planning tools and also the

planning, budgeting, monitoring and evaluation cycle. The understanding of these government planning processes will provide the basis for aligning the ongoing monitoring and evaluation of progress in implementing the National Water and Sanitation Master plan with that of other supporting government plans.

It will be critical to monitor progress at regular intervals and provide the necessary performance information that enable adjustments to approach and, where needed, in intent. Therefore, whilst it is important to understand the broader monitoring and evaluation environment, it is equally important that the modalities for a more “live” approach is enabled.

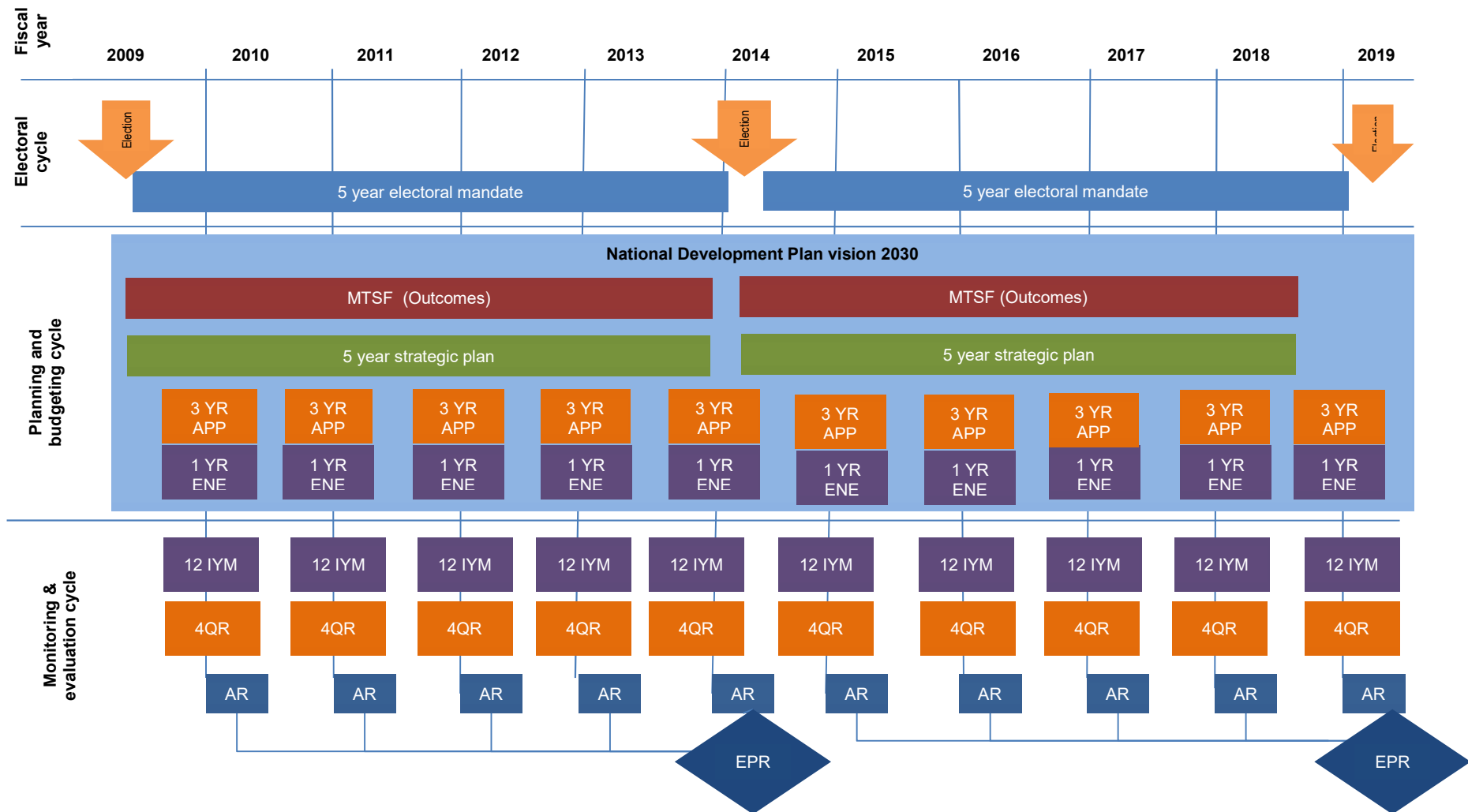
## 19.2 Present State of Planning

Government performance planning focuses on a longer period (i.e. five to twenty years) whereas budgeting has a short-term perspective (i.e. one to three years). This therefore creates some “inherent tension” between planning and budgeting resulting in difficult integration of the two. Given South Africa’s developmental state characterised by limited resources, long term plans need to inform the allocation of resources so that “historical inequities can be progressively addressed”. Therefore, operational or implementation plans that are informed by the long term strategic plans need to be developed within the context of limited resources. In view of this, the NW&SMP is anticipated to be a strategic plan that will inform the water and sanitation sectors’ operational plans.

In an effort to align planning and budgeting, departments are required to develop budget programme structures that link their objectives with their detailed operational budgets. The underlying principle for this is to “ensure a stable framework linking successive plans and strategic priorities to budget allocations and performance indicators that track delivery over medium to long term”.

The Framework for Strategic Plans and Annual Performance Plans states that when government adopts a new policy or changes occur in the department’s mandate changes may be made to budget programmes structures not just because the “implementation of a particular policy is now a priority”. This is because in many instances new policy initiatives relate to existing activities that can be “accommodated in the existing budget programme structure”.

There is a lot of focus on strengthening the integration of performance planning and budgeting with sophisticated methods proposed in ensuring outcomes-based costing. Each department is encouraged to define “performance enhancing processes, costs those processes and establish the unit cost of delivery”. This information is expected to “inform budget calculations and the choice of performance targets”.



**Figure 19.1: Long-term Relationship and Timing of Government Accountability Documents**

(Source: Adapted from Framework for Strategic Plans and Annual Performance Plans)

### 19.2.1 Present Planning Requirements

on the previous page illustrates the relationships between the government planning tools and the timing of associated monitoring and evaluation requirements. It can be summarised as follows:

#### **The National Development Plan:**

Is government's long-term plan that determines what the country should look like by 2030. It highlights two strategic goals of eliminating poverty and sharply reducing inequality with associated objectives to ensure their achievement. As it identifies the various priority areas over the long-term period, it is the underlying document for all government plans.

#### **The Medium Term Strategic Framework:**

Is a government five-year strategic plan (i.e. within a given electoral term) that reflects commitments made by the governing party's election manifesto and commitments to implement the NDP. It is a building block towards achieving the country's long-term plan and contains priority actions from various government plans within a given electoral term. It is thus a link between priorities in governing party's election manifesto and the individual plans of government departments. As the performance agreements signed between the President and each Minister are based on relevant actions in the MTSF, it is crucial for each department to ensure that their respective strategic and annual performance plans are aligned with the MTSF targets. The MTSF is a result of an intensive iterative planning process involving all three spheres of government that contains an infusion of the governing party's election manifesto. For the MTSF to be systematically implemented, its actions must be incorporated into the other government plans. Efficient and effective monitoring of the implementation of the NDP requires that there is a high level of alignment of the measurable indicators and targets across all these plans.

#### **The Strategic Plan:**

Is a departmental five-year plan that identify policy priorities, programmes and projects within the scope of the available resources that are consistent with the MTEF. It should focus on the department's strategic outcome oriented goals and objectives for each service delivery areas that are aligned to its budget programmes and sub-programmes. It lays the basis for the development of an annual performance plan and must be reviewed every five years, ideally from the first planning cycle following an election (i.e. towards the end of the period it covers). Its revision may occur during the five-year period it covers but changes should be limited to revisions relating to significant policy shifts or service delivery changes. If reviewed during this period, it should also be re-tabled with the updated Annual Performance Plan. It should consider the NDP, the MTSF, Provincial Growth and Development Strategies, municipal Integrated Development Plans, relevant executive authority performance agreements signed with the President and relevant intergovernmental service delivery agreements and international commitments.



### **The Annual Performance Plan:**

Is a departmental three-year plan that sets out among other things the performance indicators and targets per budget programmes and sub-programmes within the scope of the available resources. It must also align with the strategic plan, NDP, the MTSF, PGDS, municipal IDPs, relevant executive authority performance agreements signed with the President and relevant intergovernmental service delivery agreements and international commitments. It lays the basis for the development of the department's medium-term expenditure framework, programme business plans and officials' performance agreements. It is reviewed annually to factor in changes in the indicative budget allocations as well as recommendations from various interested and affected parties. It must include the quarterly performance targets and budget for the following financial year per budget programmes and sub-programmes. Although in-year changes are not encouraged, in instances where they occur the approval of the Executive Authority needs to be obtained before Parliament passes the midterm Appropriation Bill. In addition, these changes should be indicated in the annual report.

### **The Estimates of National Expenditure:**

Is a departmental annual plan that sets out what funds have been allocated to deliver services supporting the APP that highlights funded service delivery targets or projections. This is to assist in providing comprehensive information on how budget resources are generated and how they will be spent by respective departments. It indicates and covers the financial resources for the current financial year and indicative figures for the two following years (Medium Term Expenditure Framework). It is developed within the framework of a department's strategic plan and must be informed and also inform the annual performance plan.

#### **19.2.2 Present Planning Processes**

Corporate Planning and Organisational Performance is the central coordinator for planning in the organisation. All programmes have Directors: Strategic Support (D: SS) that coordinate *inter alia* planning, M & E within their respective programmes.

Within each programme, there are indicator champions that propose units of measurement (i.e. indicators) and collate the projected targets nationally (i.e. either from provinces, operation clusters or water management areas depending on the disaggregation of the indicator).

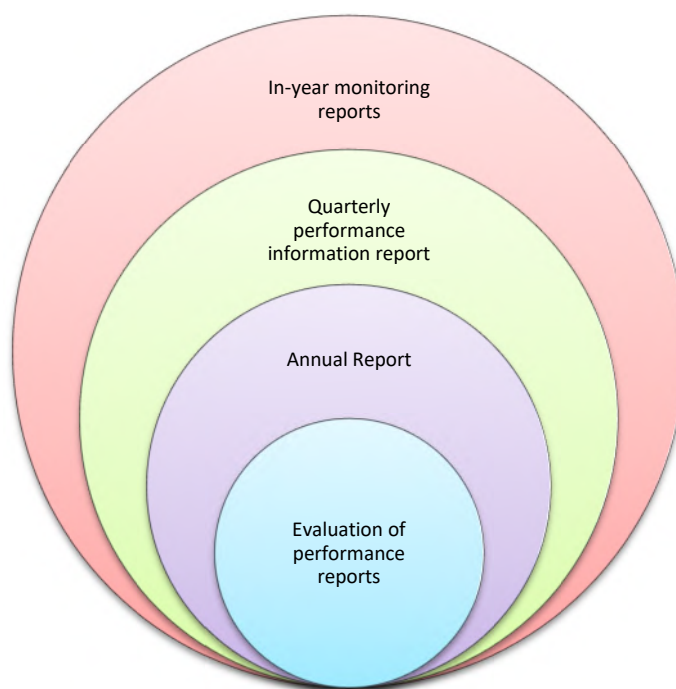
The inputs from each indicator champion is then collated per programme and submitted to Corporate Planning and Organisational Performance to develop an APP for the department.

### **19.3 Present State of Monitoring and Evaluation**

#### **19.3.1 Current Monitoring Requirements**

Monitoring and evaluation are essential components of effective management. The various reforms in the management of performance information stipulated above resulted in a change of emphasis in the monitoring, reporting and evaluation requirements within the public sector. The introduction of the government wide monitoring and evaluation framework (GWME) brought the integration of monitoring requirements with other government spheres.

The current accountability documents that fall within government's monitoring the reporting framework are as follows:



**Figure 19.2: Accountability Documents within the Reporting Framework**

#### **In-year monitoring reports:**

These are financial monthly reports that all government departments should provide by the prescribed timeframes. These include 30 days payment certificates, bank reconciliations, in-year monitoring and cash flow projections, suspense accounts reconciliation and age analysis, deviation from normal procurement process, awarded contracts, commitments, irregular, fruitless and wasteful expenditure, movable assets verified, value in Rands for finance leased assets.

#### **Quarterly performance information reports:**

These are required quarterly reports that provide progress updates on the implementation of the APP's predetermined targets. These progress reports provide the Accounting Officer with an opportunity to indicate measures that will be taken to ensure that the APP's implementation is on track. There are also other intergovernmental reports monitoring the implementation of the MTSF (e.g. outcomes and mid-year reports) that are developed from quarterly reports of respective departments and submitted to coordinating departments within the required timeframes. The coordinating department will collate and analyse all contributions and submit to Cabinet for approval.

#### **Annual report:**

This provides information on the department's performance in the preceding financial year for the purposes of oversight. It looks at the department's performance relative to the targets set

in the APP and provides audited annual financial statements revealing how the budget was implemented and the state of the institution's financial management systems.

### Evaluation of performance reports:

An institution should produce an end-term review towards the end of the period covered by its Strategic Plan. The review should broadly follow the format of the plan. The institution should report on the extent to which it has succeeded in achieving each of the strategic outcome oriented goals and objectives set at the beginning of the five-year period, as well as on any other evaluations conducted during the period.

#### 19.3.2 Current Monitoring Processes

Corporate Planning and Organisational Performance is the central coordinator for monitoring in the organisation. All programmes have Directors: Strategic Support (D: SS) that coordinate *inter alia* M & E within their respective programmes. Within each programme, there are indicator champions that collate their information nationally (i.e. either from provinces, operation clusters or water management areas depending on the disaggregation of the indicator).

The current monitoring (i.e. reporting) arrangements are manual with the following steps as depicted in Figure 19.3 below.

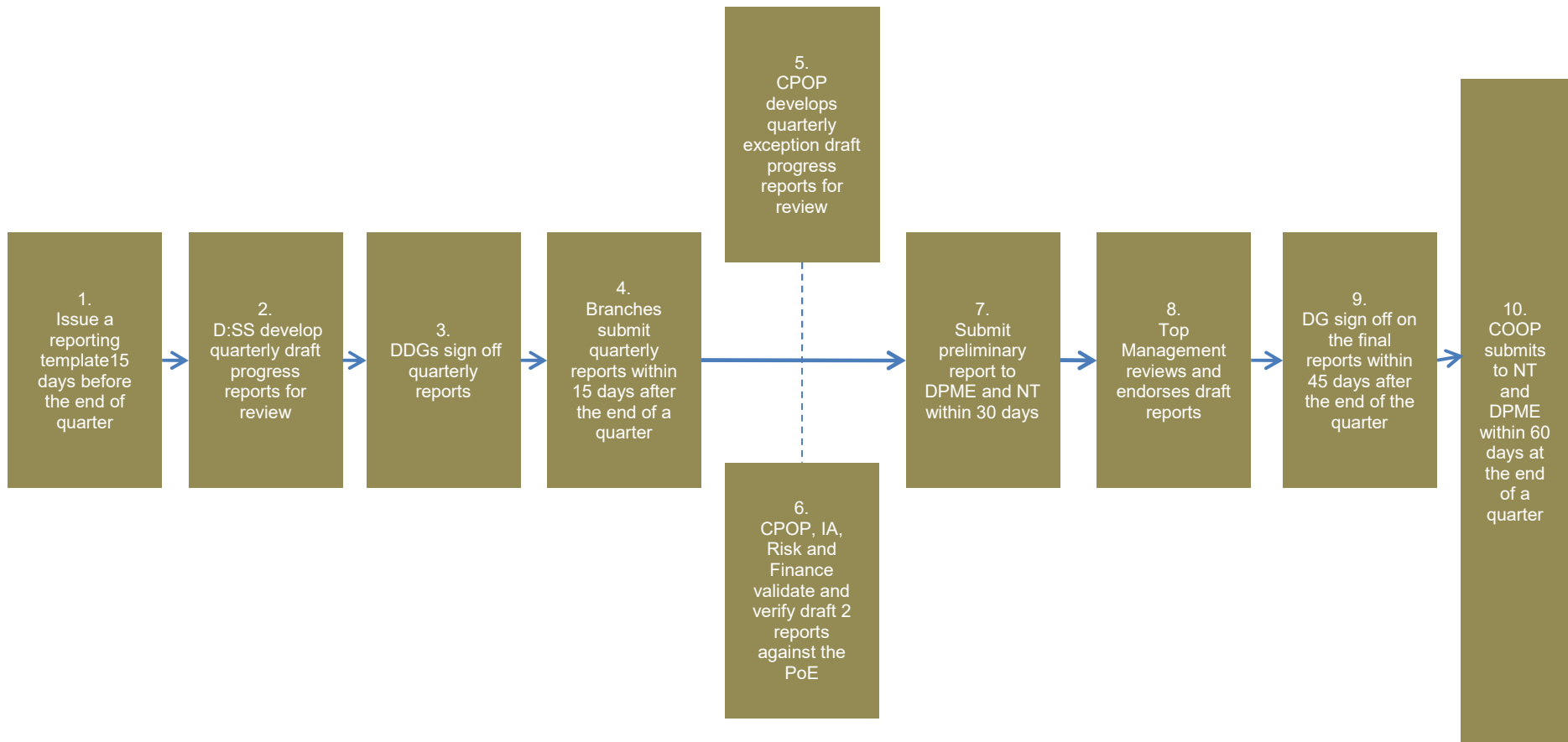
Distribution of prepopulated templates: The COOP unit pre-populates the reporting template based on the planned milestones (i.e. monthly, quarterly or annual) and distributes them 15 days before the end of each period. The D:SS further distributes the reporting template to the respective indicator champions for reporting based on the planned disaggregation.

Indicator champions report on activities: the respective indicator champions will collate progress reports from respective contributors either from provinces, operation clusters or water management areas depending on the disaggregation of the indicator. They validate and verify the reported information using supporting documents and ground-truthing (where required) to produce a national report for the indicator.

Collation of programme activities: programmes will thus collate the national information received from indicator champions to develop the programme's draft quarterly progress reports for the DDG's review. The relevant Programme Manager (i.e. DDG) should ideally through a branch progress review meeting evaluate the draft programme progress report and if in concurrence with the contents, sign off. The signed off report is then submitted to the Corporate Planning and Organisational Performance unit (with associated supporting documentation) to develop a progress report for the department.

Validation and verification at national scale (incl. exceptions report): The COOP unit will conduct the second order validation of the submitted progress reports based on the submitted supporting documentation and develop exceptional reports (i.e. identify areas of over and under achievement). Feedback is then provided to the relevant branches for areas of improvement and revisions.

Report tabled and endorsed at the quarterly review meeting: Top Management reviews the consolidated report and when concurrence on its contents is received, it will be endorsed for approval by the Accounting Officer.



**Figure 19.3: Departmental Manual Reporting Workflow**

### 19.3.3 Current Evaluation Requirements

An evaluation is the systematic collection and objective analysis of evidence on public policies, programmes, projects, functions and organisations to assess issues such as relevance, performance (effectiveness and efficiency), value for money, impact and sustainability and recommend ways forward.

The National Evaluation Policy Framework indicates that evaluation should be undertaken for four primary purposes of improving performance; improving accountability; generating knowledge (i.e. what works and what does not work) and improving decision-making.

Each department is required to develop a multi-year evaluation plan summarising the evaluations that will be conducted over one to three years. In addition, the department is required to conduct at least one evaluation report with recommendations for specific policies or programmes.

The importance of the Masterplan in guiding sector-wide processes in support of the NDP, indicates that regular evaluation to improve performance will be essential. Alignment of these evaluations with other evaluation processes across the broader sector will be critical. The timing of these must align with the governmental frameworks provided in Figure 19.1.

### 19.3.4 Current Evaluation Processes

Corporate Planning and Organisational Performance is the central coordinator for evaluation in the organisation with the following processes followed:

#### Call for evaluations:

The CPOP unit circulates a call for evaluations to all programme managers to identify programmes that should be evaluated and if concept notes exist and budgets have been allocated.

#### Departmental evaluation plan:

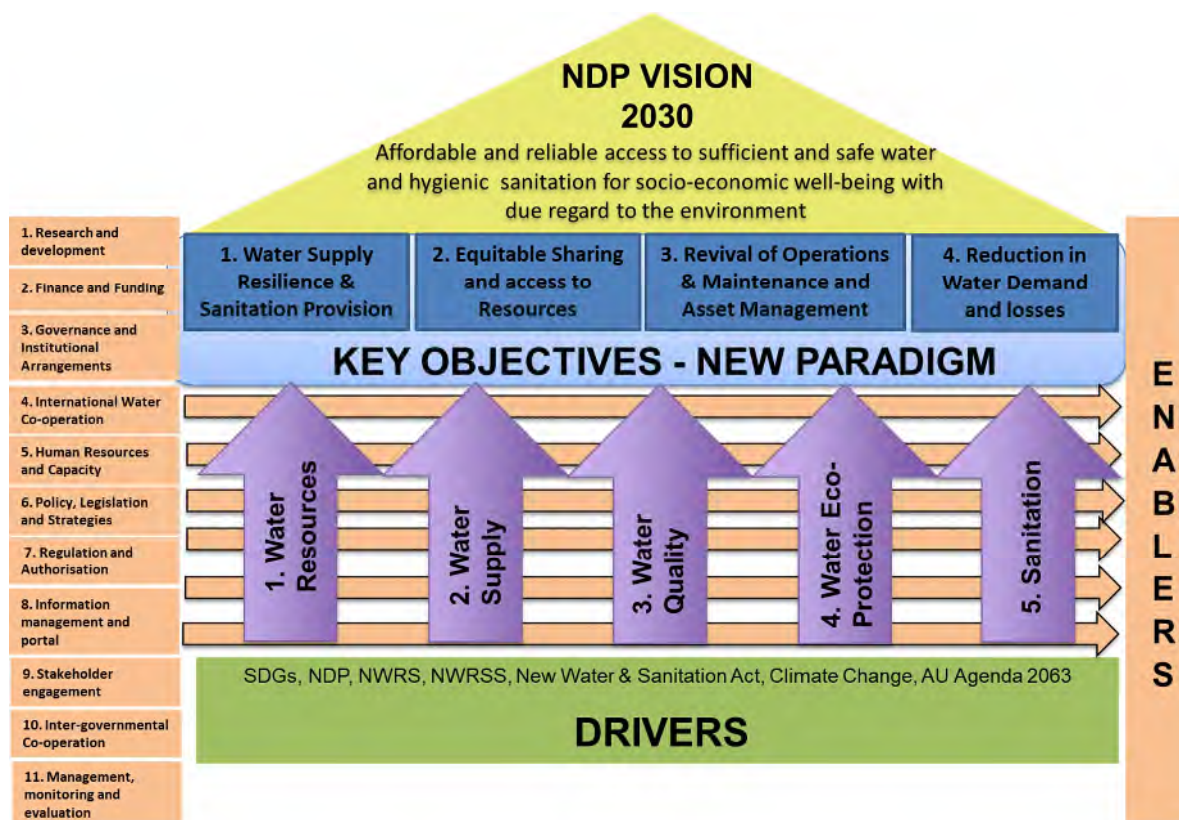
The CPOP unit develop a repository of evaluations that will be undertaken and are undertaken in the department. In addition, liaising with programme managers to suggest evaluations to be included in the annual and three-year national evaluation plan managed by the DPME.

## 19.4 Desired State of Monitoring and Evaluation for the NW&SMP

Figure 3 below indicates the proposed theory of change that explains how and why certain activities will lead to the expected results.

### 19.4.1 Proposed Planning Processes

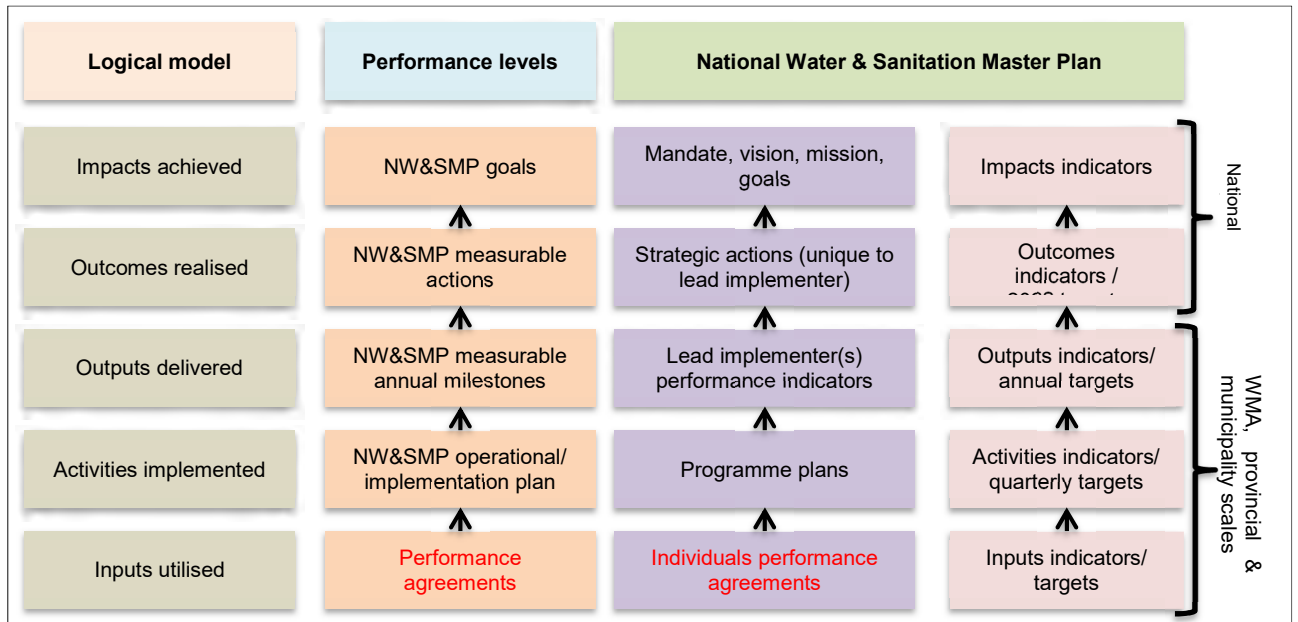
The broader change pathway and philosophy for the enablement of the NW&SMP is illustrated in the Figure 19.4 below.



**Figure 19.4: National Water and Sanitation Master Plan Philosophy**

- Replacement of the departmental strategic plan with the National Water and Sanitation Strategy with a minimum of a 5-year horizon;
- The NW&SMP determines strategic actions that will be included in the department's APP and entities' corporate plans with a 3-year horizon that should be reviewed annually;
- Alignment of NW&SMP timelines with governmental timelines to streamline them with budgeting timelines; and
- Department's APP and entities' corporate plans to use the NW&SMP strategic actions.





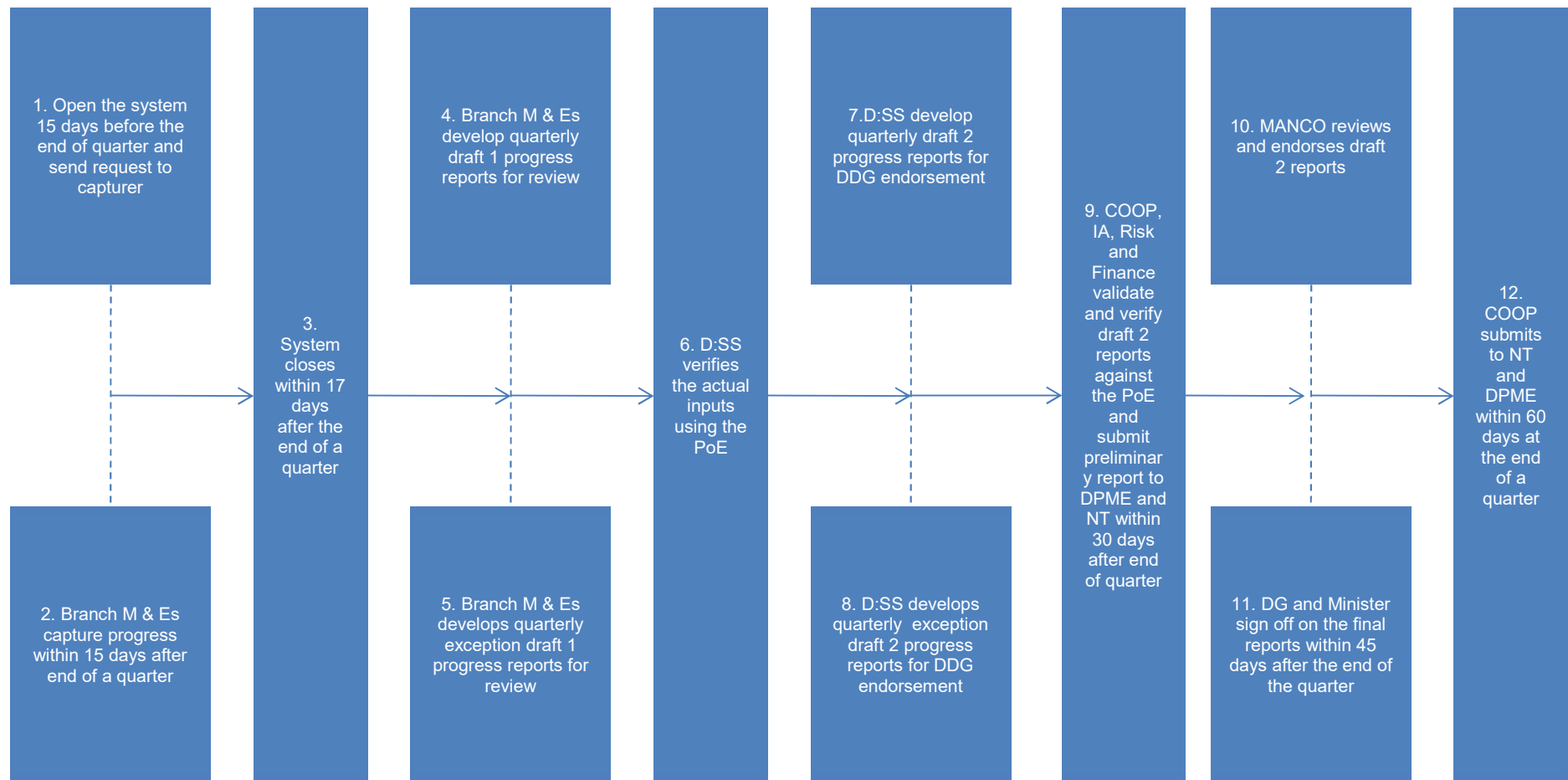
**Figure 19.5: Theory of change for the National Water and Sanitation Master Plan**

**19.4.2 Proposed Monitoring and Evaluation Processes**

In an effort to rationalise and ease the burden of reporting from its management, the department has developed an automated monitoring and evaluation (M & E) system using a balanced score card approach. This would be a quantitative system that would not only present the dashboard on the department’s performance but also provide a trend analysis thereof. This will provide the basis for the ongoing monitoring and evaluation of the masterplan.

To realise the full functionality of the automated M & E system it is crucial to understand the business process that underpin the department’s monitoring, reporting and evaluation. Figure 19.5 above, illustrates the relation of M & E to the overall planning and below, Figure 19.6, provides the details of how M & E is implemented in the department and the associated accountability documents.

**Ready for the future and ahead of the curve**



**Figure 19.6: Departmental Automated Reporting Workflow**

## ANNEXURE 1: DEFINITIONS

<b>Acid rain</b>	Rainfall of abnormally high acidity which results from atmospheric pollution by emissions of sulphur dioxide, nitrogen oxide, and chloride.
<b>Anti-pollution measures</b>	The reduction or elimination of pollution by restricting or prohibiting activities which cause pollution.
<b>Aquifer</b>	'Aquifer' means a geological formation which has structures or textures that hold water or permit appreciable water movement through them
<b>Biodiversity</b>	The number and variety of organisms and life forms, including all species, representing the totality of all their genes, found in an ecosystem or in a region.
<b>Biosphere</b>	The global sum of all ecosystems in the zone of life on Earth; integrating all living beings and their relationships. All life forms in the atmosphere, all oceans, freshwater, soils, land surfaces and the underlying geological horizons.
<b>Capable and developmental state</b>	A state that has sufficient human, financial, economic and natural resources to achieve the national objectives for the benefit of all citizens, through effective institutions and infrastructure that enable the economy and society to operate to its full potential.
<b>Catchment</b>	An area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points.
<b>Climate change</b>	Changes in climatic conditions due to natural causes or to anthropogenic (man-made) effects such as emissions of greenhouse gases, e.g. carbon dioxide, nitrous oxide, and methane, from industry, transport, farming and deforestation, that are expected to have significant consequences for rainfall and water availability on earth.
<b>Constituents</b>	Individual components, elements, or biological entities, such as suspended solids or dissolved salts.
<b>Consumption</b>	Use of water abstracted from any source, such as a river, groundwater or water supply system, for domestic, commercial, industrial, power generation, irrigation or any other purpose.
<b>Contaminants</b>	Constituents which are added to a water supply through the use thereof.
<b>Deforestation</b>	Removing natural forests from the landscape for the purpose of harvesting the timber or for making the land available for other purposes.
<b>Democracy</b>	Rule by the people.
<b>Desalination</b>	The removal of unwanted salts (constituents) from water to make it fit for use.
<b>Development</b>	The systematic use of scientific and technical knowledge, together with traditional knowledge systems and cultural values, to realise the potential of natural resources to support social and economic transformation.
<b>Ecosystem</b>	A community of all the organisms, such as plants, animals, fish and microbes, living in complex but balanced relationships with the physical features of their environment such as light, heat, moisture, wind, water, nutrients and minerals.

<b>Efficiency-equity trade off</b>	Seeking the socially, economically and politically most acceptable outcome of decision-making concerning the competing merits of efficiency and of equity and fairness.
<b>Effluent</b>	The liquid discharged from a processing step, usually from an industry, from a water purification works or from a waste water treatment plant.
<b>Effluent discharge Standards</b>	Minimum standards set for the quality of effluent streams as a means of controlling externalities, i.e. the economic and other effects on others.
<b>Efficient water allocation</b>	A situation in which the available water resources are allocated in a way that achieves maximum benefit.
<b>Emissions</b>	Solid, liquid or gaseous substances, or energy in the form of heat, usually discharged into the environment, by people and other living organisms or by chemical or physical processes; usually refers to products of combustion emitted into the atmosphere.
<b>Environmental engineering</b>	The application of science and technology to minimise the negative and to maximise the positive impacts on the environment of physical development and of the utilization of natural resources for the benefit of society.
<b>Environmental protection</b>	Avoiding negative impacts on the environment caused by physical activities, by the discharge of harmful solid, liquid or gaseous wastes or by the release of radiation.
<b>Equity</b>	Fairness, justice and impartiality which supplements or overrides common and statute law.
<b>Externalities</b>	Consequences of an action, usually negative but could be positive, which affect other parties but are not reflected in the costs.
<b>Hydraulic fracturing</b>	Also known as fracking. It is the process of injecting pressurised fluids into various rock layers in order to create cracks to allow natural gas to move freely.
<b>Fog harvesting</b>	The interception and precipitation of moisture in fog to form water.
<b>Governance</b>	Action or manner of governing by implementing sound rules and procedures.
<b>Global warming</b>	The increase in the average surface temperatures across the globe, usually measured over long periods of time; reported to have increased by 1°C over the past hundred years.
<b>Government</b>	This refers to the total of all levels of government, including national, provincial, and local government as in South Africa. It is always necessary to check what level of government is being referred to in any particular context.
<b>Greenhouse gas</b>	Gases such as water vapour, carbon dioxide and methane in the atmosphere that do not affect incoming sunlight, but trap heat emitted from the Earth, thus contributing to global warming; hence the greenhouse effect.
<b>Green water footprint</b>	The volume of water evaporated from rainfall stored in the soil as soil moisture.
<b>Grey water footprint</b>	The volume of freshwater required to assimilate a pollution load to at least comply with acceptable water quality standards.
<b>Groundwater</b>	Rainfall that infiltrates into the soil surface and percolates downwards, seepage from water in streams, lakes and artificial impoundments, and irrigation water that percolates down into the ground and accumulates in aquifers comprising permeable underground layers of sand, gravel and rock.
<b>Growth</b>	An increase in an economic factor or variable, normally persisting over successive periods. Rapid or persistent

	growth is likely to involve changes in the nature of economic activity, with new products or processes, and new types of labour skills, capital goods, and economic conditions.
<b>Impurities</b>	Constituents which are added to the water supply through use.
<b>Management</b>	The people who make decisions in an organization; the effect, impact and outcome of these decisions.
<b>Mandate</b>	Authority to carry out a policy, course of action or legal command from a superior.
<b>Pollutants</b>	Constituents which are added to water through use.
<b>Pollution control</b>	Methods for controlling pollution, usually by monitoring against minimum standards and acting against contraventions.
<b>Potable</b>	Water intended to be used for drinking or domestic purposes.
<b>Private sector</b>	Those parts of the economy not run by the government, including households, voluntary associations, community organizations, sole traders, partnerships, and privately owned company.
<b>Property rights</b>	The rights of an owner over property.
<b>Public sector</b>	Those parts of the economy which are not controlled by individuals, voluntary organizations, or privately owned companies.
<b>Rain water harvesting</b>	Interception, collection and storage of water during rain seasons for use in other times
<b>Reclamation</b>	Treatment of wastewater for reuse, including indirectly or directly as potable water.
<b>Recycling</b>	The reuse of wastewater, with or without various degrees of treatment.
<b>Regulation</b>	A rule or directive made and implemented by an authority, which individuals or organizations are obliged to respect and comply with.
<b>Regulatory agency</b>	A body created to decide on and enforce regulations or rules.
<b>Research and development</b>	The use of resources to create new knowledge, and to develop new and improved products or processes, to enhance economic activities and the quality of life.
<b>Repurification</b>	Treatment of wastewater to a quality standard suitable for various uses, including for indirect or direct reuse as potable water.
<b>Reuse</b>	Beneficial use of reclaimed or re-purified wastewater.
<b>Rights based approach</b>	Priority given to the allocation of water to people who do not have access to water, even to satisfy their basic human needs which is a constitutionally entrenched right; individuals and communities are given access to full information, justice, and to participation in decision-making processes concerning water-related issues. Such water allocations enjoy priority over other uses such as for irrigated agriculture and for industrial use.
<b>Right to access to water</b>	Every person in South Africa is entitled to sufficient, acceptable, safe, physically accessible and affordable water for personal and domestic uses.
<b>River pollution</b>	The effects on rivers of the discharge or dumping into the environment of industrial, agricultural and any other waste products.
<b>Runoff</b>	The portion of rainfall on land or on any other surface that drains away to accumulate in a stream or a river, and which does not infiltrate into the surface, get intercepted by vegetation and other covers where it is stored, or evaporate

	back into the atmosphere. Runoff is also fed by groundwater which moves naturally into streams and rivers.
<b>Sanitation Services</b>	The collection, removal, disposal or treatment of human excreta and domestic wastewater, and the collection, treatment and disposal of industrial wastewater. This includes all the organisational arrangements necessary to ensure the provision of sanitation services including, amongst others, appropriate health, hygiene and sanitation-related awareness, the measurement of the quantity and quality of discharges where appropriate, and the associated billing, collection of revenue and consumer care. Water services authorities have a right but not an obligation to accept industrial wastewater from industries within their area of jurisdiction.
<b>Sand mining</b>	The removal of sand (mainly from river beds and banks) for commercial purposes; including the screening and washing of fine material out of the product.
<b>Sewage</b>	Liquid waste, with some suspended material, mainly human excrement.
<b>Sewage disposal</b>	The discharge of liquid waste from human occupation to the environment, usually after some of full treatment.
<b>Sewerage</b>	Infrastructure for the collection, treatment, and disposal of liquid waste (sewage).
<b>Sludge</b>	Solids removed from wastewater during treatment.
<b>Storm water</b>	Runoff from a built-up area after heavy rain
<b>Surface water</b>	Runoff that occurs in streams and rivers, also in natural lakes and reservoirs; a major resource for water supplies.
<b>Virtual water</b>	The volume of water required to produce products which a country imports and exports; the volume of water embedded in products that are traded between countries or regions. Most relevant to arid or semi-arid countries with scarce water resources.
<b>Value Engineering</b>	A systematic method to improve the value of infrastructure or services by either improving the function or reducing the cost. It is a primary tenet of value engineering that basic functions must be preserved and may not be reduced because of pursuing value improvements. ( <b>Value</b> is defined as the ratio of function to cost.)
<b>Wastewater treatment</b>	This includes any process which may be used to favourably modify the characteristics of the wastewater.
<b>Water authorisation</b>	Permission to use water for a specific purpose.
<b>Water balance</b>	The regulation or rationalisation of human activity to match the sustainable local water supply, rather than base, or a process of balancing water supply and demand to ensure that water use does not exceed supply.
<b>Water efficiency</b>	Getting any given results such as equity, gravity, and development with the smallest possible inputs, or getting the maximum possible output from given resources.
<b>Water footprint</b>	An indicator of water use that considers both direct and indirect water use. The water footprint of a product (good or services) is the volume of fresh water used to produce the product, summed over the various steps of the production chain. Water footprint includes 3 components: Volume of water as consumptive use or evaporation of rainwater/stored in soil moisture (green water) Volume of water as consumptive use or evaporation of water withdrawn from groundwater or surface water (blue water) and Volume of polluted water, calculated as water that is required to dilute pollutants to such an extent that the quality

	of the water remains above agreed water quality standards (grey water).
<b>Water licence</b>	A general authorisation issued by a responsible authority for water use is authorised by a licence under the National Water Act, 1998.
<b>Water neutral</b>	The reducing of the impact of the water consuming activity in making the impact 'water neutral' by simultaneous investment in water conservation measures of other alternatives. Water neutral thereby means that one reduces the water footprint of an activity as much as reasonably possible, and offsets the negative externalities of the remaining water.
<b>Water offsetting</b>	The residual water footprint is offset by making a 'reasonable investment' in establishing or supporting projects that aim at the sustainable and equitable use of water.
<b>Water resource strategy</b>	A plan for dealing with uncertain future circumstances with respect to the availability of clean and sufficient water for domestic and commercial use. This is the set of rules by which the action to be taken depends on the circumstances, including natural events such as climate change and the actions of other people.
<b>Water resource</b>	Water that can be used to contribute to economic activity, including a water course, surface water, estuary and ground water in an aquifer.
<b>Water resources protection</b>	Protection in relation to a water resource, means: maintenance of the quality of the water resource to the extent that the water resource may be used in an ecologically sustainable way; prevention of the degradation of the water resource; and rehabilitation of the water resource.
<b>Water risk</b>	Essentially the pressure of decreasing water availability and the reliability of supplies. The fact that the results of any use of water resources are not certain, but may take more than one value.
<b>Water scarcity</b>	Water is scarce relative to human demands, not in and of itself.
<b>Water services</b>	Water supply services and/or sanitation services, or any part thereof.
<b>Water Supply Services</b>	The abstraction from a water resource, conveyance, treatment, storage and distribution of potable water, water intended to be converted to potable water and water for industrial or other use, to consumers or other water services providers. This includes all the organisational arrangements necessary to ensure the provision of water supply services including, amongst others, appropriate health, hygiene and water-related awareness, the measurement of consumption and the associated billing, collection of revenue and consumer care. Water services authorities have a right but not an obligation to provide industrial water to industries within their area of jurisdiction.
<b>Water trading</b>	The process of buying and selling of water access or use entitlements, also called <b>water rights</b> . The terms of the trade can be either permanent or temporary, depending on the legal status of the water rights.
<b>Wetland</b>	Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.



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## Water Resources

### Defining South Africa's Water Source Areas

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## **ANNEXURE 3: WRITTEN SUBMISSIONS RECEIVED**

Reference	Mandate	No	Key Actions and Main Actions (indent): Description	Level	Responsible Party	Target Date
				Nat. , Reg. & System (N)/Prov. (P)/Local (L)		

**NEW SOUTH AFICAN CONTEXT**

Rapid growth in population urbanisation, requiring rapid economic growth, of which water is one of the critical drivers

Climate change which may result in longer and more severe droughts, floods and storm events for affected areas, which means a change in water available to drive growth

**MAIN MESSAGES OF ACTION PLAN**

Ensure access to all;  
Equitable allocation and reallocating between uses and users;  
Diversify from surface water - Re-use, desalination and ground water as a resource;  
Conserve water and stop wastage;  
Value of water, repricing and cost recovery;  
Alignment between institutions inside and outside of sector;  
Integrated planning of water supply and sanitation systems, and operations.

**IMMEDIATE BIG WINS**

0.1 CMA established and mandated (delegated)	N	DWS	2019
0.2 Five large water use polluters or unlawful takers brought before court;	N	DWS	2019
0.3 Five large waste water treatment works to be turned around physically and operationally.	N, P, L	DWS, RWU, WSA	2020

Reference	Mandate	No	Key Actions and Main Actions (indent): Description	Level	Responsible Party	Target Date
				Nat. , Reg. & System (N)/Prov. (P)/Local (L)		

### 1. WATER RESOURCES

SDG 6.5	Implement integrated water resource management		1.1 Integrated planning and operating rules from water resources to tap and back through sewerage system to source;	N, P, L	CMA, DWS, RWU, WSA	2025, 2030
NDP, Vision 2030	Ensure access to clean, potable water and enough water for agriculture and industry, recognising trade-offs in use of water		1.2 Re-examine water allocations in the light of potential savings through greater efficiencies and make water available for equity;	N	CMA, DWS	2025, 2030
NDP, Vision 2030	Timely development of several new water schemes to supply urban and industrial centres and National water conservation programme to improve water use and efficiency		1.3 Re-allocate water between agriculture, mining, industry, domestic, and cross border/shared, with equity objective in mind;	N, P, L	CMA, DWS, RWU, WSA	2025, 2030
Outcome 6 SIP 18	Water and Sanitation Infrastructure Master Plan: Investigate and implement water re-use and desalination		1.4 Re-examine water pricing to further promote efficiencies;	N, P, L	DWS, RWU, WSA	2020, 2025
Outcome 7	Expand land under irrigation		1.5 Move from predominantly or default surface use towards ground water, re-use, desalination of sea water, and other related alternatives such as mine drainage;	N, P, L	DWS, RWU, WSA	2025, 2030
			1.6 Update operating rules in terms of projected climate changes.	N, P, L	DWS, RWU, WSA	2025, 2030

### INFRASTRUCTURE PROJECTS ALREADY MANDATED

Outcome 6 SIP 3	South Eastern node & corridor development
Outcome 6 SIP 5	Saldanha- Northern Cape development corridor: Vaal-Gamagara Bulk water supply scheme
Outcome 6 SIP 5	Saldanha- Northern Cape development corridor: Clanwilliam dam project
Outcome 6 SIP 7	Integrated Urban Space : Mooi Mgeni Transfer Scheme
Outcome 6 SIP 7	Integrated Urban Space : Acid mine drainage
Outcome 6 SIP 18	Water and Sanitation Infrastructure Master Plan: Additional water supply to Lephalale area



Reference	Mandate	No	Key Actions and Main Actions (indent): Description	Level	Responsible Party	Target Date
				Nat. , Reg. & System (N)/Prov. (P)/Local (L)		

**2. WATER SUPPLY (COMMITTED  
REFURBISHMENT AND NEW  
INFRASTRUCTURE**

SDG 6.1	Equitable access to safe and affordable drinking water		2.1 Compile national water and sanitation infrastructure master plan;	N	DWS	2025, 2030
NDP, Vision 2030	Ensure access to clean running water in all homes		2.2 Compile master plan per regional water utility –	P	RWU	2025, 2030
NDP, Vision 2030	Reliable water supply to meet their needs, while increasingly efficient agricultural water use will support		2.3 Compile water and sanitation infrastructure master plan per WSA – aligned to regional;	L	WSA	2025, 2030
Outcome 7	Develop and implement spatial development plans		2.4 Append schedule of National projects to this Master Plan.	N	DWS	2018, 2020, 2025, 2030
Outcome 7	Develop under-utilised land in communal areas					
Outcome 7	Eradicate infrastructure backlog in rural schools					
Outcome 9	Members of society have sustainable and reliable access to basic services : Water					
Outcome 6 SIP 18	Water and Sanitation Infrastructure Master Plan: SIP projects implemented					
Impact	Members of society have sustainable and reliable access to basic services : Water					

**3. SANITATION AND WASTEWATER  
TREATMENT**

SDG 6.2	Equitable access to adequate sanitation		3.1 Compile national water and sanitation infrastructure master plan;	N	DWS	2025, 2030
Outcome 6 SIP 18	Water and Sanitation Infrastructure Master Plan: SIP projects implemented		3.2 Compile master plan per regional water utility – aligned to national – aligned to municipal;	P	RWU	2025, 2030
Outcome 7	Develop and implement spatial development plans		3.3 Compile water and sanitation infrastructure master plan per WSA – aligned to regional;	L	WSA	2025, 2030
Outcome 7	Develop under-utilised land in communal areas		3.4 Append schedule of National projects to this Master Plan.	N	DWS	2019, 2020, 2025, 2030
Outcome 7	Eradicate infrastructure backlog in rural schools					
Outcome 7	Bucket system eradicated in rural areas					
Outcome 9	Members of society have sustainable and reliable access to basic services : Sanitation					
Outcome 9	Members of society have sustainable and reliable access to basic services : Bucket sanitation in formal areas					

Reference	Mandate	No	Key Actions and Main Actions (indent): Description	Level	Responsible Party	Target Date
				Nat. , Reg. & System (N)/Prov. (P)/Local (L)		

#### 4. OPERATION AND MAINTENANCE OF INFRASTRUCTURE

NDP, Vision 2030	Comprehensive management strategy including Investment programme for water resource development, bulk water supply and wastewater management	4.1	Turnaround WTW and WWTW;	P, L	RWU, WSA	2020, 2025
		4.2	Monitor drinking water quality, effluent quality and water loss through blue drop and green drop equivalent with compulsory accredited self measurement;	N, P, L	DWS, RWU, WSA	2020, 2025, 2030
		4.3	Monitor quality of effluent discharges into stream by WSAs;	N, L	DWS, WSA	2020, 2025, 2030
		4.4	Thereafter focus on supply and treatment reliability assessments and monitoring functions and reporting (85%: 65% to 95% 95%)	P, L	RWU, WSA	2025, 2030

#### 5. WATER CONSERVATION AND DEMAND MANAGEMENT (EFFICIENCY)

SDG 6.4	Increase water use efficiency	5.1	Measure use and set use targets for agriculture, industry, mining and domestic,	N, P, L	CMA, DWS, DEP AGR, RWU, WSA	2022, 2025, 2030
NDP, Vision 2030	Reduce water demand in urban areas	5.2	Research water efficient technologies and role out applications, perhaps with benefits;	N	WRC	2020, 2025, 2030
NDP, Vision 2030	Timely development of several new water schemes to supply urban and industrial centres and National water conservation programme to improve water use and efficiency	5.3	Quantify and re-allocate saved water to other yet unmet priorities, e.g. social, domestic security, deferring schemes.	N	WSA, DWS	2025, 2030
Outcome 6 SIP 18	Water and Sanitation Infrastructure Master Plan: Establish a dedicated national programme to reduce water demand and improve water-use efficiency in Agricultural sector					
Outcome 7	Support to smallholder producers to ensure production efficiencies					
Outcome 10	Implement strategies for water conservation and demand management					

#### 6. WATER QUALITY

SDG 6.3	Improve WQ and reduce pollution	6.1	Develop a well-resourced programme to rehabilitate prioritised polluted systems;	N	DWS, CMA	2020, 2025, 2030
		6.2	Employment opportunities of rehabilitation and clean-up programme to be exploited;	N, L	DWS, CMA, WSA	2020, 2025, 2030
		6.3	Monitoring of source by CMAs		CMA	2025, 2030

Reference	Mandate	No	Key Actions and Main Actions (indent): Description	Level	Responsible Party	Target Date
				Nat. , Reg. & System (N)/Prov. (P)/Local (L)		

8 **7. WATER ECOLOGICAL SYSTEMS**

SDG 6.6	Protect and restore water eco systems		7.1 Develop approximated rapid standardised determination method for Reserve and RQO to assess all catchments quickly with restricted budget;	N	DWS, CMA	2020, 2025
NDP, Vision 2030	Ensure environmental sustainability and resilience		7.2 Refinements of Reserve and RQO can take place later	N	DWS, CMA	2025, 2030
NDP, Vision 2030	Managing, monitoring and protecting South Africa's water resources in a sustainable way while allowing for economic growth					
Outcome 10	Water resource protection					
Outcome 10	Maintain or improve watershed services					
Outcome 10	Implement environmental regulations: Number of environmentally significant areas identified and published for restriction for mining activities					
Outcome 10	Reduced vulnerability and risk associated with climate change impacts					

**7b Disaster Management**

			7b.1 Allocate easily accessible funding for disaster contingencies;	N	DWS	2020, 2025, 2030
			7b.2 Develop protocols for rapid response procurement (drought, flood, hazardous waste, cholera, sewage spills);	N	DWS	2022, 2025
			7b.3 Provide individual managers at senior level with the mandate to procure and action (within specific circumstances and limit).	N, P, L	DWS, RWU, WSA	2022, 2025

**8. POLICIES, LEGISLATION AND STRATEGIES**

Outcome 6 SIP 18	Water and Sanitation Infrastructure Master Plan: Review water and sanitation norms and standards and financial provisions		8.1 Complete new National Water Bill.	N	DWS	2020, 2022
NDP, Vision 2030	New spatial norms and standards		8.2 National Water Bill to specifically include the final mandate of all institutions as listed under institutional above (development, operations, regulatory);	N	DWS	2020
Outcome 10	Development and implementation of sector adaptation strategies/plans		8.3 National Water Bill to enable this action plan in context of new realities including increased water scarcity due to climate change and growing population, urbanisation and the lack of untapped surface resources.	N	DWS	2020
			8.4 National Water Bill to grant enforcement power in relation to unlawful use, pollution and waste.	N	DWS	2020

Reference	Mandate	No	Key Actions and Main Actions (indent): Description	Level	Responsible Party	Target Date
				Nat. , Reg. & System (N)/Prov. (P)/Local (L)		

**9. REGULATION AND AUTHORISATION**

Outcome 6 SIP 18	Water and Sanitation Infrastructure Master Plan: Review existing water allocations		9.1 Transfer mandate for licencing and use regulation to CMA with dedicated licencing team (as above);	N	DWS CMA	2022, 2025, 2030
			9.2 Complete verification of existing lawful use and update water use register and billing;	N	DWS CMA	2025, 2030
Outcome 10	Implement environmental regulations: Number of catchments identified for Acid mine drainage		9.3 Currently all licences to be issued within 300 days but over time accelerate this to 6 months maximum licencing time frame to capture additional economic benefits;	N	DWS CMA	2025
Outcome 10	Implement environmental regulations: Number of mines monitored for non-compliance in accordance with water license conditions		9.4 Green and blue drop and no drops equivalents to be resumed (as above);	N, P, L	DWS, CMA, RWU, WSA, REG	2022, 2025, 2030
Outcome 10	Enhance compliance monitoring and enforcement capacity within the sector		9.5 Establishment of independent regulator (as above).	N	DWS, REG	2022
			9.6 Enforce current national norms and standards and current regulations;	N	DWS, REG	2020, 2025, 2023
			9.7 Only when current norms and standards and regulations are properly enforced, consider whether expansion or further restrictions are required or whether some regulations no longer required;	N	DWS	2025
			9.8 Place enforcement mandates within appropriate agency, be it CMA (water use and effluent discharge), Regulator (tariffs, norms and standard), DWS (e.g. dam safety).	N	DWS, CMA, REG, WSA	2025

Reference	Mandate	No	Key Actions and Main Actions (indent): Description	Level	Responsible Party	Target Date
				Nat. , Reg. & System (N)/Prov. (P)/Local (L)		

#### 10. GOVERNANCE AND INSTITUTIONAL ARRANGEMENTS

NDP, Vision 2030	Create regional water and wastewater utilities and expand mandates of existing water boards	10.1	Establish institutions for managing the water value chain;	N	DWS	2025
NDP, Vision 2030	Local governments will retain responsibility for ensuring service provision in their areas and, in many cases, will continue to manage the services directly.	10.2	NWRIA to be established with functions for national and some regional infrastructure build and refurbishment;	N	DWS, NWIA	2025
Outcome 6 Action 3	Consider establishing an economic regulator for water	10.3	CMA to be established with 9 regional operations with mandate for licensing, RQO determination, Reserve determination, pollution of source control and water use regulation;	N	DWS, CMA	2025
Outcome 6 SIP 18	Water and Sanitation Infrastructure Master Plan: Establish National water resources infrastructure agency	10.4	RWUs to be established through amalgamation – first with combined mandate of existing water boards with later incrementally expanded mandate to beyond current core water board functions;	N	DWS	2025
Outcome 6 SIP 18	Water and Sanitation Infrastructure Master Plan: Finalise future institutional arrangements	10.5	Ringfenced accounting and budgeting and infrastructure spend for WSAs and WSPs;	L	WSA	2022
Outcome 6 SIP 18	Water and Sanitation Infrastructure Master Plan: Establish regional water and waste water utilities	10.6	Finalise restructuring of WUA LWRMIs	N, P	DWS, RWU, wua	2025
Outcome 9	Responsive, accountable, effective and efficient developmental local government system	10.7	Establish independent water sector regulator for municipal and RWU regulation.	N	DWS, REG	
		10.8	Define Roles and responsibilities of Government Departments and sector stakeholders for this plan	N	DWS	2019, 2020, 2025

#### 11. HUMAN RESOURCES, SKILLS DEVELOPMENT AND CAPACITY

	11.1	Training to be focused on executing above actions;	N, P, L	DWS, RWU, WSA	2020, 2025
	11.2	Training for operations and maintenance of WTW, WWTW, pump stations, and dam operations to be prioritised;	P, L	RWU, WSA	2022, 2025
	11.3	Laboratory expertise for raw water and potable water quality testing also to be prioritised;	P, L	RWU, WSA, CMA	2022, 2025
	11.4	Need for national training centre to be considered (e.g. Midvaal Water initiative).	N, P, L	DWS, RWU, WSA, CMA	2025

Reference	Mandate	No	Key Actions and Main Actions (indent): Description	Level	Responsible Party	Target Date
				Nat. , Reg. & System (N)/Prov. (P)/Local (L)		

#### 12. INTERNATIONAL WATER COOPERATION

SDG 6.a	Expand international cooperation and capacity-building support		12.1 Focus on allocation, planning and development of shared water courses through established basin commissions;	N	DWS, CMA	2020, 2025, 2030
Outcome 6 SIP 17	Regional integration for African cooperation: Lesotho Highlands Phase 2		12.2 LHWP is behind schedule and must be commenced with urgency;	N	DWS	2020, 2025, 2030
Outcome 11	Enhance African Agenda and enhanced regional cooperation		12.3 Funding and skills transfer from international donors must be leveraged towards executing these critical actions rather than as stand-alone projects.	N	DWS	2020, 2025
Outcome 11	Reformed global governance institutions					
Outcome 11	Enhanced trade and investment					

#### 13. RESEARCH, DEVELOPMENT AND INNOVATION (RDI)

Outcome 10	Research in Climate services		13.1 Renewed emphasis in research on water use efficiency and alignment with this action plan	N, P	DWS, RWU	2020, 2025
			13.2 Research to focus on practically implementable research projects and motivated through actual provable measurement (empirical proof);	N, P	DWS, RWU	2020, 2025

#### 14. FINANCE AND FUNDING

NDP, Vision 2030	Finance through tariffs, taxes and loans		14.1 Cost recovery must be improved through measurement, reporting, billing and through action against debtors;	N, P, L	DWS, RWU, WSA	2020, 2025, 2030
NDP, Vision 2030	Comprehensive management strategy including Investment programme for water resource development, bulk water supply and wastewater management		14.2 Status of water board Trade Receivables due by large users such as municipalities to water boards is placing financial viability of water boards at risk and must be addressed by National (National Treasury and COGTA), and if necessary by rerouting DORA grant finance in a budgeted and managed manner;	N, P, L	DWS, RWU, WSA	2020, 2025
Outcome 6 SIP 18	Water and Sanitation Infrastructure Master Plan: Develop comprehensive investment programme		14.3 Address inefficient procurement throughout the value chain.	N, P, L	DWS, RWU, WSA	2022

Reference	Mandate	No	Key Actions and Main Actions (indent): Description	Level	Responsible Party	Target Date
				Nat. , Reg. & System (N)/Prov. (P)/Local (L)		

**15. IMPLEMENTATION PROTOCOL**

15.1	This is the country plan for the water and sanitation sector. Consequently, a straightforward MoU of commitment to the action plan will be concluded with all stakeholders (all committed stakeholders to sign off).	N, P, L	DWS, CMA, RWU, WSA	2018, 2019
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**16. INFORMATION MANAGEMENT AND DATA PORTAL**

16.1	Progress with action plan will be formally monitored and will be reported on annually together with DWS financial statements, in National Treasury reporting and to all committed and signed-in stakeholders	N, P, L	DWS, CMA, RWU, WSA	2018, 2020, 2025, 2030
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**17. STAKEHOLDER PARTICIPATION AND COMMUNICATION**

SDG 6.b	Stakeholder participation to improve water and sanitation management	17.1	Stakeholder engagement will be transparent, with views considered;	N, P, L	DWS, CMA, RWU, WSA	2018, 2019, 2020, 2025
		17.2	However, stakeholders will be briefed that list of actions should not grow into a wish list until the current actions are under the belt (people cannot drink paper);	N	DWS	2018, 2019



Reference	Mandate	No	Key Actions and Main Actions (indent): Description	Level	Responsible Party	Target Date
				Nat. , Reg. & System (N)/Prov. (P)/Local (L)		

17

**18. MANAGEMENT, MONITORING AND EVALUATION**

S 68 WSA	Section 68 of Water Services Act requires Minister to maintain National Info System on development, implementation and monitoring of national policy and international obligations for shared catchments		18.1 Progress with action plan will be formally monitored and will be reported on annually together with DWS financial statements, in National Treasury reporting and to all committed and signed-in stakeholders	N, P, L	DWS, RWU, WSA	2018, 2020, 2025, 2030
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**FINAL REMARKS**

<p>This Plan will become a reality  Less is more  A journey starts with the first very small step  Action plan simple and achievable and just-do-it, bit by bit, day after day, better and better – for the consumer’s benefit.</p>	2018 - 2030
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