Report number 2.1 Edition 1

POLICY

Water Quality Management Policies and Strategies for South Africa

Water Quality Management Policy

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Department of Water and Sanitation

WATER QUALITY MANAGEMENT POLICIES AND STRATEGIES FOR SOUTH AFRICA

WATER QUALITY MANAGEMENT POLICY

Report Number 2.1

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POLICY SYNOPSIS

Motivation

South Africa is facing a multi-faceted water challenge, which, if not addressed effectively, 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 aquatic ecosystems. It reduces the amount of water available for use in that more water must be retained in our river systems to dilute the pollution to acceptable standards. It increases the costs of doing business such that many enterprises are forced to treat water before being able to use it in their industrial processes, and the cost of municipal water treatment increases. It impacts on human well-being and productivity falls as more work days are lost due to water-related illnesses and finally, it threatens several economic sectors by impacting on crop yields and makes crops vulnerable to import restrictions in key trading partner countries. Some of the impacts are clearly visible, such as major fish kills, while others are more insidious and long term. Combined, however, they are having a significant negative impact on socio-economic development. **Water quality is clearly an economic and developmental issue**.

The current picture is not encouraging and without a change in how we manage water, land use and development options, worsening water quality will continue to decrease the socio-economic benefits from and increase the costs associated with use of the country's water resources. Therefore, this **policy is designed to enable government, as a whole, in partnership with civil society and the private sector, to tackle the issue of water quality across the country**. *It brings together the best elements of existing, but fragmented, water quality management policy in the country,* as set out, for example, in the 1991 Water Quality Management Polices and Strategies (DWAF, 1991), the 2006 Resource Directed Management of Water Quality (DWAF, 2006), the draft policy on Mine-Water Management Policy (DWS, 2016f, in progress), and the principles of the National Water Resources Strategy -2. *It draws on international experience, to add new policy positions to the foundation provided by existing policy, to craft a new way forward for water quality management (WQM) in South Africa.*

A fundamental and new framing of this policy is that **integrated water quality management (IWQM) is a government-wide task, under the leadership of the Department of Water and Sanitation, with the private sector and civil society playing a key role**. In this light, the WQM policy calls for an inclusive approach to managing water quality in the country.

Historically, water quality management has been the mandate of the Department of Water and Sanitation alone, and yet there are many government departments whose mandates impact profoundly on water quality, most critically, the Departments of Environmental Affairs, Mineral Resources, Agriculture, Co-operative Government and Traditional Affairs, Health, National Treasury, Trade and Industry, their provincial counterparts where relevant, and municipalities. **A joint approach between these government departments, private sector and civil society forms the basis of tackling the water quality challenges facing the country.**

In addition, the policy recognises that managing water quality is a complex problem. Contrary to historical views that relatively simple command and control approaches could be used to

manage water quality, it is now recognised that in the water quality domain, both human and bio-physical systems interact. Both of these systems are, on their own, complex systems, and together, they are even more complex. There is no simple solution to dealing with complex problems, no one path that will lead straight to the correct future. In dealing with complex systems, the pathway is often affected by unexpected events and developments, calling for course corrections and new approaches (see **Figure E-1**). This policy, therefore, is firmly rooted in the recognition that th**e only way to manage the complex challenge of water quality is through adaptive management, a process that calls for flexibility, and for structured learning throughout the process in order to inform and amend policy and practice over time**. It is also rooted in the understanding that there are many different sets of knowledge that must be brought together to address the problem, be they social, political, earth sciences, financial analysis, or others. **Managing water quality requires us to bring together a wide range of knowledges in a structured process that allows co-learning, co-creation, and co-adaptation as we move forward.**

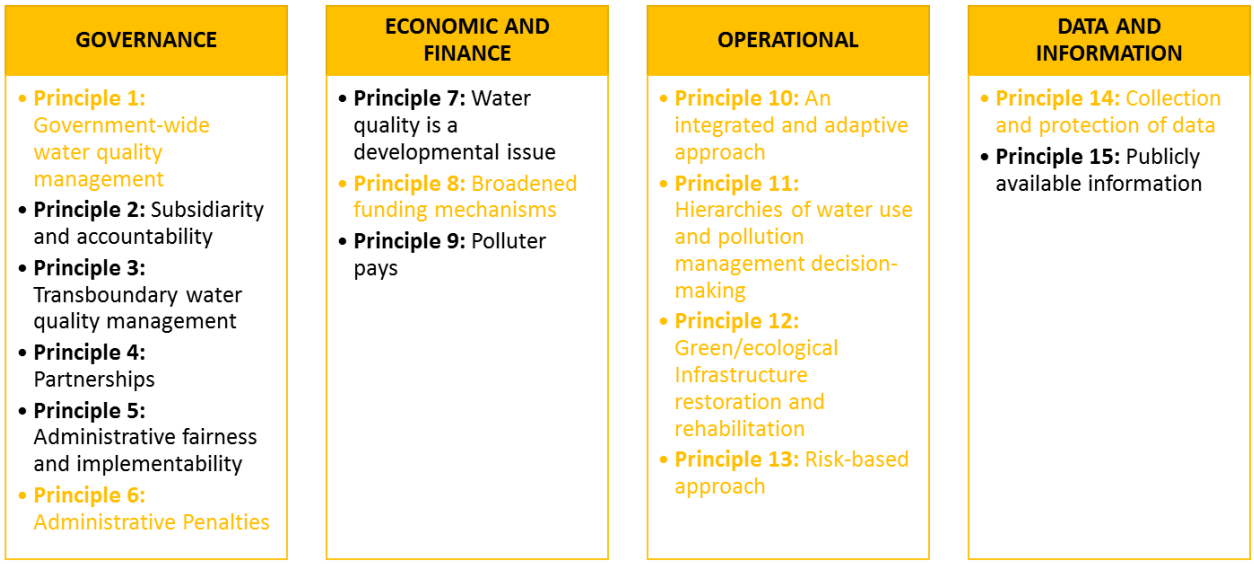
The policy also provides for a **substantial shift in dealing with non-compliance** with water legislation, **setting out the need to adopt an approach of administrative penalties** to replace the current process of using the criminal justice system to impose penalties for non-compliance.

Process of Development

To support the development of this Integrated Water Quality Management Policy for South Africa a number of steps were followed. Initially the Water Research Commision hosted a workshop of experts and hosted a community of practice to review the existing strategies and frameworks for water quality management. A series of papers examining the current situation and international experiences were then drafted, focused on: a situation assessment of water quality and water quality management challenges in South Africa (DWS, 2016a)*;* South African policy and strategy for water quality management (DWS, 2016a); institutional arrangements for WQM in South Africa (DWS, 2016d); a review of water quality management instruments for South Africa (DWS, 2016e); and lessons from international experiences on dealing with WQM (DWS, 2016a).

The Water Quality Management Principles

On the basis of this work, a set of fifteen policy principles for integrated water quality management were developed. Principles 1, 6, 8, 10, 11,12, 13 and 14 are new principles, in that they are new in how they apply to WQM.



E-2: WQM Policy Principles

The Water Quality Management Policy Responses

The policy responses to the challenges, aim to support the vision for water management captured in the NWRS-2:

Sustainable, equitable and secure water for a better life and environment for all

In line with above, the vision of this WQM policy is to adopt:

A government-wide adaptive and systems-based management approach, in alliance with the private sector and civil society, that will improve resource water quality in South Africa in order to prevent pollution and ecological degradation and support ecologically sustainable economic and social development and informed use of the nation's water resources.

In light of this, the goals for the WQM Policy are to:

- Provide a coherent, consolidated, current and inclusive (government in partnership with the private sector and civil society) approach to the way water quality is managed;
- Align water quality management policy with current legislation and relevant overarching policies and provide resolution on matters that are not adequately addressed in current policy;
- Provide guidance on sustainable water use, especially as far as it relates to water quality management;
- Inform the water resource management function as well as the required framework for the development of related policies and sub-strategies related to water quality management;

- Address key operational aspects such as taking an integrated approach, broadening finance mechanisms and improving knowledge and information in the execution of the water quality management function; and
- Guide the further development of legislative instruments and appropriate measures to manage water quality.

In order to achieve this, the WQM Policy has been divided into four, integrated sections that respond to:

- **Inclusive water quality management:** This response deals with the need for an inter-departmental strategic, adaptive and systems-based response to the WQM challenges facing the country, some of the key policy aspects that must be addressed in achieving such an approach, as well as the need to build partnerships between government, civil society and the private sector in order to be able to successfully address the challenges.
- **Integrated, adaptive water quality regulation and management**: This response spells out the integrated, adaptive and systems-based approach to WQM, including the adoption of a risk-based approach and the application of a hierarchy of decision-making.
- **Financing integrated water quality management:** This response examines the financial underpinnings of IWQM, looking at tools for financing the required actions, as well as the role of the private sector in this regard.
- **Knowledge and information management:** This describes the policy with regard to the knowledge, human resource capacity and information base requirements to be able to implement the policy approaches.

E-3: The policy responses

A summary of these reponses are presented below.

A. AN INCLUSIVE APPROACH TO WATER QUALITY MANAGEMENT

DWS will lead a collaborative process to ensure alignment of NEMA, NWA, CARA and MPRDA to support integrated water quality management;

DWS will establish appropriate inter-departmental and inter-governmental structures to ensure government-wide co-ordination of water quality management processes.

DWS will lead the use of an adaptive and systems-based approach in these structures.

DWS will ensure that challenges arising from the mandates of government departments are addressed through the interdepartmental and intergovernmental co-ordinating structures.

In line with the principles of subsidiarity enshrined in Agenda 21, and in the White Paper on a National Water Policy for South Africa, the management of water quality will be delegated to CMAs, with DWS providing the necessary oversight, national strategic guidance, and control of international matters.

CMAs will build the necessary capacity to take action under section 19 (3-6) of the NWA, which is a responsibility allocated to them by the NWA.

Catchment Management Forums and Catchment Committees will be used as appropriate.

All relevant departments and government agencies will be held

B. INTEGRATED, ADAPTIVE AND SYSTEMS-BASED WATER QUALITY REGULATION AND MANAGEMENT

DWS will drive the adoption of an integrated, adaptive and systems-based approach at the catchment scale.

CMAs will work with relevant departments and organs of state to align water, environmental, economic development and land use planning processes at the catchment level. Where there is more than one CMA in a river basin, DWS will co-ordinate water, economic development and land-use planning at the basin level.

DWS will expedite the establishment, capacitation and delegation of appropriate functions to CMAs got integrated catchment management.

CMAs will ensure that the process used to develop the water quality elements of catchment management strategies will enable key stakeholders and regulators to co-create a vision and to co-learn during implementation in order to support adaptive water quality management.

South Africa will comply with its international water quality commitments and will work with other riparian states to manage water quality in transboundary basins.

Water pollution management will follow a hierarchy of decision-making which:

- requires that water pollution be avoided, wherever possible; or

accountable for their actions in relation to this policy, and DWS will report annually, in its annual report, on the effective implementation of the inter-departmental approach to integrated water quality management. DWS will to forge highly-focused, fit-for-purpose, civil society and corporate business partnerships that are relevant to each primary water quality challenge. DWS will actively promote the concept of water stewardship and encourage private enterprise to look beyond the factory fence to support integrated water quality management and to consider the local and catchment scale in line with the international Alliance for Water Stewardship Standard. Polluters will take cradle to grave responsibility for their products and improve self-regulatory processes to reduce the regulatory burden on the state. DWS/CMAs will work closely with civil society organisations to build programmes of citizen-based monitoring, and education and awareness programmes to reduce pollution of water resources. DWS/CMAs will work with the Department of Education and schools to develop school-based programmes of water quality monitoring which can benefit DWS/CMAs in terms of data, while also serving as educational programmes at school. Active catchment management forums will be established and supported by DWS/CMAs to ensure an on-going platform for participation in water quality management processes by civil society and the private sector.	• where such water pollution cannot be avoided altogether, it is minimised; and • ensures that any waste discharge that is allowed is done so with due consideration of the precautionary principle and resource quality objectives. Where resource quality objectives have already been exceeded physical rehabilitation or reduction of discharges will be implemented. Decisions will be informed by the specific catchment or water resource related conditions. The poor assimilative capacity of groundwater systems will be recognised in water quality management. Hazardous substances, due to issues of toxicity, persistence and the capacity to bio-accumulate presents potentially major threats to human health and the environment, and the Receiving Water Quality Objectives Approach will not apply to hazardous substances. The protection and restoration of wetlands and similar green infrastructure will be included in integrated water quality management plans. In certain cases, a change to the management class of a resource may be required. A legislative amendment to the NWA is required for this purpose. Government will enhance its capacity for controlling illegal waste discharges, through combined actions by DWS and DEA in particular. A targeted risk-based approach will be adopted in which the potential

	significance of the impact of water pollution, or the compliance history of the enterprise, will inform the level of response or intervention from the state. New mines will be subject to stricter regulatory requirements than in the past. Mines will be categorised in relation to their potential water quality impact, and regulated accordingly. This will require an amendment of the legislation. The water use licencing process will be differentiated according to the complexity of licence application. DWS will put in place a protocol ensuring that public participation is required for all water use licence applications determined as posing a high risk to water quality. Different instruments will be used to implement IWQM including waste discharge authorisation; waste discharge charges; administrative penalties; a pollution register, and voluntary instruments. DWS will update its data information systems and put in place the necessary mechanisms, through CMAs and regional DWS offices, to ensure that the information is kept up to date. An inter-departmental CME system will be instituted, with the roles of the relevant bodies formalised under the IGRFA. Key organs of state in this regard are DWS, CMAs, and DEA/PDEAs DWS will take the lead in developing on-the-job IWQM training for relevant government officials.

C. FINANCING INTEGRATED WATER QUALITY MANAGEMENT

DWS will conduct an analysis of the financing required for effective water quality management, develop a Water Quality Management Financing Framework. Funding considerations will include financing for green/ecological infrastructure.

DWS will implement the Waste Discharge Charges Strategy in a phased and targeted manner, beginning with those catchments in which water quality is of highest concern.

DWS, with National Treasury and COGTA, will work to ensure sufficient funding through municipal grants and budgets for the rehabilitation and effective operation and maintenance of WWTWs.

DWS, with National Treasury, DMR and DEA, will investigate the costs of long-term water pollution from closed mines, and determine any required changes to the financial provisions for mine rehabilitation, and the roles of DWS and CMAs in approving the rehabilitation work required for closed mines to minimise water pollution.

New mining ventures will be required to show that the long-term costs of dealing with the residual impacts associated with mining (e.g. AMD) are sufficiently catered for in their financing arrangements.

The financial provisioning clause will extend to all industries that are deemed “high-risk” polluters.

Licence use application fees will be revised to reflect the cost of the time required to process a licence application. Waste discharge

D. KNOWLEDGE AND INFORMATION MANAGEMENT

DWS, with DEA, CMAs, international river basin commissions, and other relevant government entities, will develop a national water quality monitoring and evaluation system. DWS will be responsible for the national assessment of water quality based on this data.

DWS, with the WRC and CMAs, will investigate the options provided by recent technological developments to improve water quality monitoring as well as data storage and management.

DWS will report annually on the state of water quality in the country, including the performance of local government management of waste water through the Green Drop report. DWS with strengthen its role in the monitoring and evaluation of performance by local government.

DWS, with the WRC and CMAs, will lead the development of a programme to create and support citizen-based monitoring programmes.

Water quality data collected by public sector institutions will be made available to the public in line with the constitutional right of access to any information.

The WRC will lead the sector to:

- develop a national water quality research plan that addresses the entire innovation value chain
- support the alignment of applied research priorities to ensure that water research directly contributes to the resolution of

authorisation applications will be divided into categories of complexity and level of risk, with appropriate fees allocated to each category. Government will build partnerships with the private sector to mobilise private sector capacity and funding to support management and rehabilitation activities.	water sector challenges • investigate and improve funding for water quality research • promote innovation and knowledge sharing to support new and appropriate technology uptake • with DST, continue to develop and enhance the impact of the Water Technologies Demonstration Programme (WADER) DWS and DEA will develop on-the-job training programmes for officials from all relevant state institutions to improve the capacity of government to regulate activities with impacts on water quality, and to improve the compliance monitoring and enforcement capacity of the state. DWS, in partnership with DEA, will make training available to civil society organisations active in the water sector to enable their informed participation in water quality management processes. DWS, in collaboration with COGTA, will develop the necessary regulations to ensure the professionalization of key water services positions in Water Services Authorities to ensure that the staff responsible for the management of water and waste water systems at municipal level have the necessary competencies. DWS will continue to provide bursaries for students to study water quality-related subjects at universities in order to provide a pool of qualified recruits for the state

Implications for Legislative Amendments

Based on the responses outlined in the WQM Policy, the following legislative amendments will need to be considered in order to give full effect to this Policy:

Reclassification of resources

The National Water Policy, and resulting policies, indicate that as a last resort, if the receiving water body does not have enough assimilative capacity to absorb the waste without exceeding the RQOs, and if there are major socio-economic drivers behind a new waste discharge, there may be a need for a case to be made to reclassify a particular resource. In this situation, it is essential to investigate whether or not a lower management class that might allow for socio-economic development opportunities to be implemented may be more appropriate. In doing so, the full procedures required under the legislation for the determination of a management class and RQOs, including stakeholder consultation, will be applied. The converse is also true: if the management class is found to be inadequate for any reason, a higher management class might be applied, after appropriate investigation and consultation. **Currently, however, the legislation does not allow for this, and a legislative amendment to the NWA is required for this purpose.**

Declaration of protected areas

In highly sensitive and important catchment areas, such as water source areas or wetland conservation areas, developments that have a significant adverse impact on water quality may be prohibited under:

- Section 24(2A) of the NEMA, which provides the Minister of Environmental Affairs with the powers to prohibit or restrict the granting of environmental authorisations by the competent authority – in this case the DMR – for a listed or specified activity such as mining in a specified geographical area. These powers should be used if necessary to "ensure the protection of the environment, the conservation of resources or sustainable development", as part of the risk-averse or cautious approach;
- Section 49 of the MRPDA, which provides the Minister of Mineral Resources with the powers to prohibit or restrict the granting of any reconnaissance permission, prospecting right, mining right or mining permit in respect of land identified by the Minister for a period and under such terms and conditions that the Minister may determine; and
- Sections 12, 13 and 26 of the NWA which provide the Minister of Water and Sanitation with the powers under the water resources classification system to determine for a particular class of resource those activities which must be regulated or prohibited in order to protect the water resource; to determine for a particular water resource or stretch of water resource the regulation or prohibition of in-stream or land-based

activities that may affect the quantity of water in, or the quality of, the water resource; and to make regulations on the prohibition of certain activities.

Currently, the NWA only allows for only the prohibition of activities in a water source area. **A legislative amendment that would allow the Minister of DWS to declare the water source area as protected is required to ensure certain areas receive full protection.** This may be required for an area to recover and rehabilitate itself, or simply, it may be required for ecological protection.

Categorisation of polluting industries

There is a need to apply different degrees of regulation depending on the specific risks posed by polluting industries. For example, in relation to mines, new mines will be subject to stricter regulatory requirements than have been applied in the past, with requirements for the application of Best Practicable Environmental Options (BPEO) to deal with mine water drainage. Mines will be categorised in relation to their potential impact on water quality, and will be regulated accordingly. **Although current policy does differentiate between the different categories of mines, this policy needs to be strengthened. This will require an amendment of the existing legislation.**

Waste Discharge Charge System

The WDCS is being developed by the Department to promote waste reduction and water conservation. It forms part of the Pricing Strategy, which is being established under section 56 of the NWA. The WDCS proposes two charges:

- Waste Discharge Mitigation Charge (mitigation charge); and
- Waste Discharge Levy (incentive charge).

From a reading of section 56 of the NWA, it is clear that a mitigation charge can be imposed under the NWA. From the wording of the specific section of the Act, it appears that the Minister may consider incentives and disincentives in setting the water use charges. However, it is less clear whether the provisions of section 56 of the NWA authorises the Minister of the Department to impose the incentive charge.

Section 57(5) of the NWA clearly limits the Ministers ability to impose a levy, tax or duty and reads as follows:

> ***"(5) No charge made under this Act may be of such a nature as to constitute the imposition of a tax, levy or duty."***

The purpose of the limitation in section 57(5) appears to be aimed at two issues:

- Ensuring that monies recovered from water remains in the water sector (the funds are ring-fenced); and
- Recognising that the Minister of Finance is the only organ of state that may promulgate bills that appropriate money or impose taxes in parliament through a Money Bill.

Although section 57(5) of the NWA limits the imposition of a charge that is a levy or tax under the NWA, it does not preclude any other legislation from doing so. Accordingly, as required by the Constitution, a Money Bill would allow for the Waste Discharge Levy to be imposed as a levy/ tax.

It is recommended that the provisions relating the charge, i.e. section 56 and 57 of the NWA, be amended as part of the water law review process to make express provision for the institutional arrangements in relation to the setting of the Waste Discharge Levy and assigning the power to do so through the Money Bill Process.

Administrative Penalties

Currently South Africa relies on criminal prosecution for addressing water quality violations, but such processes are slow and difficult, particularly in a currently overburdened criminal justice system. Criminal prosecution is entirely dependent on evidence that proves the case beyond reasonable doubt, and the support of the South African Police Service and National Prosecuting Authority. Many of the players in the criminal justice system do not fully understand water legislation or the seriousness of environmental crimes, with the result that such violations do not draw serious penalties.

Importantly, this is a common problem in many countries and, as a result, many countries are moving towards administrative or civil penalty systems for environmental violations, with a criminal enforcement option retained for the worst environmental crimes. DWS will work in coordination with DEA to create the relevant regulatory authority to **impose immediate monetary penalties that truly reflect the cost of water quality violations to society**. **This intervention will enable the state to achieve greater compliance amongst South African companies**. **This must operate along similar lines to the way in which the Competition Act has allowed for civil and administrative penalties to be imposed, with significant impacts on corporate behaviour**. *This will require an amendment of the NWA*. In line with the principle of taking an inter-departmental approach to water quality management, this regulatory authority could serve both DWS and DEA in relation to administrative penalties for water and environmental non-compliance.

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LIST OF ACRONYMS

Abbreviation	Meaning
AMD	Acid Mine Drainage
BFAP	Bureau for Food and Agricultural Policy
BPEO	Best Practicable Environmental Option
CARA	Conservation of Agricultural Resources Act
CER	Centre for Environmental Rights
CMA	Catchment Management Agency
CME	Compliance Monitoring and Enforcement
CMF	Catchment Management Forum
CMS	Catchment Management Strategy
COGTA	Department of Cooperative Governance and Traditional Affairs
CSIR	Council for Scientific and Industrial Research
CSO	Civil Society Organisations
DAFF	Department of Agriculture, Forestry and Fisheries
DALY	Disability Adjusted Life Year
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DOE	Department of Energy
DOH	Department of Health
DRDLR	Department of Rural Development and Land Reform
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EDC	Endocrine Disrupting Chemicals
EIA	Environmental Impact Assessment
EMI	Environmental Management Inspectors
EMP	Environmental Management Plan
EU	European Union
e-WULAAS	Electronic Water Use Licence Application and Authorisation System
GDP	Gross Domestic Product
HDI	Historically Disadvantaged Individuals
IGF	Intergovernmental Forum
IGRFA	Intergovernmental Relations Framework
IMC	Inter-Ministerial Committee
IPIC	Inter-governmental Project Implementation Committee
IWQM	Integrated Water Quality Management
IWQMP	Integrated Water Quality Management Plan

Abbreviation	Meaning
IWRM	Integrated Water Resource Management
LG	Local Government
MC	Management Class
MPRDA	Mineral and Petroleum Resources Development Act
NCCR	National Climate Change Response
NDP	National Development Plan
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Area
NIWIS	National Integrated Water Information System
NT	National Treasury
NWA	National Water Act
NWRS	National Water Resource Strategy
PDEA	Provincial Department of Environment Affairs
PDOA	Provincial Department of Agriculture
R&D	Research and Development
RDM	Resource Directed Measures
RQO	Resource Quality Objective
RSA	Republic of South Africa
RSAP	Regional Strategic Action Plan
SABS	South African Bureau of Standards
SADC	Southern African Development Community
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SAQA	South African Qualification Authority
SASS	South African Scoring System
SDC	Source Directed Controls
SDG	Sustainable Development Goals
SES	Socio-Ecological Systems
SPLUMA	Spatial and Land Use Management Act
SWPN	Strategic Water Partners Network
TDS	Total Dissolved Solids
UASA	United Association of South Africa
UNEP	United Nations Environmental Programme
USA	United States of America
WADER	Water Technologies Demonstration Programme
WARMS	Water Authorisation and Registration Management System
WDCS	Waste Discharge Charge System
WHO	World Health Organisation

Abbreviation	Meaning
WMA	Water Management Area
WQM	Water Quality Management
WRC	Water Research Commission
WRCS	Water Resource Classification System
WSA	Water Service Authorities
WSLG	Water Sector Leadership Group
WUL	Water Use Licence
WWTW	Waste Water Treatment Works

1. INTRODUCTION TO THE INTEGRATED WATER QUALITY MANAGEMENT POLICY FOR SOUTH AFRICA

Water quality is a developmental issue

South Africa faces a multi-faceted water challenge, which, if not addressed effectively, has the potential to significantly limit the economic growth potential of the country. Deteriorating water quality is a key element in this challenge. South Africa is a water scarce country, with water scarcity compounded by frequent droughts, increasing water demands, and deteriorating resource water quality. Poor water quality has significant negative impacts on South Africa: it reduces the amount of water available for use (more water must be retained in our river systems to dilute the pollution to acceptable standards); it increases the costs of doing business (the cost of municipal water treatment increases and many enterprises are forced to treat water before being able to use it in their industrial processes,); it impacts on human health and reduces productivity (an increased number of work days are lost due to water-related illnesses); it threatens several economic sectors (poor water quality impacts on crop yields and makes crops vulnerable to import restrictions from countries with strict quality standards), and it threatens ecological goods and services provided by our water resources. Deteriorating water quality is, therefore, clearly an economic and developmental issue, and must be addressed as such.

The current picture is not encouraging. South Africa is seeing the deterioration of water quality in rivers, streams, dams, wetlands, estuaries and aquifers, due to effluent discharges and run-off from urban and industrial areas, seepage and discharges from areas that support mining, and pollution from intensive agriculture. Sewage from urban areas is often not treated properly prior to discharge, due to inadequate or broken sewerage systems, overloaded or poorly managed sewage treatment plants, aging infrastructure and poor management capacity at municipal level resulting in poor operation and maintenance of infrastructure. Many industrial processes produce waste that contains hazardous or even toxic chemicals that are discharged into sewers, rivers or wetlands. Waste products disposed of in landfills or slag heaps may release pollutants that seep into nearby watercourses or groundwater. Agricultural practices add to the pollution burden, with pesticides and fertilisers entering water resources.

The resultant water pollution has major impacts on the economy, on human health, and on aquatic ecosystems. Deteriorating water quality leads, amongst other things, to increased treatment costs of potable and industrial process water, decreased agricultural yields due to increased salinity of irrigation water, loss of productivity and human well-being due to biological and chemical contamination of water, fish kills and other impacts on important aquatic species, and impacts on tourism due to poor water quality in recreational areas. Some of these impacts are clearly visible, such as major kills, while others are more insidious

and long term. These include the proliferation of aquatic invasive species, eutrophication and silting of dams. Combined, they have significant negative impacts on socio-economic development and human wellbeing in South Africa.

Without a change in how we manage water, worsening water quality will continue to decrease the socio-economic benefits from and increase the costs associated with use of the country's water resources.

This policy is designed to enable government, as a whole, in partnership with civil society and the private sector, to tackle the issue of water quality across the country. It brings together the best elements of existing, but fragmented, water quality management policy in the country, as set out, for example, in the 1991 Water Quality Management Polices and Strategies (DWAF, 1991), the 2006 Resource Directed Management of Water Quality (DWAF, 2006), the draft policy on Mine-Water Management Policy (DWS, 2016f, in progress), and the principles of the National Water Resources Strategy -2. It draws on international experience, to add new policy positions to the foundation provided by existing policy, to craft a new way forward for water quality management in South Africa. It does not deal with the issue of the quality of potable water as provided by municipalities, but only with the issue of resource water quality, the quality of the water in our rivers, lakes, dams, aquifers, wetlands and estuaries.

A fundamental and new framing of this policy is that integrated water quality management (IWQM) is a government-wide task, under the leadership of the Department of Water and Sanitation, with the private sector and civil society playing a key role. In this light, the WQM policy calls for an inclusive approach to managing water quality in the country.

Historically, water quality management has been the mandate of the Department of Water and Sanitation alone, and yet there are many government departments whose mandates impact profoundly on water quality, most critically, the Departments of Environmental Affairs, Mineral Resources, Agriculture, Co-operative Government and Traditional Affairs, Health, National Treasury, Trade and Industry, their provincial counterparts where relevant, and municipalities. A joint approach between these government departments, the private sector (through initiatives like the SWPN) and civil society forms the basis of tackling the water quality challenges facing the country.

In addition, **the policy recognises that managing water quality is a complex problem**. Contrary to historical views that relatively simple command and control approaches could be used to manage water quality, it is now recognised that in the water quality domain, both human and bio-physical systems interact. Both of these systems are, on their own, complex systems, and together, they are even more complex. There is no simple solution to dealing with complex problems, no one path that will lead straight to the correct future. In dealing with complex systems, the pathway is often affected by unexpected events and developments, calling for course corrections and new approaches (**Figure 1**). This policy, therefore, is firmly rooted in the recognition that **the only way to manage the complex challenge of water quality is through adaptive management**, a process that calls for

flexibility, and for structured learning throughout the process in order to inform and amend policy and practice over time. It is also rooted in the understanding that there are many different sets of knowledge that must be brought together to address the problem, be they social, political, earth sciences, financial analysis, or others. **Managing water quality requires us to bring together a wide range of knowledges in a structured process that allows co-learning, co-creation, and co-adaptation as we move forward.**

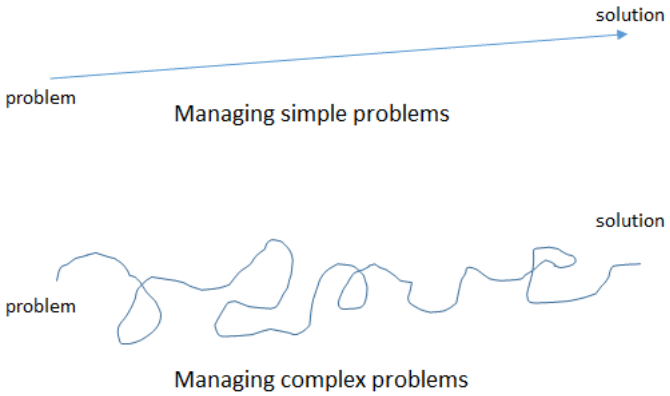

Figure 1: The different paths of managing simple and complex problems

The policy also provides for a substantial shift in dealing with non-compliance with water legislation, setting out the need to adopt an approach of administrative penalties to replace the current process of using the criminal justice system to impose penalties for non-compliance.

A government-wide adaptive and systems-based management approach, in partnership with the private sector and civil society, that will improve resource water quality[1] in South Africa

1.1 The Sustainable Development Agenda

In addition, this policy will contribute to the country's ability to meet the global Sustainable Development Goals (SDGs), adopted in 2015. The SDGs are aimed at ending poverty, protecting the planet, and ensuring prosperity for all as part of a new sustainable development agenda (**Figure 2**). South Africa, as a signatory to the SDGs, must strive to meet the targets under each of the SDGs. Water quality has a direct bearing on our ability to meet the goals of ending poverty, ending hunger and achieving food security, ensuring healthy lives and promoting sustainable economic growth. In relation to Goal 6: Ensure availability and sustainable management of water and sanitation for all, water quality is particularly relevant.

[1] The definition of water quality is expanded on in Appendix A.

Under Goal 6, there are three targets that are particularly relevant to water quality:

- 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
- By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
- By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

Figure 2: The Sustainable Development Goals

These SDGs mirror the sustainable socio-economic development path of South Africa as outlined in the National Framework for Sustainable Development (2008): *"South Africa aspires to be a sustainable, economically prosperous and self-reliant nation state that safeguards its democracy by meeting the fundamental human needs of its people, by managing its limited ecological resources responsibly for current and future generations, and by advancing efficient and effective integrated planning and governance through national, regional and global collaboration".*

The National Development Plan (2012), in turn, states that: From an environmental perspective South Africa faces several related challenges, some of which are in conflict. The country needs to "*protect the natural environment in all respects, leaving subsequent generations with an endowment of at least equal value".*

Implementation of this Integrated Water Quality Management Policy is critical if we are to achieve goal 6 of the Sustainable Development Goals and our own national goals of sustainable development.

1.2 Process

To support the development of this Integrated Water Quality Management Policy for South Africa a number of steps were followed (**Figure 3**). Initially the WRC hosted a workshop of experts and hosted a community of practice to review the existing strategies and frameworks for water quality management. A series of papers examining the current situation and international experiences were then drafted:

- a situation assessment of water quality and water quality management challenges in South Africa (DWS, 2016a)*;*
- South African policy and strategy for water quality management (DWS, 2016a);
- institutional arrangements for WQM in South Africa (DWS, 2016d);
- a review of water quality management instruments for South Africa (DWS, 2016e); and
- lessons from international experiences on dealing with WQM (DWS, 2016a).

On the basis of this work, a set of policy principles for integrated water quality management were developed. These policy principles served as the basis for the development of the Integrated Water Quality Management Policy and are referred to in the Policy Response section of the policy document.

Stakeholders were consulted throughout the policy development process and further engagement will take place on the basis of this draft policy.

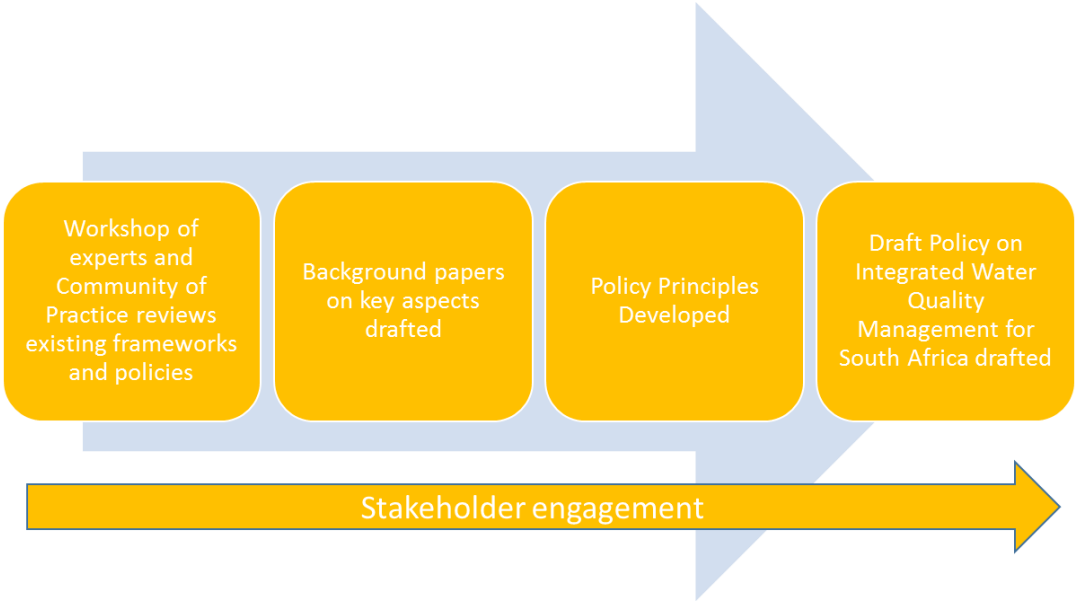

Figure 3: The policy development process

1.3 Structure

This document is structured as follows:

Section 1 provides the overall rationale for an integrated water quality management policy in South Africa, outlines the process that was followed in developing the policy, and describes the structure of the document.

Section 2 provides a context for why this water quality management policy is important for South Africa. It provides an overview of water quality challenges in South Africa; details the economic impact of water quality challenges; summarises the failures in water quality management for South Africa; and provides a policy context for water quality management. This section thus sets the scene for the development of an integrated water quality management policy.

Section 3 outlines the vision for integrated water quality management and the proposed policy response to water quality management challenges in South Africa. A vision for water quality management is stated first, before the proposed policy positions are detailed. The policy positions are grouped into four major themes:

- An inclusive, systems based approach to water quality management;
- Integrated, adaptive water quality regulation and management;
- Financing integrated water quality management; and
- Knowledge and information management.

These themes have emerged from the various research reports (DWS, 2011; DWS, 2006; DWS, 2015; DWS, 2016) and stakeholder workshops conducted – in order to understand what is required of an integrated water quality management policy – as the key levers for unlocking improved water quality management in South Africa.

Under each of these themes, a short problem statement is followed by the proposed policy response. The principles that underpin the policy responses are indicated in a sidebar in the text.

The conclusion to this document is provided in **section 4.**

2. WATER QUALITY IN SOUTH AFRICA

2.1 Overview of Water Quality Challenges

Despite the work of DWS over many years, surface and ground water quality across the country is deteriorating, due to pollution from mining, agriculture, urban areas (including through storm water and failing wastewater treatment works) and industry. These pollution challenges have different scales and severity of impact, and some are more geographically specific than others. Salinisation, sedimentation, nutrient enrichment, and microbial pollution, for example, occur at a national scale, while acid mine drainage and agrochemical pollution occur at regional or site specific scales. However, the impact of acid mine drainage is recognised as having sufficient impact to be of national importance.

Some of the pollution arises from point source discharges such as industrial processes and municipal wastewater treatment works, while some arises from diffuse sources such as run-off from land or infiltration into aquifers through land.

Figure 4 summarises the major water quality challenges in different regions in the country. The prevalence and/or severity of impact of particular water quality issues varies markedly from river system to river system and between water management areas.

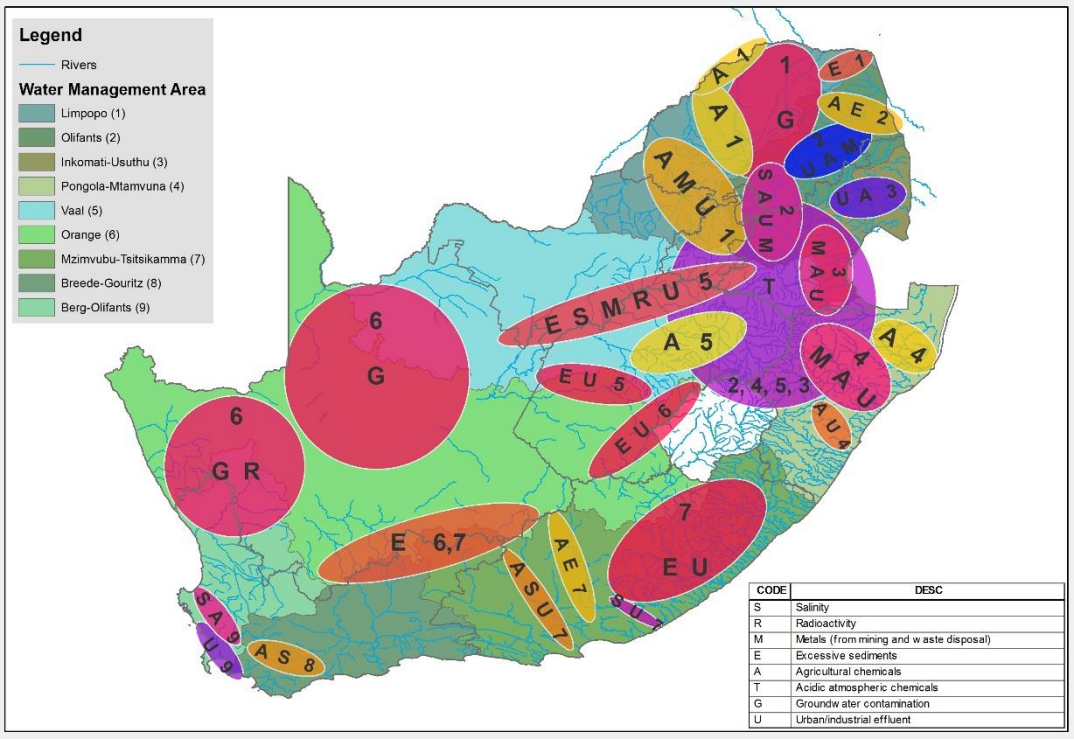

Figure 4: Map of the different types of water quality problems across in South Africa (adapted from CSIR, 2010)

Based on an analysis of the scale and severity of impact, five stand out as priority issues of national importance (see Figure 5):

- eutrophication (which includes the issue of failing municipal WWTW),

- salinisation,
- acid mine drainage and acidification,
- sedimentation and
- urban runoff pollution.

There other pollution issues that must be addressed at regional or site specific scales.

There are some pollutants, such as industrial and agrochemicals, metals and nanoparticles, reflected on the right hand side of **Figure 5** about which there is insufficient information to understand the severity of impacts, which may be significant, and about which more research and investigation is needed to inform the actions to be taken.

Good research and accessing of knowledge from the international water sector must inform the approach to managing potential new pollutants. Critically, however, the ***precautionary approach*** must be applied in relation to pollutants around which little is known, to avoid the introduction of potentially harmful new pollutants into our water resources.

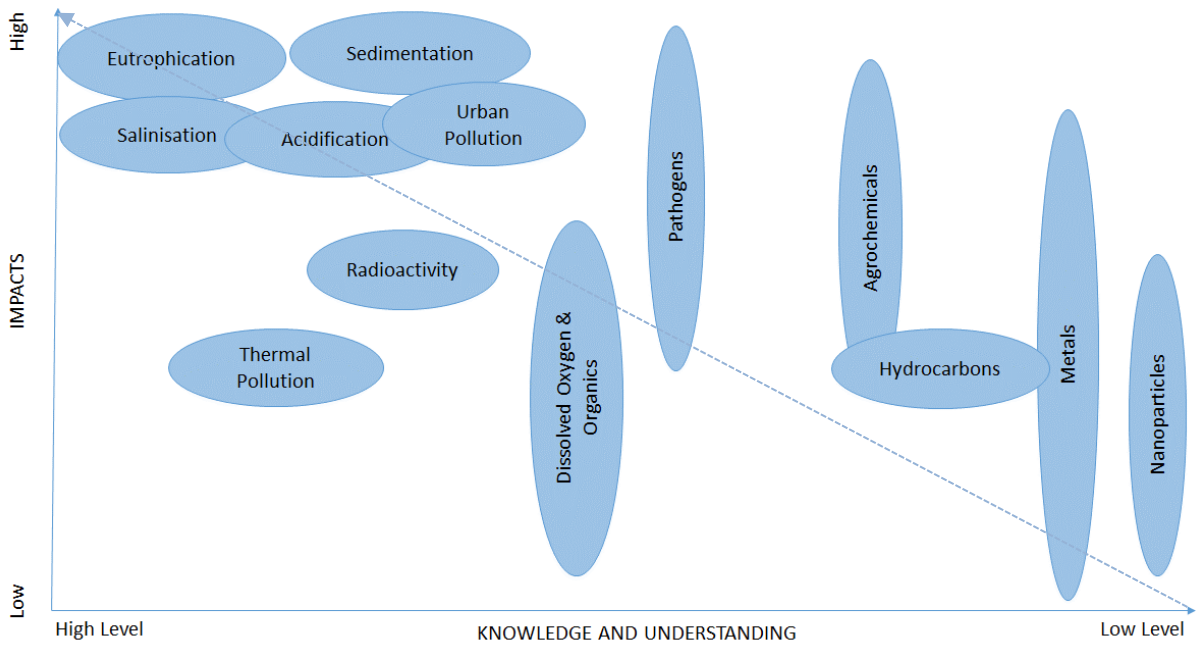

Figure 5: Water quality issues mapped against impacts and knowledge/understanding

In addition, there are several trends which already are, or may unfold in South Africa, which may result in new or accelerated water quality impacts:

- climate change which will change rainfall patterns, increased water demand due to higher temperatures, and change the rate of biogeochemical and ecological processes that determine water quality;
- unconventional oil and gas extraction using hydraulic fracturing;

- the growth of inadequately serviced densely populated settlements;
- population growth; and
- increasing industrialisation.

These trends will occur within already complex socio-economic and bio-physical systems and understanding the multiple potential impacts and changes in these systems provides a major challenge.

Within these complex systems, water quality and water quantity issues are inextricably linked. Water resources have a certain assimilative capacity which can dilute pollution to acceptable levels. Increased abstraction of water from water resources decreases the amount of water available in the resource, resulting in reduced assimilative capacity and increased concentrations of pollutants. While a portion of the abstracted water is usually returned to the water resource at the tail end of the use process, it is inevitably in a worse quality than when abstracted. In periods of drought, the assimilative capacity of water resources is significantly decreased, while floods have the potential to mobilise pollutants that have been trapped in sediment. Thus, the management of water quality cannot be done in isolation from the management of abstraction, storage and use, including water conservation and demand management.

2.2 Water Quality and a Prosperous and Sustainable Nation

Water pollution has direct, but insufficiently recognised, impacts on economic growth, human health, ecosystems, job creation and the cost of doing business. It stands to reason, then, that improving our resource water quality will impact positively on economic growth and human health and well-being. Some of the water quality related costs that this policy aims to reverse are discussed below.

Livelihoods and productive sectors

Water pollution impacts negatively on productive economic sectors like agriculture, fisheries, the commercial sector, industry and tourism, as well as on rural livelihoods, through, for example, reduction in crop yields, loss of tourism, and increased requirements for pre-treatment of water in industrial and agro-processing enterprises.

Industrial water users require water of a suitable quality for their industrial processes. Where such water is abstracted directly from a polluted water resource, industry must treat the water to a suitable quality, thus impacting on their profitability.

In the agricultural sector, deteriorating water quality impacts on crop yields: for example, heavy-metal pollution can not only result in lower plant growth rates (ranging from 13% to 70%), but also in a decrease in the yield of wheat (40% to 83%) (Athar and Ahmad (2002)). It also impacts on long-term soil productivity through, for example, salinization of land, and, critically, on export of crops where irrigation water quality does not meet the stringent standards of the EU or the USA. (thus making crops unacceptable)

Farmers risk losing contracts with international clients because of poor water quality. In 2014, it was reported that the European Union had given a final warning that it would "stop imports from crops irrigated with water from the Olifants because of the level of health-threatening pollutants from mines seeping into the river". Later that year, the non-profit Bench Marks Foundation released a statement about the impact of poor water quality on the economy, saying that farming exports were "affected by the influx of collieries with many vegetable farmers downstream from the mines in the Kendal Ogies area losing European clients due to the bad quality of water used for irrigation" (CER, 2016).

In India a study compared two villages in Andra Pradesh, one of which was polluted by nearby industries, and the other which was not. In the polluted village, water contained very high levels of arsenic and had abnormally high chemical oxygen demand, total dissolved solids, and other contaminant levels. The amount of land under cultivation in this village declined by 88 percent over nine years after being affected by water pollution. The loss of cultivable land is attributed solely to contamination of soils from polluted irrigation water (Reddy and Behera 2006).

In the tourism sector, water pollution may cause loss of wildlife sanctuaries and degradation of protected areas, fish kills, health impacts for tourists, and visual impairment of water resources, discouraging tourist activity in affected areas.

It is estimated that the U.S. tourism industry loses close to $1 billion each year, mostly from losses in fishing and recreational activities because of nutrient-polluted water bodies. In the Philippines, tourism losses due to water pollution represent around 70 percent of the total US$ 1.3 billion annual economic losses from water pollution (WB 2003).

The Middle Vaal River is an area with particularly high urban, mining and industrial pollution. The direct and indirect costs of contamination in the form of salinisation in this area were estimated by Urban Econ in 2000: it was estimated that direct costs of R80.5 million per annum would be saved if levels dropped to 200 mg/l TDS; on the other hand, a level of 1,200 mg/l TDS would increase salinity-related costs to R183 million. (Nieuwoudt et al., 2004).

In 2010, an economic impact study conducted by Plus Economics concluded that a decrease in the quality, and therefore usability, of water in South Africa by 1% might result in the loss of 200,000 jobs, a drop of 5,7% in disposable income per capita, and an increase of 5% or R18,1 billion in government spending. Additional macroeconomic effects of poorer water quality included a drop of R16-billion in household spending, a drop of 1% in the GDP growth rate as well as a drop of R9-billion (2,5%) in total fixed investment.

A Feasibility Study for a long-term solution to address Acid Mine Drainage (AMD) associated with the East, Central and West Rand underground mining basins in the Gauteng Province was completed by the Department of Water Affairs in 2013. If AMD is discharged without treatment into the Vaal River System, the high salt load requires large dilution releases to be made from the Vaal Dam to maintain the fitness-for-use objectives set for the Vaal Barrage and for further downstream users. This would result in unusable water surpluses developing in the Lower Vaal River and threaten the acceptable levels of assurance of water supply from

the Vaal Dam with an increasing risk of water restrictions in the Vaal River water supply area, which would have negative economic and social implications. (DWA 2013b).

"It is estimated that water from current mining operations entering the Witbank and Middelburg Dams amounts to 30 million cubic metres per annum and this will rise to 44 million cubic metres by 2030. To treat this water to pre-mining standards would cost R300 million Rands per annum currently, rising to R440 million per annum in 2030 (at present Rand value). What the final discharge of polluted water will be is uncertain but one estimate places it at around 200 million cubic metres per annum, which will cost R2000 million per annum to treat at current Rand value. It is unclear for how long acid generation will continue, but it is likely to persist for hundreds of years." (McCarthy and Pretorius 2009)

Municipal services:

Water services authorities and water boards face rising costs in treating increasingly polluted water to potable standards. In addition, treatment systems require upgrading and modification to deal with the range of pollutants in raw water. These costs are passed onto consumers, pushing up costs for households and water intensive businesses in particular.

In the United States, freshwater pollution by phosphorus and nitrogen cost government agencies, drinking water facilities and individual Americans at least $4.3 billion annually as estimated in 2008.

Human health

Every year, more people around the world die from unsafe water than from all forms of violence, including war – and the greatest impacts are on children under the age of five. Diarrhoeal disease results in the death of around 1.5 million people each year (WHO 2012) with 58% (842 000 deaths per year), resulting from unsafe water supply, sanitation and hygiene. This includes the death of 361 000 children under the age of five, mostly in developing countries (WHO 2014). While over 95% of South Africans have access to water supply infrastructure, aging infrastructure and poor management of water services in many municipalities means that both neither the supply nor the quality of water provided is adequate, and in some areas the quality of water provided has deteriorated over time.

Poor water quality, whether in municipal systems or water resources, increases the incidences of water borne diseases, resulting in costs to households in medical treatment, lost working days, costs to the public and private health care systems, and loss of life from water borne diseases. People in rural areas and isolated communities are particularly at risk due to lower capacity for treatment of water quality and poor water services. These same communities are often also disadvantaged by geographical and economic isolation and poor health care services.

There is an increasing problem of bacterial growth in water resources - in 2010, the quantity of bacteria found was more than five times the concentration that the World Health

Organization (WHO) recommends (Mellor et al., 2013). This can cause intestinal deterioration, bacterial diarrhoea, arthritis, and kidney disease.

In 2005, an outbreak of typhoid in Delmas during resulted in five deaths, 596 cases of typhoid and 3,346 cases of diarrhoea. In 2003, nearly 4000 cases of cholera were reported in South Africa. A recent WRC study shows cholera, shigella, salmonella and other harmful viruses and bacteria at every sampling point on the Umgeni River between the Inanda Dam and Blue Lagoon in Durban. In June 2014, three babies died in Bloemhof from drinking contaminated water.

In 2010 it was estimated that Hospitalizations for three common waterborne diseases, Legionnaires' disease, cryptosporidiosis and giardiasis, cost the US health care system as much as $539 million annually. Estimates suggest waterborne pathogens are the cause of between 12 million and 19.5 million cases of illness per year in the USA. In Dutch coastal bathing waters, halving the risk of infection would save around US$ 256 million per year. Human health-related costs can be highly significant – for example, economic losses as a result of the mortality and morbidity impacts due to the lack of water and sanitation in Africa are estimated at US$ 28.4 billion or about 5 percent of GDP (UN WWAP 2009).

Agricultural land irrigated with contaminated water can result metal bioaccumulation in crops, with potential health hazards to humans including the possibility of chronic toxicity and ultimately organ failure from high doses and prolonged exposure. Livestock fed on crops containing heavy metals may accumulate these metals in their meat, with subsequent risks to humans from the consumption of this meat.

Emerging research indicates that pollutants have different impacts on women and men, and this is an area where significantly more research is needed to understand the gender disaggregated heath impacts of water pollution.

Not only does poor water quality impact on the right to an environment that is not harmful to health or well-being, but it carries significant economic costs through lost productivity and high health costs.

Ecosystems

Aquatic ecosystems provide valuable goods and services to the country. Deteriorating water quality impacts negatively on these ecosystems, destroying this value. In 2010, the economic value of aquatic ecosystems in the then Inkomati, Olifants and Usuthu to Mhlatuze water management areas was calculated at close to R3 billion per annum for rivers, and a further R1,6 billion for wetland and estuarine ecosystems (DWA 2010).

Water pollution weakens or destroys natural ecosystems that support human health, food production, and biodiversity. Studies have estimated that the value of ecosystem services is double the gross national product of the global economy, and the role of freshwater ecosystems in purifying water and assimilating wastes was valued at US$ 400 billion (in 2008-dollar value) (Costanza et al. 1997). Freshwater ecosystems are among the most degraded on the planet, and have suffered proportionately greater species and habitat losses

than terrestrial or marine ecosystems (Revenga et al. 2000) (UNEP, 2010). This degradation of freshwater ecosystems is evident in South Africa as well, with unrecognised long-term economic costs for the country.

In 2009 leading researchers, scientists, conservationists and wildlife pathologists joined forces to respond to the death of hundreds of crocodiles in the Kruger National Park's Olifants Gorge. The programme was initiated after it became clear that the death of the crocodiles was symptomatic of a serious and growing environmental problem in the Olifants River system including pollution from industrial, mining and agricultural sources. According to officials of the Kruger National Park, at least 160 crocodile carcasses were found, although the actual number of deaths may have been higher due to carcasses being consumed or swept away by the river[2].

There are also negative feedback loops related to deteriorating water quality and aquatic ecosystems. Increased levels of nitrogen and phosphates lead to eutrophication and increased weed growth (particularly of invasive exotic species such as water hyacinth (Eichhornia crassipes), red water fern (Azolla spp.), water lettuce (Pistia stratiotes), Kariba weed (Salvinia molesta), Hydrilla (Hydrilla verticillata) and parrot's feather (Myriophyllum aquaticum). If left uncontrolled, water weeds can disrupt water abstraction facilities, destroy fishing grounds, disable water sports areas, block up irrigation channels and watercourses causing siltation and flooding, provide breeding grounds for mosquito larvae and habitat for bilharzia snails, and devastate aquatic biodiversity. South Africa spends considerable sums of money annually on control of water weeds but their growth is fuelled by other water quality challenges.

Water infrastructure

Poor water quality increases the costs to both the public and private sectors related to the corrosion of equipment and conveyance systems, clearing of waterways and drainage systems, and the decreasing storage capacity of impoundments due to sedimentation. The current water infrastructure in South Africa is valued at around R143 billion (DWS owned), R160 billion (Water Boards) and R370 billion (Municipalities). This excludes the value of any privately owned infrastructure. Even a small percentage of this value being eroded as a result of water quality challenges results in a significant economic and public finance impact.

Surveys of accumulated sediment in South Africa's registered dams indicate that 34% of dams have lost more than 20% of their original capacity, while 16% have lost more than 50% of their original capacity (Gibson et al. 2010). Considering that the total investment in these dams amounts to tens of billions of rand in current-day terms, the economic cost of sedimentation is self-evident. Equally important is the loss of water storage in a water scarce

[2] http://www.krugerpark.co.za/krugerpark-times-5-9-crocodile-deaths-lead-healthier-river-24978.html

country, and the significant cost of replacing such lost storage through the creation of new dams, particularly in a context of limited viable dam sites in the country.

Costs of rehabilitation and emergency responses

The costs of rehabilitation of degraded water resources, or of emergency responses to pollution incidents can be extremely high. South Africa faces a particular challenge in relation to its mining legacy, and the costs to the private sector and the state of treating acid mine drainage from closed mines, including abandoned mines which are the sole responsibility of the state.

In 2003 the cost of cleaning up the mercury pollution from Thor Chemicals in Kwa-Zulu Natal was estimated by the Department of Environmental Affairs to be in the region of R60 million.

In 1998, a mining-related accident in Spain, in which a dam failure caused the release of approximately 5 million cubic meters of toxic sludge into the River Agrio, cost US$ 44 million in regional government clean-up costs, plus another US$ 53.3 million in government acquisition of land polluted by the spill (UNECE 2007).

2.3 Why is Water Quality Management Failing in South Africa?

Despite considerable attention being paid to water quality management over the years by government, the current state of the country's water resources indicates a failure to manage water quality effectively. There are a number of contributing factors to this weakness which are discussed briefly below.

Management approaches inappropriate for complex problems: Water quality is a complex problem and **wicked problem** i.e. one that is difficult to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize. In managing water quality, there are a multitude of interacting factors, incomplete information, and changes outside the control of managers. The approach used to date has not managed to address this 'wicked problem' effectively.

Fragmented policies and implementation: Current government policies and strategies are fragmented, and there is a lack of cooperative governance and alignment between different government departments. While the Constitution, through Chapter 2 (the Bill of Rights) provides the imperative for protecting water quality in South Africa, the regulatory responsibility is spread across the Department of Water and Sanitation, and the Departments of Environmental Affairs, Mineral Resources and Agriculture, Forestry and Fisheries, and their provincial counterparts, which all have some regulatory responsibility for water quality management. There is insufficient cooperative governance between different government departments to ensure effective water quality management with limited state resources both in relation to authorisation of activities that impact on water quality and in terms of compliance monitoring and enforcement. In particular, the regulatory responsibility and

associated cooperative governance pertaining to agriculture (DAFF), mining (DMR), and wastewater treatment (municipalities) needs to be strengthened.

In addition, within DWS, the responsibility for WQM functions is spread across various branches and units, with inadequate systems in place to ensure co-ordinated activities.

Inadequate measures to counter adverse land use practices: There are significant water quality challenges arising from land use. For example, inappropriate practices for surface soil tillage, fertiliser application, riparian buffer zones and other cultivation land management needs for both agricultural crops and commercial timber plantations cause nutrient, chemical and sediment pollution in downstream water courses or underlying groundwater resources. Furthermore, inappropriate dry-land tillage, unsuitable crop choices, over-irrigation, inefficient irrigation technologies and absence of drains to intercept saline irrigation return flows, cause elevated salinities in downstream water courses and/or underlying groundwater resources. Of particular concern is anthropogenic soil erosion in catchments and riparian zones through poor land management activities in locations where soils are erodible, or by in-stream and riparian disturbances such as inappropriate crop and silviculture practices; over-grazing; destruction of natural riparian vegetation buffer zones; destruction of wetlands; physical modification of river channels and river banks; poorly-serviced dense human settlements and reckless construction activities. The impact on water quality of land use planning and authorisation decisions has not been considered historically, leading to significant diffuse source pollution of water resources.

Challenges in municipalities: Despite major programmes by DWS and COGTA, a notable degree of dysfunction is present in the management of wastewater treatment works at municipal level. This is illustrated by the latest Green Drop report which rated almost 50% of 824 municipal wastewater treatment facilities as “critical” or “poor”, resulting in extensive nutrient and pathogenic pollution of water courses due to untreated or inadequately treated sewage effluent from such facilities. This dysfunction has a number of causes, primary among which are lack of technically qualified and experienced staff, poor maintenance of infrastructure, and weak financial management and billing systems.

The municipal dysfunctionality outlined above also underlies the increase in wide-spread urban runoff pollution, caused by a lack of implementation of best-management practices in urban land-use planning (residential, commercial, industrial, recreational, conservational), poor storm water management systems, and a lack of or poor enforcement of municipal by-laws.

Furthermore, the mushrooming of informal dense human settlements in and around most urban centres during the past two decades due to rural-to-urban economic migration has caused steadily increasing diffuse source pollution of local and downstream water courses, as well as of underlying groundwater resources. Poor municipal service delivery and the challenges of servicing informal settlements mean that many of these settlements are only minimally serviced, if at all, with increasing water resource pollution as they grow. It should be noted that, despite their stronger financial base, not even the metropolitan municipalities

have been able to adequately provide for effective sanitation services to prevent this level of pollution from under-serviced human settlements.

Limited technical capacity in government: Water quality management has suffered from a lack of technically skilled and experienced staff in DWS and in municipalities in particular (FFC 2012). The latter has contributed significantly to high levels of pollution from municipal wastewater treatment works as discussed below. The former has resulted in weaknesses in authorisation of waste discharges by DWS, gaps in water quality and compliance monitoring, including failure to take effective action against polluters. The over-stretched judicial system has added to the challenges in taking action against polluters, as cases can take a long time to get to court, and judges and magistrates are not always sufficiently aware of the seriousness of water-related crimes such as pollution.

Inadequate monitoring and assessment: The sustainable and equitable management of water quality is dependent on sound data and assessment of the status of water quality and water quantity and the ability, *amongst other things*, to identify key areas of concern and trends over time. Currently, DWS implements a range of water quality monitoring programmes at a national level, to monitor microbial pollution, eutrophication, toxicity, chemical pollution, and aquatic ecosystem health.

However, there are still gaps in the monitoring system, including the number and spatial extent of monitoring points, shortage of staff to carry out monitoring, and monitoring of new and emerging contaminants. A further challenge is the translation of data into appropriate information and ensuring effective enforcement of regulations based on the data.

Delay in the development of Catchment Management Strategies: The slow process of establishment of CMAs has led to a delay in the development of catchment management strategies (CMSs). The Department has recognized the gap, and catchment specific integrated water quality management plans (IWQMP) are in the process of being developed for prioritised catchments (Olifants, Crocodile-West). These plans will address specific water quality needs with regards to securing water which is fit-for-use under different management and development scenarios. The plans will also be used to inform reconciliation strategies, the resource quality objectives (RQOs), and the implementation requirements to meet these objectives. As such these plans will guide future resource directed measures and source directed controls. The first of these plans should be completed by 2018 (DWS, 2015).

Limited financing: The budget allocation for water quality management is insufficient to address the water quality challenges of the country. One option for increasing the funding available is the Waste Discharge Charge System (WDCS) that has been developed by the department. While the development of the WDCS is well advanced, it has not yet been implemented, leaving the ability to management water quality challenges effectively still constrained by insufficient funds.

2.4 Policy Context

2.4.1 The Evolution of Water Quality Management in DWS

South Africa has a long history of policies and programmes for managing water quality. While the first focus was on the disposal of sewage, the Water Act (Act 54 of 1956) introduced controls on industrial water use and the treatment and disposal of industrial effluent, including requiring that all effluent be treated and returned to the body of water from which it was abstracted. The 1984 Water Amendment Act (Act 96 of 1984), responding to increasing impacts from mining and industry, provided for Uniform Effluent Standards, General and Special Standards, and Special Standards for Phosphate, to control pollution.

In 1991 the *Water Quality Management Policies and Strategies in the RSA* introduced the receiving water quality approach, which shifted the focus to managing cumulative impacts on a particular water resource to protect downstream users and the environment, rather than focusing on individual discharges.

In 1996, the Constitution of South Africa (Act 108 of 1996), and, in particular, Section 24 (Bill of Rights) set the framing for a revision of national water policy. The Bill of Rights stipulates that everyone has the right of access to sufficient water (which implies water of an appropriate quality as well); the right to an environment that is not harmful to health or well-being; and the right to have the environment protected, for the benefit of the present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation.

The White Paper on a National Water Policy for South Africa (1997) was founded on 28 key principles which included:

- “The objective of managing the quantity, quality and reliability of the nation’s water resources is to achieve optimum, long-term, environmentally sustainable social and economic benefit for society from their use” and
- “The water and water-related services which people use are not dependent only on the physical and chemical characteristics of the water itself, but on the healthy functioning of whole ecosystems, such as rivers, lakes, dams, wetlands, estuaries or the coastal marine environment. … It is the healthy functioning of the whole ecosystem which gives a water resource its ability to recover from droughts, floods and the impacts of human use. Therefore, the most effective approach is to use receiving water quality objectives as the basis for water environmental quality management.”

The 1997 White Paper on a National Water Policy for South Africa, and the 1998 National Water Act (NWA), brought about an integrated resource, remediation and source directed approach, managing the water resource system as a whole. A further step in this approach was an integrated approach to managing water quality and quantity, recognising the interlinkages between pollution concentrations and the amount of water in a system.

At the same time, a decentralized approach to water resources management was introduced, with the Act enabling the establishment of CMAs, responsible for managing water resources at the catchment scale.

The NWA requires the preparation of a National Water Resources Strategy (NWRS) by the Minister of Water and Sanitation, now in its second edition. The NWRS2 identifies as some of the outstanding challenges in water resources management in the country:

- strengthening of regulation of water resources and water quality;
- improvement of technical and management skills to implement developmental water management; and
- improvement in the integration of monitoring and information management

All of these are relevant to water quality management.

1997 also saw the development of the Water Services Act that provided the legislative framework for the effective provision of water services, including for basic human needs. It highlighted the spirit of co-operative governance with the emphasis on building capacity at all levels of government. The Strategic Framework for Water Services of 2003 further addressed water supply and sanitation issues, serving as an umbrella framework for the entire water service sector, setting overall water supply and sanitation goals and outlining an institutional framework and operational frameworks (financial, planning and implementation) that need to be set or be in place to achieve these goals.

The Draft National Sanitation Policy, published in 2016 for comment, is the first comprehensive policy for sanitation provision in South Africa. The policy includes positions on equity, institutions and sustainability, and commits the Minister to developing norms and standards for sanitation in informal settlements.

In addition to the primary policy and legislation discussed above, water quality is managed by DWS through a number of operational policies and strategies. Details of the existing operational policies, strategies and guidelines, and those currently under development are given in Annex 2.

Thus, water quality management in South Africa has evolved over time from end-of-pipe pollution control focused on the enforcement of uniform effluent standards to the current approach of resource planning and management, complemented with appropriate source management controls and remedial efforts, within the context of Integrated Water Resource Management (IWRM) (**Figure 6**).

However, the existing overarching water quality management policies (comprising the Water Quality Management Policies and Strategies in the RSA of 1991 and the Resource Directed Management of Water Quality in 2006) are dated, and whilst innovative at the time of publication, are in need of revision to align with current realities. This Integrated Water Quality Management Policy is the revised and renewed overarching policy that guides all other policies being developed by DWS.

In addition, throughout the evolution of water quality management, the burden of managing water quality has fallen largely on the shoulders of the Department of Water and Sanitation. It is clear, however, that finding a solution to the problem requires an integrated approach across key government departments, utilising global best practice tools and mechanisms. This approach also informs the new policy approach.

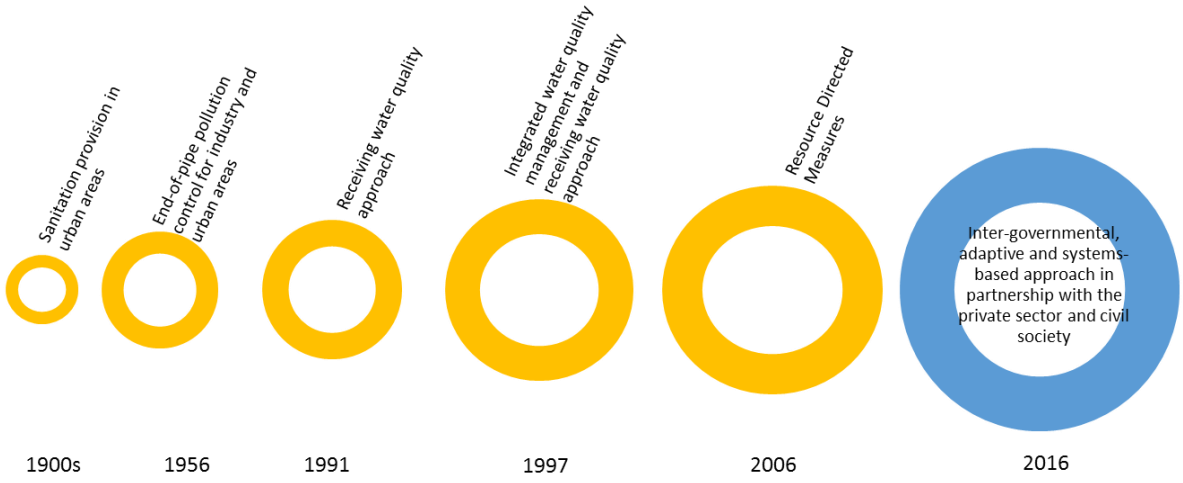

Figure 6: Evolution of water quality management in South Africa

2.4.2 Other Relevant Water Quality Management Policies and Legislation

There are a range of policies and pieces of legislation administered by other government departments that are also relevant to the management of water quality in South Africa.

The White Paper on Environmental Management in South Africa of 1997 and the National Environmental Management Act of 1998 (NEMA) set out the overarching policy and legislative framework for environmental management in South Africa. The White Paper outlines government's environmental vision, strategic goals and supporting objectives and the powers and responsibilities of different spheres of government and civil society. The primary instrument to ensure that natural resources are managed sustainably as far as new projects are concerned is Environmental Impact Assessment (EIA) (Brownlie, Coetzee, Morris, 2013[1]).

The Spatial Planning and Land Use Management Act of 2013 (SPLUMA), administered by the Department of Rural Development and Land Reform, provides a framework for spatial planning and land use management and specifies the relationship between spatial planning, the land use management system and other kinds of planning; provides for development principles and norms and standards; provides for the sustainable and efficient use of land;

[1] http://pmg-assets.s3-website-eu-west-1.amazonaws.com/130731ladies.pdf

and provides for cooperative government and inter-departmental relations between national, provincial and local spheres of government[3]. SPLUMA applies to the whole of South Africa (urban and rural areas) and governs informal and traditional land use development processes. However, there is been insufficient consideration of water quality impacts from land use and it is not sufficiently taken into account in spatial planning and land use management initiatives.

The White Paper on Agriculture of 1995 and the Conservation of Agricultural Resources Act (CARA) of 1983 principally aim to build the agricultural sector in South Africa in order to reduce unemployment and poverty. One of the policy objectives is "to preserve agricultural natural resources and to develop supporting policies and institutions". With this in mind, DAFF has developed a number of legislative and other tools which provide and contribute to the prevention of water pollution by agricultural activities. They include the following: -

- An Irrigation Strategy of South Africa, 2015;
- National policy on organic production;
- National Aquaculture Policy Framework;
- Pesticide Management Policy for South Africa, 2010;
- Research studies in relation to water quality in collaboration with the WRC.

In addition, there was the development of a discussion document on a Policy on Agriculture in Sustainable Development[4] by the Department of Agriculture, which deals extensively with water issues, including impacts on water quality arising from agricultural practices. However, the Agricultural Policy Action Plan (2015 – 2019) itself does not make any reference to issues of the water quality impacts of agriculture, or of the impacts on agriculture of declining water quality. This once again alludes to the fragmented nature of water quality management and suggests that the issue of water quality is not being appropriately addressed.

From a mine water management perspective, there are also challenges posed by current policy and legislation under which the mining industry continues to benefit from a special regulatory regime implemented by the DMR rather than by the environmental authorities like other industries. This results in a conflict of interest in the DMR's mandate, between the promotion of mining and the regulation of its environmental impacts, fundamentally compromising effective regulation of the detrimental impacts of mining. The authorisation of mining development by DMR is not aligned with an assessment of sensitive, vulnerable and important water resource areas, placing some of South Africa's strategic water source areas at risk. Despite the requirement by Cabinet of a one-stop authorisation process that involves

[3] http://www.lexology.com/library/detail.aspx?g=dc21b3d0-c543-42f9-b93c-ec389b52e976

[4] http://www.daff.gov.za/daffweb3/Portals/0/Policy%20Documents/Policy%20on%20agriculture%20in%20sustainable%20development.pdf

DEA, DWS and DMR, too often mines are given authorisations to operate without due consideration of the long term and extremely significant water quality implications of mining.

However, an agreement between the Ministers of Water and Sanitation, Environmental Affairs and Mineral Resources in 2014 has set the basis for improved integration and alignment between the three departments. This agreement, titled One Environmental System, entails that all environment related aspects will be regulated through the National Environmental Management Act, 1998 (Act No. 107 of 1998) and that all environmental provisions will be repealed from the Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002); that the Minister responsible for environmental affairs sets the regulatory framework and norms and standards, and that the Minister responsible for mineral resources will implement the provisions of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and the subordinate legislation as far as it relates to prospecting, exploration, mining or operations; that the Minister responsible for mineral resources will issue environmental authorisations in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) for prospecting, exploration, mining or operations, and that the Minister responsible for environmental affairs will be the appeal authority for these authorisations; and that the three Ministers agreed to align the time frames and processes for their authorisation processes.

The Mining Charter provides that mines are expected to design and plan all operations so that adequate resources are available to meet the closure requirements of all operations. Section 28(2) (c) of the MPRDA requires mines to report on their compliance to the Mining Charter on an annual basis. However, in instances where a mine is declared insolvent and subsequently closes, the responsibility is inherited by the State who then has to ensure the continuous rehabilitation of derelict and ownerless mines. The rehabilitation fund provided prior by the mine is often not sufficient for continuous management and rehabilitation and the financial burden falls on the state. The challenge of providing sufficient funding for the on-going management of water pollution from closed mines has not yet been satisfactorily addressed. What becomes clear in looking at the relevant policies across government is that there is a lack of policy and implementation alignment between the relevant government departments, and a lack of a common policy imperative which balances the need for economic development with the protection of natural resources, including water. The DWS is in the process of developing a Mine Water Management Policy, that seeks to address the issues outlined above, particularly when it comes to issues around liability, funding and attribution.

If our limited water resources are to provide a foundation for the development of a prosperous nation into the future, **it is critical that there be a coherent water quality management policy for all government departments, and that strong inter-departmental arrangements enable the implementation of this policy in line with the imperatives of the Bill of Rights.**

3. POLICY RESPONSE

3.1 Policy Principles for Integrated Water Quality Management

Part of the process towards the development of this policy was the development of a set of policy principles for integrated water quality management in South Africa. These policy principles are summarised here.

These principles elaborate on and add to the existing policy principles in the many primary policy documents of government, such as the White Paper on a National Water Policy for South Africa and the White Paper on Environmental Management. They are grouped into clusters relating to governance, economics and finance, operational matters and data and information (**Figure 7**). Principles 6, 8, 10, 12, 13 and 14 are new principles, in that they are new in the way that they are applied to WQM.

Governance principles

Principle 1: Government-wide water quality management

It is the Constitutional duty of all spheres of government to protect the quality of South Africa's water resources.

Principle 2: Subsidiarity and accountability

Water quality should be managed at the lowest appropriate level and the institutions responsible for managing water quality must be held accountable.

Principle 3: Transboundary water quality management

Water pollution is a transboundary water management problem that must be managed within the principles of the SADC Protocol on Shared Watercourses.

Principle 4: Partnerships

In order to manage water quality effectively, partnerships should be developed between government, the private sector and civil society.

Principle 5: Administrative fairness and implementability

Regulation must be administratively fair, and must also be effectively implementable within technical and financial resource constraints.

Principle 6: Administrative Penalties

A system of effective administrative penalties for water pollution offences must be adopted

Economic and financial principles

Principle 7: Water quality is a developmental issue

In addressing the management of water quality, the developmental, economic, social and environmental impacts of deteriorating water quality must be taken into account.

Principle 8: Broadened funding mechanisms

The mechanisms for funding water quality management should be broadened, given that water quality has impacts on, and is impacted by, many different sectors, and recognising the negative developmental impact of declining water quality.

Principle 9: Polluter pays

The costs of remedying pollution, degradation of resource quality and resulting adverse health effects, and of preventing, minimising or controlling pollutions is the responsibility of the polluter.

Operational principles

Principle 10: An integrated and adaptive approach

An integrated and adaptive, systems-based resource, remediation and source directed approach which manages the water resource system as a whole at catchment or sub-catchment scale will be adopted, *e.g.* to include integration between *"quality"* and *"volume"*, integrated planning, integrated regulation, etc.

Principle 11: Hierarchies of water use and pollution management decision-making

Principle 10 implies that water quantity and quality must, from the outset, be considered as *"two sides of the same coin"*. In light of that, water use and pollution management will follow a hierarchy of decision-making in which:

- Prevent, where possible.
- Minimise, where possible or be subjected to specific licence conditions or minimum standards.
- If the above options have been exhausted, then appropriately apply the cross-cutting Precautionary, Continuous Improvement and Adaptive Management approaches.
- If the resource water quality is degraded below the determined resource class, rehabilitate and remediated and as a last resort reclassify.

Principle 12: Green/ecological Infrastructure restoration and rehabilitation

Rehabilitation and restoration of catchments should be pursued, including the use of green/ecological infrastructure

Principle 13: Risk-based approach

A risk-based approach to regulation should be adopted, based on the likely magnitude of potential impacts.

Data and Information

Principle 14: Collection and protection of data

Data on water quality must be standardised, collected, managed and protected as a strategic asset for monitoring, management and research purposes, while also being used to support co-learning and adaptive management.

Principle 15: Publicly available information

Information and data on water quality and waste discharges must be available in the public domain and should be used to enhance public awareness and education, and to support adaptive management approaches.

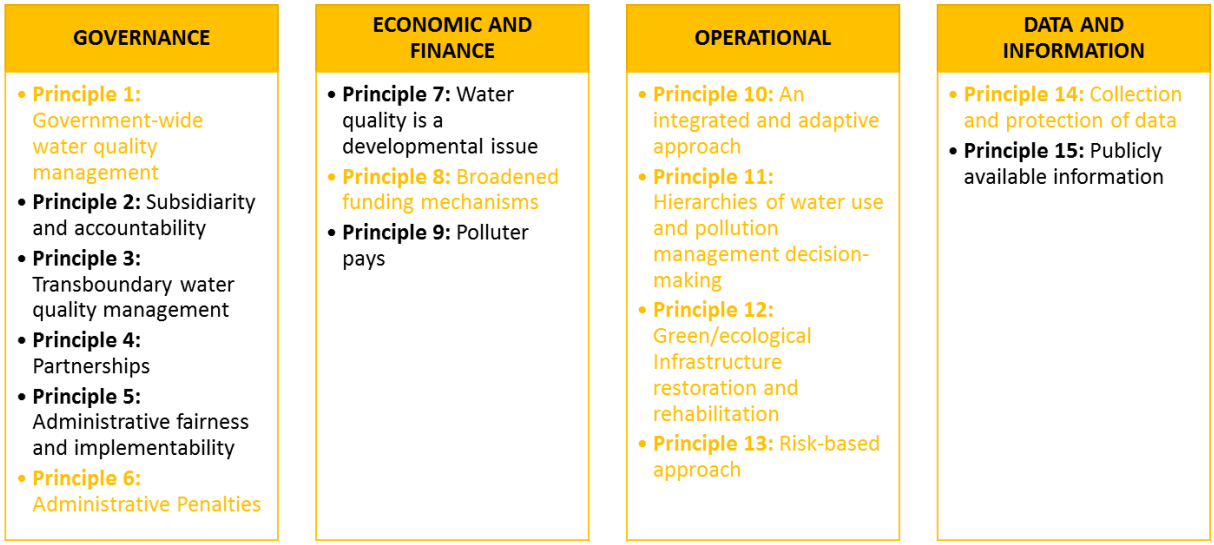

Figure 7: Summary of policy principles

3.2 Values

In addition to the policy principles set out above, the successful implementation of the Integrated Water Quality Management Policy is premised on the following values:

Value system – justice, ethics, equity, integrity, fairness

Coherent action without a value system is at risk of floundering in the face of demands from competing sectors and the challenges of corruption. The Bill of Rights and the Constitution provide clear value-based principles for action in implementing the IWQM policy.

Courage

The courage to act decisively, to make mistakes and to learn, within a cycle of monitoring and review that is governed by a strategic adaptive management approach.

Communication and team work

Recognition of an interconnected water system of which water quality is a part, supports the needs for transparent communication and the ability to work as a team across all sectors of government and with the private sector and civil society.

Competence

There are many aspects to IWQM, including technical aspects and the need to manage complex systems, that require high levels of technical competence. The appointment of competent staff must be supported by capacity building programmes.

Empowerment

Officials are empowered to act (that is, to use their courage and competence) where there is effective leadership.

Informed civilians

Informed civilians are a key element of the effective delivery of integrated water quality management. The emergence of an informed civilian population requires investment in effective public information processes.

Responsibility

Responsible action emerges when there is competence, trust, and an active, shared, value system.

Listening and learning

Responsive implementation of the policy will require water quality managers to listen to water resource users and protectors, both individually and institutionally, and to be open to new learning and to be able to change approaches in the spirit of adaptive management.

3.3 Vision and Goals

The policy responses to the challenges laid out in the previous section, aim to support the vision for water management captured in the NWRS2:

Sustainable, equitable and secure water for a better life and environment for all

In response to the above principles, the vision of this policy is to adopt:

A government-wide adaptive and systems-based management approach, in alliance with the private sector and civil society, that will improve resource water quality[5] in South Africa in order to prevent pollution and ecological degradation and support ecologically sustainable economic and social development and informed use of the nation's water resources.

In light of this, the goals for the WQM Policy are to:

- Provide a coherent, consolidated, current and inclusive (government in partnership with the private sector and civil society) approach to the way water quality is managed;
- Align water quality management policy with current legislation and relevant overarching policies and provide resolution on matters that are not adequately addressed in current policy;
- Provide guidance on sustainable water use, especially as far as it relates to water quality management;
- Inform the water resource management function as well as the required framework for the development of related policies and sub-strategies related to water quality management;
- Address key operational aspects such as taking an integrated approach, broadening finance mechanisms and improving knowledge and information in the execution of the water quality management function; and
- Guide the further development of legislative instruments and appropriate measures to manage water quality.

[5] The definition of water quality is expanded on in Appendix A.

The policy framework that is required to achieve the vision and goals is spelt out in these following four sections:

- **Inclusive approach to water quality management:** This section deals with:
    - the need for a government-wide integrated, adaptive and systems-based response to water quality management challenges in the country,
    - key policy aspects that must be addressed in achieving such an approach, and
    - the need to build partnerships between government, civil society and the private sector in order to be able to successfully address the challenges.
- **Integrated, adaptive water quality regulation and management**: The second section spells out:
    - the integrated approach to adaptive, systems-based water quality management;
    - the hierarchy of decision making; and
    - key instruments for implementing the integrated, adaptive and systems based approach.
- **Financing integrated water quality management:** The third section then examines the financial underpinnings of integrated water quality management, looking at tools for financing the required actions, and the role of the private sector.
- **Knowledge and information management:** The final section describes the policy with regard to the knowledge and human resource capacity base required to be able to implement the policy approaches described in the previous three sections.

These four policy aspects are captured in **Figure 8** below.

Figure 8: The four aspects of the policy response

A. AN INCLUSIVE APPROACH TO WATER QUALITY MANAGEMENT

A.1 Problem statement

Protection of water quality is a Constitutional imperative arising from the right to an environment that is not harmful to health or well-being and the right of access to sufficient water. In addition, as has been highlighted in section 2, deteriorating water quality in the water resources of South Africa is an economic and developmental challenge.

While the national economic impacts of poor water quality are insufficiently quantified in the South African context, it is apparent that the economic impacts of deteriorating water quality are significant. Deteriorating water quality poses a risk for competitiveness of businesses and a general risk to the economy. As discussed in section 2, there are economic and financial costs to the agricultural, tourism, industrial, commercial and municipal sectors as a result of deteriorating water quality. At the same time, poor water quality has significant short and long-term impacts on human and animal health, particularly in poor communities, as well as on ecosystems that sustain our social and economic development. It is thus critical that water quality is recognised and addressed as being of economic, social and environmental importance.

Managing water quality is a complex task as pollution arises from a range of sources, through direct discharge or diffuse sources, with a complex and increasing array of pollutants finding their way into water resources. In addition, the impacts of pollution are influenced by, amongst other things, rainfall, water temperature, ecological sensitivity, levels of water abstraction, and rates of flow in rivers.

While the **Department of Water and Sanitation is the department primarily responsible** for protecting water quality in South Africa, there are a number of **other government departments and spheres of government that have important roles** in this regard, in particular, municipalities, the Department of Mineral Resources, national and provincial departments of Agriculture, Environmental Affairs and Health, and National Treasury. Currently water quality management arrangements are hampered by poor co-ordination and conflicting approaches between government departments and spheres of government.

For example, the responsibility for environmental protection, which includes the water environment and waste management, lies with the department of Environmental Affairs. DWS, on the other hand, is tasked with protecting water resources in order to ensure their sustainable utilisation, thus balancing protection and use of water resources. Both the NWA and the NEMA cover the protection of water resources. However, a lack of co-ordinated planning, lack of clarity on roles and responsibilities, and poor co-ordination with regard to implementation of legislation are impacting negatively on the ability of the country to keep water pollution under control.

Some progress is, however, being achieved in improved co-ordination. For example, the proposed amendments to the NEMA strengthen the ability of DEA to deal with non-compliant mines and this – with the revised EIA Regulations – strengthen the understanding of what is required in terms of EIAs. Some progress has also been achieved in moving towards a more seamless one-stop shop for authorisations between DEA and DWS, and joint approaches to compliance monitoring and enforcement are being developed.

However, there remain challenges with regards to the responsibilities of DWS, DEA and DMR in relation to mines. While an agreement between the Ministers of Environmental Affairs, Water and Sanitation and Mineral Resources in 2014 through the inter-departmental project implementation committee (IPIC) has set the scene for an integrated and coherent approach to environmental management, including water resources protection, this has not yet been fully implemented, and challenges still remain.

At the highest level, there is also a need for strategic planning for overall development. The National Development Plan (NDP), for instance, highlights both the promotion of agriculture, as well as beneficiation (adding value to our mineral wealth). These two goals imply competition for scarce resources (land and water) between agriculture and mining (BFAP, 2015). There is thus a need for more coherent integrated planning and direction for the benefit of the country.

In relation to municipalities, which are a major source of water pollution, DWS has developed a protocol for addressing breaches of licence conditions, but more focus needs to be put on implementing the protocol and holding municipalities accountable for failure to meet their licence conditions. In this regard, DWS should work closely with COGTA and the provincial departments of Co-operative Government to ensure that municipalities comply with the NWA.

Legislative compliance, monitoring and enforcement have been a serious concern for DWS, driven, amongst other things, by insufficient technical and scientific capacity in DWS and CMAs, and inadequate staffing of this function in provincial offices. Co-operative governance around CME, particularly the development of joint programmes with DEA and provincial Environmental departments remains inadequate.

In addition, the WQM functions in DWS itself are fragmented, with different directorates in head office that deal with elements of water quality. Water Quality Management needs to be elevated as a priority within the Department and within government as a whole.

This tension plays out in the private sector as well. The private sector is a significant player in generating pollution in South Africa, whether from large or small enterprises. While some enterprises have done a considerable amount of work in cleaning up their processes, meeting water quality standards and participating in initiatives such as the SWPN, there are still far too many enterprises that are contravening legislation and polluting water resources. This not only has significant impacts on other water users and aquatic ecosystems, but also places an additional burden on state resources through increasing the number of staff members required to ensure compliance with legislation, and tying up resources in lengthy and time-consuming judicial processes.

Civil society, while active in some areas, must play a stronger role as a partner in the process of identifying pollution incidents and issues, supplementing the capacity of the state through having eyes and ears across the country.

A.2 Policy Response

In line with the Constitution, all relevant government role players are required to develop and implement appropriate legislative (and other) measures, and to operate in concert through formalised co-operative governance structures, to protect water resources from pollution.

This requires inter-departmental harmonisation of policies, legislation, CME, regulation and other functions in accordance with the requirements of this integrated water quality management policy. Formalised inter-departmental structures will be utilised to achieve this integrated approach, under the leadership of the Minister of Water and Sanitation. A joint programme of compliance monitoring and enforcement with relevant departments will also be formalised and implemented.

In the discussion below, we consider inter-departmental harmonization for effective WQM with regards to policies and legislation; regulation; and CME.

Policy Principle 1: Government-wide water quality management

It is the Constitutional duty of all spheres of government to protect the quality of water in our water resources

Policy Principle 2: Subsidiarity and accountability

Water quality should be managed at the lowest appropriate level and the institutions responsible for managing water quality must be held accountable

Policy Principle 4: Partnerships

In order to manage water quality effectively, partnerships should be developed between government, the private sector and civil society

Policy Principle 7: Water quality is a developmental issue

In addressing the management of water quality, the developmental, economic, social and environmental impacts of deteriorating water quality must be taken into account.

Policy and Legislation

To achieve an effective inter-departmental approach, DWS will lead a collaborative process to ensure alignment of NEMA, NWA, CARA and MPRDA to support integrated water quality management, and to formally address overlaps of or gaps between statutory/regulatory/oversight mandates of all government institutions relevant to water quality management.

Co-ordination within government

DWS will establish appropriate inter-departmental and inter-governmental structures to ensure government-wide co-ordination of water quality management processes. Strategic management of the primary water quality challenges will require a drastic intensification of cooperative governance and regulatory interfaces among the various affected government entities. Engagement with appropriate decision-making representatives of the affected government entities will be crucially important. Such intra-government engagements will require the approval of the Directors-General of DWS and the affected departments, as well as

of the Accounting Officers of other government entities. [6] This intra-government engagement will need to include National Treasury because some of the potential strategies to deal with dysfunctional municipalities' inadequate wastewater plant operations and maintenance, as well as with historically-caused acid mine drainage, will require special public financing arrangements. The DWS is the apex department amongst these departments, and has the responsibility for leadership and co-ordination of other departments and spheres of government. In achieving coordination between government departments, DWS will build on existing structures, rather than creating new structures.

Critically, in these inter-governmental structures, an adaptive and systems-based approach will be adopted, which will enable the various role-players to develop a common understanding of the challenge, to co-create a vision managing the challenge, and to adapt management approaches based on a structured monitoring, evaluation and learning approach.

At present, the regulatory framework for WQM faces the challenge of some government departments having both a mandate in terms of promotion of sectoral economic activity, and a role in terms of regulation of the same activity to ensure environmental protection. This division of environmental and water protection mandates has resulted in reduced effectiveness of regulation for WQM. In looking at coordination between various government departments, this needs to be taken into account, with co-ordinated action by all relevant departments to ensure that economic development takes place within an environmentally sustainable framework. DWS will ensure, in this regard, that these challenges are addressed through the interdepartmental and intergovernmental co-ordinating structures.

The critical departments and agencies that must form part of an integrated, government-wide approach to water quality management include:

- The Department of Water and Sanitation
- The National and Provincial Departments of Environmental Affairs
- The National and Provincial Departments of Agriculture
- The Department of Mineral Resources
- The National and Provincial Departments of Rural Development and Land Reform
- The Department of Energy
- The National and Provincial Departments of Health
- Municipalities
- Catchment Management Agencies (CMAs)

[6] In the mining sector, the AMD issue in South Africa and the need for inter-departmental cooperation led to the establishment in 2010 of an Inter-Ministerial Committee (IMC) on AMD, comprising the Ministers of Mineral Resources, Water and Environmental Affairs, and Science and Technology, and the Minister in the Presidency: National Planning Commission.

Details of the roles and responsibilities of these bodies are given in Annex 3.

In line with the principles of subsidiarity enshrined in Agenda 21, and in the White Paper on a National Water Policy for South Africa, the management of water quality will be delegated to CMAs, with DWS providing the necessary oversight, national strategic guidance, and control of transboundary matters. The CMAs will also build the necessary capacity to take action under section 19 (3-6) of the NWA, which is a responsibility allocated to them by the NWA. The CMAs CMFs and Catchment Committees will be used as appropriate.

All relevant departments and government agencies will be held accountable for their actions in relation to this policy, and DWS will report annually, in its annual report, on the effective implementation of the inter-departmental approach to integrated water quality management.

Private Sector

The second NWRS2 places emphasis on partnerships between DWS and the private sector in order to deal with water challenges. Some of the platforms to facilitate cooperation and dialogue between stakeholders are the Strategic Water Partnership Network (SWPN), the National Business Initiative, and the Water Sector Leadership Group (WSLG)[7]. The SWPN is an initiative between DWS and the private sector to enhance coordination efforts in order to close the water predicted gap between water supply and demand in the country by 2030.[8] Provincial water forums have been created to address water challenges, align plans and strengthen collaboration.

Through mechanisms and forums like those mentioned above, effective stewardships and partnerships will be built to deal with water quality challenges in specific priority areas, and platforms like Catchment Management Forums will be used to ensure stakeholder engagement. A strategic management approach to the primary water quality challenges requires that DWS will need to forge highly-focused, fit-for-purpose, civil society and corporate business partnerships that are respectively relevant to each primary water quality challenge.

DWS will actively promote the concept of water stewardship and encourage private enterprise to look beyond the factory fence to support integrated water quality management and to consider the local and catchment scale in line with the international Alliance for Water Stewardship Standard which is designed to achieve four water stewardship outcomes: (1) good water governance, (2) sustainable water balance, (3) good water quality status and (4) healthy status of Important Water-Related Areas.

[7] This is a sector-wide strategic engagement led by DWS.

[8] Among the projects are those that aim to conserve water, reduce leakages, expand the capacity of local municipalities, and provide the private sector with incentives to further expand effluent treatment and re-use initiatives that are already being undertaken.

As part of this partnership approach it will be critical that polluters take cradle to grave responsibility for their products and improve self-regulatory processes to reduce the regulatory burden on the state.

Civil Society

In managing water quality, it is crucially important that government forges strong partnerships with civil society, which has an important role to play both in compliance monitoring and enforcement and as partners in pollution prevention and rehabilitation programmes. At the national and catchment scale, DWS/CMAs will work closely with civil society organisations to build programmes of citizen-based monitoring, and in education and awareness programmes to reduce pollution of water resources. In particular, DWS/CMAs will work with the Department of Education and schools to develop school-based programmes of water quality monitoring which can benefit DWS/CMAs in terms of data, while also serving as educational programmes at school.

Active catchment management forums will be established and supported by DWS/CMAs to ensure an on-going platform for participation in water quality management processes by civil society and the private sector.

B. INTEGRATED, ADAPTIVE AND SYSTEMS-BASED WATER QUALITY REGULATION AND MANAGEMENT

B.1 Problem statement

Water pollution arises from a number of sources in a catchment, whether direct discharge from mines, industry and municipalities, or diffuse pollution arising from run-off from agricultural land, urban areas, open cast mines, irrigation with effluent or other land use activities. Water pollution affects all water resources, whether surface ground water resources. Pollution is also mobile, moving along the length of a water resource or underground, with the potential for increased cumulative impacts from multiple sources.

Water quality is affected by: the nature, volume and concentration of pollutants entering the water resources; the volume of water abstracted from the water resource; the complex interaction of ground and surface water; rainfall (which can increase pollution through increased wash-off of pollutants into water resources, or decrease pollution concentrations through increasing the volume of water in a resource) and temperature which increases evapotranspiration from water resources and affects the spread and growth of pathogens in particular. Equally important in the management of water quality are questions of the required water quality in a particular water resource, and the sensitivity of the resource to pollution loads.

Water quality management at the catchment scale requires, amongst other things, recognition of the respective roles of the *concentration* (e.g. mg/l) and the *load* (e.g. kg/day; tonne/a; etc.) of a particular pollutant in streamflow or water supply. Unfavourable pollutant *concentrations* in streamflow or water supply generally have near-immediate impacts on the functional health of particular aquatic ecosystems or crops or animals or humans or industrial processes that need to utilise such streamflow or water supply. On the other hand, frequent high pollutant *loads* (e.g. sediments or nutrients) are generally of concern in catchment elements where such loads end up in storage, such as dams, wetlands, swamps, floodplains and estuaries. Over time, the cumulative impacts of such inflowing loads ultimately lead to loss of function of and/or habitat in and around these water bodies.

High *concentration* impacts by pollutants must to be mitigated and managed through on-going short-term source-directed controls over pollutant inflows to receiving waters, such as on-going monitoring and enforcement of WWTW effluent quality/storm-water quality standards, or operationally through short-term dilution-water releases from upstream dams. On the other hand, the deleterious presence of high pollutant *loads* must be prevented by resource directed measures, such as land management interventions, in addition to the aforementioned source-directed controls.

Adding to the complexity of managing water quality is the fact that catchments are complex social ecological systems (SES), subject to continual change arising from external influences and internal system changes. The changes in the catchment may be non-linear, and due to the interaction between different elements within the SES, cannot be predicted by

understanding only one element of the system. A further complexity is that social values are not coherent across all groups in the catchment, and may change over time, changing the desired outcome in the catchment. These complexities can create uncertainties about what management strategies best meet societal goals, and call for on-going learning and for adaptive strategies to be developed.

South Africa is already experiencing significant pressure on limited water resources, and climate change is expected to result in increasing water scarcity. The full impacts of climate change on water quality (pathogens, flooding, disaster management) are unclear, although an increase in the frequency and severity of droughts is likely. Drought conditions result in a loss of dilution, meaning that pollution affects water resources more severely, and that water quality management needs to be factored in to future drought planning and preparation at the catchment scale.

In addition, most of South Africa's large watercourses are shared with neighbouring states, so that water quality is a transboundary issue, dependent on combined action between riparian states and governed by the SADC Protocol on Shared Watercourses (2000)[9] and various bilateral and basin-wide agreements. Management of water quality in South Africa must therefore be done in such a way as to not cause significant harm to another riparian state in accordance with international obligations.

All of these issues have to be considered within a country in which there are high levels of poverty and unemployment and in which the creation of jobs and equitable economic development are critical. The complexity of managing landscape-wide sources of water pollution arising from a combination of direct and diffuse discharges is made more complex by the range of institutions responsible for intervention and the poor cooperative governance between critical government departments, as discussed in the previous section and is compounded by the limited resources available to the state for addressing these challenges.

Policy Principle 3: Transboundary Water Quality Management

Water pollution is a transboundary water management problem and must be managed within the SADC Protocol of Shared Watercourses

Policy Principle 10: An integrated and adaptive approach

An integrated and adaptive, systems-based resource, remediation and source directed approach which manages the water resource system as a whole at catchment or sub-catchment scale will be adopted.

[9] The SADC Protocol states that: "10(a) State Parties shall, in utilising a shared watercourse in their territories, take all appropriate measures to prevent the causing of significant harm to other Watercourse States. "(b) Where significant harm is nevertheless caused to another Watercourse State, the State whose use causes such harm shall, in the absence of agreement to such use, take all appropriate measures, having due regard for the provisions of paragraph (a) above in consultation with the affected States, to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation."

A significant challenge in the management of water quality is weakness in enforcement of legislation and authorisation conditions, whether under the NWA or the MPRDA, resulting in the externalisation of costs to communities and society.

B.2 Policy response

Responding to this complex challenge requires the adoption of an integrated, adaptive and systems-based approach at the catchment scale, and the adoption of practical tools and mechanisms that result in the greatest benefit with the use of limited state resources. Within the inter-departmental approach outlined in the previous section, therefore, the approaches outlined below will form the framework within which integrated water quality management will take place.

Integrated approach at the catchment scale

In managing the complex interaction of elements affecting water quality, an integrated, resource-based, systems approach will be adopted at the catchment scale. This will require integrated planning within catchments that takes into account water quality and quantity elements, and well as land-use plans and changes, changing user and stakeholder requirements and expectations, and other elements, as necessary. DWS/CMAs will work with relevant departments and organs of state to align water, environmental, economic development and land use planning processes at the catchment scale.

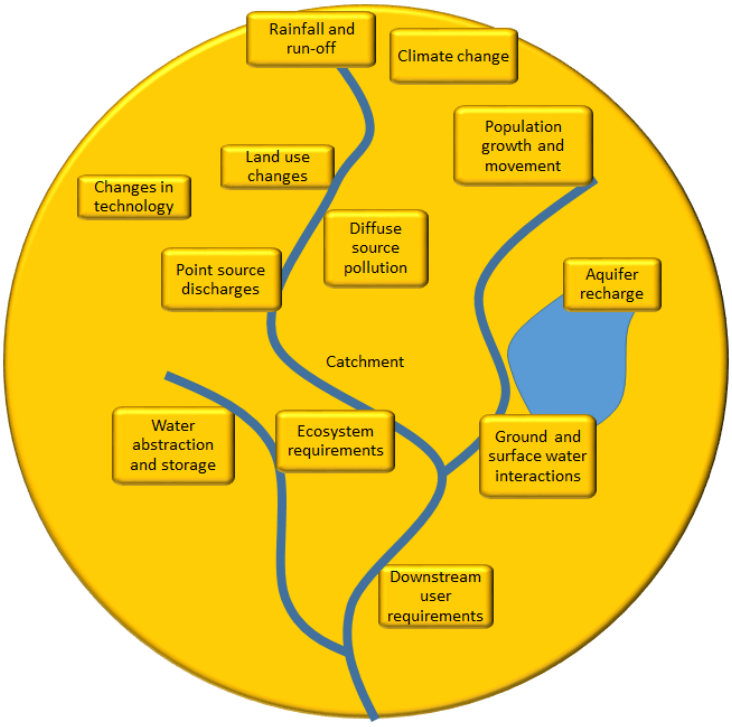

Figure 9: Key elements in the complex challenge of managing water quality

CMAs will co-ordinate land use, economic development and water use planning at the catchment scale. DWS will expedite the establishment and capacitation of CMAs as well as the delegation of appropriate functions to CMAs in order to take integrated catchment management forward. Where there is more than one CMA in a river basin, DWS will co-ordinate basin-wide water, economic development and land-use planning.

The development of catchment management strategies (CMS), through an inclusive process, is an important tool in addressing integrated water quality management at the catchment scale. The water quality elements of catchment management strategies (including strategies at sub-catchment scale, or at any other scale) will be developed through a process that enables key stakeholders and regulators to co-create a vision and systemic approach, and that enables co-learning in order to support adaptive management approaches to water quality management.

As part of the catchment-based approach to integrated water quality management, **joint consideration of issues of quantity and quality will be undertaken when developing CMSs**, as will ground and surface water which are, in most cases, interconnected. Issues of aquatic ecosystem functioning including habitat and biota will also be included. An integrated, adaptive and systems-based response to water quality challenges which includes both source directed and resource directed measures will be adopted.

The issue of the appropriate scale for addressing particular problems will also be identified. For example, the management of a river that crosses a number of international boundaries needs management practices that draw managers from all of the riparian countries. South Africa will comply with its water quality commitments in terms of international obligations and transboundary agreements and will work with other riparian states to manage water quality challenges in transboundary basins.

On the other hand, a small part of a larger catchment might benefit from management practices that bring local water users to address issues of common interest. **Water quality issues that cross administrative boundaries will require approaches that bring together all of the relevant parties.**

The integrated approach will also use a combination of resource directed measures[10] and source directed controls[11].

[10] Resource Directed Measures (RDM) include the resource Class, the Reserve and the Resource Quality Objectives (RQOs) for a particular resource. The Water Resource Classification System (WRCS) is used to determine the desired characteristics of significant water resources across the country, as represented by a Management Class (MC) and associated Resource Quality Objectives (RQOs). The Class describes the desired condition of the resource, and conversely, the degree to which it can be utilised and thus sets the boundaries for the volume, distribution and nature of effluent discharge into the resource. The classification process is a consultative one that involves key stakeholders affected by or using the water resource in question.

[11] Source Directed Controls (SDCs) are aimed at controlling the source of pollution, and there are different measures to be applied for new discharge sources and existing discharges.

Hierarchy of pollution management decision-making:

For the management of water quality in the surface water and groundwater components of a particular catchment, the eventual deleterious water quality impacts of consumptive water uses as well as the more direct pollution impacts of discharges/streamflows containing waste **will always be considered jointly** through evaluating both the total water balances and the waste load balances that are associated with particular activities.

To this end, for a particular catchment, the hierarchy of sequential steps of both water pollution management decision-making and water use management decision-making will be applied.

Water pollution management will follow a hierarchy of decision-making where:

- Consumptive water uses and discharges/streamflows containing waste will be **prevented** as far as possible.
- Where such consumptive water uses and discharges/streamflows containing waste cannot be avoided altogether, they will be **minimised** or subjected to specific licence conditions with specific conditions or minimum standards.
- After all practical options to avoid and minimise such consumptive water use and discharges/streamflows containing waste have been exhausted, such water use and/or discharges/streamflows containing waste will be assessed and managed by appropriately **applying the cross-cutting Precautionary, Continuous Improvement and Adaptive Management approaches**, which are outlined below.

For several water resources, the resource quality objectives have already been exceeded, and in these cases, the decision-making process may determine that physical rehabilitation of water resources is necessary or that existing legal discharges may need to be reduced.

Supporting the hierarchy of decision-making are three over-arching approaches (in red on the right hand side of **Figure 10**):

- the **precautionary approach,** which has four central components:
    - take only risk-averse actions in the face of uncertainty;
    - shift the burden of proof to the proponent of an

***Policy Principle 11:* Hierarchies of water use and pollution management decision-making**

Water use and pollution management will follow a hierarchy of decision-making to

- ***Prevent,*** *where possible.*
- ***Minimise,*** *where possible or be subjected to specific licence conditions or minimum standards.*
- *If the above options have been exhausted, then appropriately* ***apply the cross-cutting Precautionary, Continuous Improvement and Adaptive Management approaches****.*
- *If the resource water quality is degraded below the determined resource class,* ***rehabilitate and remediated and as a last resort reclassify.***

activity[12] in the face of uncertainty;

- explore a wide range of alternatives to possibly harmful actions; and
- significantly increase public participation in decision making.

- The approach of **continuous improvement** of water quality that strives to minimise and, ultimately, to prevent pollution, within the context of justifiable socio-economic development imperatives, while yet cognisant of inevitable constraints on the availability of water supply and assimilative capacity of water resources.
- The approach of **adaptive management** which establishes evidence-based flexibility in decision-making in a situation of increasingly holistic scientific and socio-economic understanding of cause-and-effect dynamics in catchments.

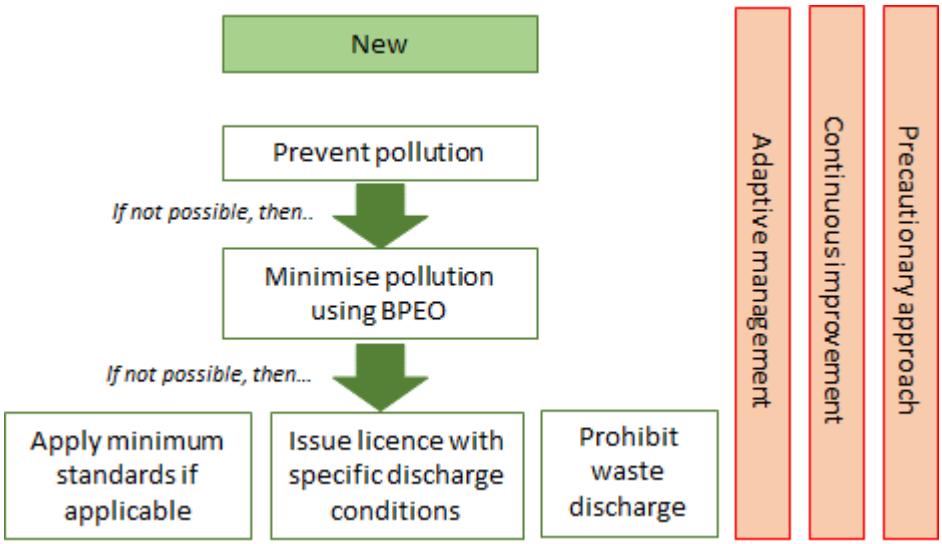

Figure 10: Hierarchy of decision-making

Catchment Specific Approach

In order to protect water resources, the department will be guided by the level of protection determined by the resource class and associated RQOs (including the Reserve). In practical terms, for a river, for instance, this implies that collectively all source-directed controls (including licence conditions) applied upstream of each classified reach and each RQO site,

[12] If an action has a suspected risk of causing significant harm to the public or the environment, in the absence of scientific evidence that it is ***not harmful*** the burden of proof that it is not harmful falls on whoever is wanting to take that action, and that the action should not be allowed until sufficient proof of non-harm has been provided.

must ensure that the water quality RQOs at all downstream sites are achieved and maintained. This Policy aims to put renewed focus on this systemic management obligation.

The resource class and RQOs vary between catchments and water resources, and decisions will be informed by the specific catchment or water resource related conditions. In catchments with no water quality stress, minimum standards and/ or requirements[13] for waste discharge, as determined by DWS or the CMA will be applied. These may be relaxed in special circumstances, but the resource class should be maintained.

In stressed water catchments or water catchments where application of the minimum standards and/ or requirements are not sufficient to maintain water quality objectives, standards stricter than the minimum effluent standards will be applied. These standards will be site-specific and will be based on the results of a waste allocation load investigation according to the Receiving Water Quality Objectives approach.

Groundwater systems have limited assimilative capacity, and once polluted, remediation of groundwater is difficult. This will be recognised in dealing with water quality management.

Hazardous substances, due to issues of toxicity, persistence and the capacity to bio-accumulate presents potentially major threats to human health and the environment, and the Receiving Water Quality Objectives Approach will not apply to hazardous substances. **For those substances a precautionary approach is adopted to prevent their entry into the water environment.**

Prevention

The first step in decision-making on water quality is to prevent pollution where possible, while recognising the need for equitable socio-economic development to take place. This is based on the premise that it is better to prevent harm than to manage it after the fact. Thus, irrespective of the amount of allocable water quality, users will be encouraged to prevent pollution where possible.

Prevention is specifically important for controlling the handling, discharge and disposal of hazardous substances, or substances that could present a major threat to the receiving water environment. Equally important is the application of the precautionary approach. This is particularly important in the field of emerging contaminants, where understanding cumulative impacts is particularly complex, for pollutants of high toxicity, hazard or bio-accumulation, or in the context of uncertainty arising, for example, from climate change.

[13] Minimum requirement: A regulation or standard set by the Department that specifies the very least that should be complied with. (DWAF, 2006)

Minimisation

Where prevention of pollution is not altogether possible, and in the interests of promoting ecologically sustainable and justifiable economic and social development, the discharge of pollutants into water resources (point source or diffuse source) should be minimised, preferably through the use of the best practicable environmental option (BPEO).

Tools in the minimisation of pollution include detoxification, neutralisation, application of best practices, recycling and re-use of water that would otherwise be discharged, and the capture for re-use of products in the water that would otherwise be discharged into water resources.

Since many land uses have a significant impact on water pollution, the regulation of land use, including the prohibition of polluting activities, will, where appropriate, be used as an instrument to minimise pollution.

Permissible water use

Where there is no alternative to discharging water containing waste or disposing of waste, water uses with a pollution potential will be regulated under minimum standards, general authorisations or licences with specific discharge conditions, or through prohibition of particular discharges or activities[14]. In all this the precautionary approach will be applied.

Rehabilitation

The final step in the hierarchy of decision-making is the rehabilitation or remediation of heavily polluted water resources in order to improve water quality. This will apply particularly, but not only, where a water resource has already been degraded to below the determined resource class. In this regard, a catchment-wide approach will be adopted to ensure that the most cost-effective solutions for addressing the rehabilitation at the catchment scale are identified and implemented.

[14] *Activities that impact negatively on water quality may be prohibited under:*

Section 24(2A) of the NEMA, which provides the Minister of Environmental Affairs with the powers to prohibit or restrict the granting of environmental authorisations by the competent authority (such as the DMR) for a listed or specified activity like mining in a specified geographical area. These powers can be used to "ensure the protection of the environment, [or] the conservation of resources or sustainable development".

Section 49 of the MRPDA, which provides the Minister of Mineral Resources with the powers to prohibit or restrict the granting of any reconnaissance permission, prospecting right, mining right or mining permit in respect of land identified by the Minister for a period and terms and conditions that the Minister may determine.

Sections 12, 13 and 26 of the NWA which provide the Minister of Water and Sanitation with the powers to (i) determine for a particular class of resource those activities which must be regulated or prohibited in order to protect the water resource; (ii) determine for a particular water resource or stretch of water resource the regulation or prohibition of instream or land-based activities which may affect the quantity of water in or quality of the water resource; and (iii) to make regulations on the prohibition of certain activities.

Remediation or rehabilitation may include direct intervention on degraded land to minimise contamination risk to a water resource. In determining approach to rehabilitation, the critical role of green infrastructure, such as wetlands, in water quality management will be recognised, and such infrastructure will be both protected and rehabilitated and sufficient investment will be made for this. Rehabilitation will either require action and funding by government, or actions to be taken by those responsible for the pollution, depending on the nature of the polluting activity and the rehabilitation actions required. The rehabilitation of sources of pollution will also be addressed, such as rehabilitation of mine dumps and other contaminated sites. The implementation of the WDCS will increase the funding available for waste minimisation and rehabilitation activities.

The protection and restoration of wetlands and similar green infrastructure is an important part of integrated water quality management, which is being highlighted through the development of a specific policy on wetlands by DWS.

Policy Principle 12: Green/Ecological Infrastructure and Restoration and Rehabilitation

Rehabilitation and restoration of catchments should be pursued, including the use of green /ecological infrastructure

Reclassification

As a last resort, if the receiving water body does not have enough allocable water quality to absorb the waste without exceeding the RQOs, and if there are major socio-economic drivers behind a proposed new waste discharge, there may be a case to be made for reclassification of a resource. In this case, it needs to be investigated whether a lower Resource Class, that might allow for socio-economic development opportunities to be implemented, may be more appropriate. In such a case, the full procedures required under the legislation for the determination of Resource Class, RQOs and Reserve, including stakeholder consultation, will be applied. The converse is also true, that is, if the Resource Class is found to be inadequate for any reason, a higher Class might be applied, after appropriate investigation and consultation. **Currently, however, the legislation does not allow for the classification of a resource to be changed, and a legislative amendment to the NWA is required for this purpose.**

Existing waste sources

Where lawful waste discharges already exist, in accordance with the principles of adaptive management and continuous improvement, licences and standards may be amended over time, and under the NWA, in order to reduce pollution, to improve the quality of water, or to accommodate further development/waste discharge by new users within a catchment.

Addressing unlawful waste discharges

Government will enhance its capacity for controlling illegal waste discharges, and will take more stringent action against illegal discharge and ensuring compliance with licence conditions through combined actions by DWS and DEA in particular.

A targeted, risk-based approach

There are limited human and financial resources available within government. In order to use these resources most effectively and to achieve the greatest impact, a targeted risk-based approach will be adopted. Under this approach, the potential significance of the impact of water pollution will inform the level of response or intervention from the state. Thus, areas of particular sensitivity will receive heightened attention, as will activities from which the pollution potential is of a particularly hazardous nature and areas where pollution is already extremely high.

Policy Principle 13: Risk-based approach

A risk-based approach to regulation should be adopted based on the magnitude of potential impacts

In addition, greater regulatory attention will be paid to waste dischargers with a history of non-compliance than to those with a history of compliance. This will allow an appropriate allocation of state resources.

New mines will be subject to stricter regulatory requirements than in the past, with requirements for the application of Best Practicable Environmental Options (BPEO) to deal with mine water drainage. Mines will be categorised in relation to their potential water quality impact, and regulated accordingly. **Although current policy does differentiate between the different categories of mines, such policy needs to be strengthened. This will require an amendment of the legislation.**

The water use licencing process will be differentiated according to the complexity of licence application. Water use licencing will be integrated into the environmental authorisation process for more complex applications. Furthermore, under the NWA, public participation in the consideration of water use licence applications is discretionary. DWS will, however, put in place a protocol ensuring that public participation is required for all water use licence applications determined as posing a high risk to water quality.

Adaptive management

The management of water quality takes place in a constantly changing and complex environment. Water quality changes in any catchment result from, *amongst other things* changes in abstraction volumes and patterns, changes in diffuse and point source discharges, the nature of pollutants being discharged, downstream water use requirements, seasonal rainfall and water availability, climate change, social expectations and economic conditions. Adaptive management, a systemic approach for improving resource management by learning from management outcomes (**Figure 11**) will be adopted in order to obtain the optimal results in this context of continual change. An adaptive

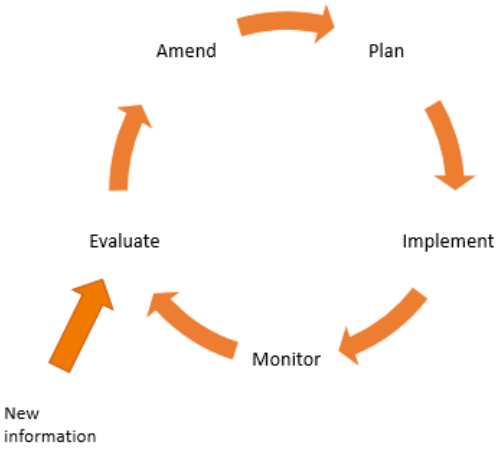

Figure 11: The cycle of adaptive management

management approach involves examining alternative ways to meet management objectives, considering the possible outcomes of these alternatives based on the current state of knowledge, and implementing one or more of these alternatives. Critically, it then involves monitoring and assessment of the impacts of the management actions, in order to inform any required adjustment or recalibration. Thus an adaptive management approach contains a structured feedback loop of learning and adapting, done best through partnerships of managers, specialists, and other stakeholders. This will be done within the inter-departmental approach set out previously.

Water Quality Management Regulatory Instruments

In order to achieve the desired resource quality objectives of any particular water resource, the state has at its disposal a range of regulatory and management instruments, including command and control instruments; economic and market instruments; information as regulation; and voluntary instruments such as negotiated agreements and community based monitoring. The implementation of IWQM will incorporate the use of tools from across this spectrum. These instruments are discussed briefly below.

Water Use Authorisation

Government will continue to use the command and control approach to regulation as one of several regulatory tools. The primary mechanism of command and control will be through the authorisation of discharge to water resources under the NWA. Other command and control mechanisms include the regulation of land use activities and the control of development activities through regulations, EIAs, prohibitions on certain activities (in line with the National Freshwater Ecosystem Priority Areas (NFEPAS)), setting of product or technical production standards, and setting of performance standards. While the mandate of different departments influences the instruments that can be used, the relevant regulatory instruments will be implemented within the integrated water quality management system created. In evaluating waste discharge applications, DWS/CMAs will look for innovative ways in which development can be supported without increasing the pollution load above acceptable levels in the receiving water body. This may involve developing partnerships that facilitate, for example, the reduction of pollution load from one or more sources to enable further economic development in the catchment while still meeting the resource quality objectives.

Introduction of Administrative Penalties

Currently South Africa relies on criminal prosecution for addressing water quality violations, but such processes are slow and difficult, particularly in an overburdened criminal justice system. Criminal prosecution is dependent on evidence that proves the case beyond reasonable doubt, and the support of the South African Police Service and National Prosecuting Authority. Many of the players in the criminal justice system do not fully understand water legislation or the seriousness of environmental crimes, with the result that such violations do not draw serious penalties.

This is a common problem in many countries, and as a result, many countries are moving towards administrative or civil penalty systems for environmental violations, with a criminal

enforcement option retained for the worst environmental crimes. DWS will work in coordination with DEA to create the relevant legislative framework and regulatory authority to impose administrative penalties that reflect the cost of water quality violations to society. **This intervention will enable the state to achieve greater compliance with water quality regulations amongst waste dischargers.** This will operate along similar lines to the Competition Act which allows for civil and administrative penalties to be imposed**.** This will require an amendment of the NWA. In line with the inter-departmental approach to water quality management, this regulatory authority could serve both DWS and DEA in relation to administrative penalties for water and environmental non-compliance.

Certain activities that result in water pollution, however, will still follow the criminal prosecution route, such as acts of vandalism.

DWS will work with DEA on the training of inspectors, and in enforcement of legislation.

Economic Instruments

An economic instrument is "a policy, tool or action which has the purpose of affecting the behaviour of economic agents by changing their financial incentives in order to improve the cost-effectiveness of environmental and natural resource management." Economic instruments often work best when they complement other approaches such as information and communications measures. Economic instruments include water pricing, charges, penalties and incentives to be used to stimulate marketing mechanism, and serve as an incentive to reduce pollution of water sources.

The Waste Discharge Charge System (WDCS) is the most important tool that will be implemented in this regard. It is based on the polluter-pays principle and aims to promote the sustainable development and efficient use of water resources; internalise the environmental and social costs of using water; create financial incentives for water users to reduce waste and use water resources more optimally, and recover costs associated with impacts of waste discharges. It consists of two charges: a Waste Discharge Levy and a Waste Mitigation Charge. The Waste Mitigation Charge, provided for by the NWA, is intended to cover the quantifiable administrative costs of implementing measures to mitigate the negative impacts of waste related discharges. The Waste Discharge Levy provides a disincentive to the discharge of wastewater and will be based on the rate of water utilisation as a means of disposing of waste. **In order for the Waste Discharge Levy to be introduced, an amendment to the NWA is required to give the Minister permission to promulgate a Money Bill.**

Voluntary regulation

Voluntary regulation is an important addition to the suite of regulatory instruments. There are four main types of voluntary regulation:

- environmental agreements negotiated between regulators and industry;

- public programs (administered by regulators or third parties) that individual firms are invited to join; public disclosure initiatives that collect and disseminate information on participants' environmental performance; and
- unilateral commitments made by firms[15].

Research suggests that the threat of mandatory regulation often pushes firms to take part in voluntary regulatory initiatives[16], so that strong implementation of the command and control approach is critical to ensuring that voluntary regulation takes place. The water stewardship approach adopted by DWS supports the voluntary regulation approach.

Policy Principle 4: Partnerships

In order to manage water quality effectively, partnerships should be developed between government, the private sector and civil society

Citizen-based regulation (sometimes called community-based regulation) is a further area of voluntary regulation, where citizens, communities or residents play a critical, if non-statutory role, in monitoring and reporting on environmental compliance. Citizen-based regulation can involve a community or group of people regulating a nearby industry or commercial water user, or it may take the form of internal community regulation of the use of natural resources. This is an area of regulation that will be supported by DWS in the furthering of improved water quality management.

Information as regulation (Incentive-based regulation): While adequate information is a prerequisite for all forms of regulation, and the exercise of all regulatory instruments, it can also be used as a regulatory tool in its own right[17]. The publication of information has proved a useful tool internationally in the management of pollution, through, for example, a publicly available pollution register.

In the South African context, the Blue Drop/Green Drop certification system for municipalities has proved the regulatory value of the reporting and disclosure of information, and it will continue to be used as a tool in water quality management in relation to municipalities. DWS will introduce a water pollution register to extend this reporting beyond municipalities to incentivize polluters to reduce their pollution. In this register, enterprises that are meeting best practice standards will be recognised, as will non-compliance by enterprises.

Effective Data Management

For integrated water quality management to be successful, it must be based on accurate information. In this regard, DWS will update its data information systems such as the National Integrated Water Information System (NIWIS), Water Authorisation and Registration Management System (WARMS) and, ultimately the **Electronic Water Use Licence Application and Authorisation System (e-WULAAS).** This will enable the provision of up-to-date and correct information on all water use authorisations and on registered water use

[15] Khanna 2001 in Blackman 2008
[16] Khanna, 2001
[17] Lopez *et al*. 2004

across the country. DWS will put in place the necessary mechanisms, through CMAs and regional DWS offices, to ensure that the information is kept up to date.[18]

Integrated Compliance, Monitoring and Enforcement

An inter-departmental CME system will be instituted, with the roles of the relevant bodies formalised under the IGRFA. Key organs of state in this regard are DWS, CMAs, and DEA/PDEAs, while DAFF/PDOAs, DMR, DOE and local government may also be part of the system. The creation of integrated regulatory water monitoring committees will assist in the integration of CME activities.

In pursuing an integrated CME system, it will be necessary to increase capacity across technical and administrative levels in all relevant sectors. To aid with building capacity, DWS will take the lead in developing on-the-job IWQM training for relevant government officials.

[18] The e-WULAAS system was developed by the DWS as an online system to ease capture and processing of licencing data online. The Department has finalised the e-WULAAS system, and is in the process of integrating the two systems.

C. FINANCING INTEGRATED WATER QUALITY MANAGEMENT

C.1 Problem statement

The financial resources currently available for managing water quality are insufficient for the task, and do not recognise the level of investment that is required to counteract the economic harm done by declining water quality. In some catchments water quality challenges are exacerbated by low investment in maintenance of water quality infrastructure such as treatment works. As water quality challenges increase as a result of increasing population and economic development, the funding requirements will also increase. The mechanisms for funding water quality management will need to be revised to address the significant impacts of declining water quality.

Some of the funding-related challenges are:

- inadequate funding raised through the regulatory mechanisms available to DWS due, for instance, to delayed implementation of the Waste Discharge Charge Strategy (WDCS);
- the lack of sustainable financial models for local government, leading to inadequate funds to maintain Waste Water Treatment Works;
- inadequate implementation of environmental provisions related to mine rehabilitation;
- poor co-ordination and planning across the sector, and
- economic policy uncertainties and anomalies as well as the generally uncertain political climate, which have resulted in inadequate investment by private sector companies, including in WQM.

Funding is required not only for regulatory activities such as water use authorisation, compliance monitoring and enforcement, but also for rehabilitation and in some cases, the construction and management of water and wastewater treatment facilities. Funding is required to

- ensure sufficient staff in DWS, CMAs and other relevant departments for water quality management
- effective water use authorisation and compliance monitoring and enforcement,
- monitoring of water quality (monitoring stations, data and information systems),
- research on emerging pollutants and the impacts of declining water quality,
- the building, operation and maintenance of wastewater treatment works (including ecological WWTWs), and
- the rehabilitation of degraded areas.

Two additional financial issues are of specific concern regarding the management of water quality. Firstly, the current models of funding for municipalities create perverse incentives for

a build-degrade-rehabilitate/rebuild model of infrastructure. Substantial grants are available to municipalities for the construction of new infrastructure and the rehabilitation of dysfunctional infrastructure. Operation and maintenance costs, however, are expected to come from the equitable share and the municipal budget. In many municipalities, expenditure on preventative maintenance is limited, resulting in the rapid degradation of infrastructure. This leads to the need to rehabilitate or replace the infrastructure. Grants are available from national government for infrastructure rehabilitation, making this an obvious choice for Municipalities. **This is an unsustainable model**, and new conditions for such grants, or new grant models are required to ensure sustainable infrastructure models at local government level. Of further concern is the fact that water services revenue is, in many cases, not ring-fenced, and tariffs are not reflective of actual costs. This results in municipal water services budgets that are too low to maintain and operate waste water and sanitation systems effectively.

In relation to mining activities, ensuring sufficient funding for water quality management post-closure remains a significant challenge. Financial provision by mines for rehabilitation is mandatory in South Africa. Section 41 of the MPRDA requires an applicant for a prospecting right, mining right or mining permit to make a prescribed financial provision for the rehabilitation or management of negative environmental impacts, before the Minister would be able to approve the Environmental Management Plan. However, up to now, very few mines have been issued with mine closure certificates and most mines have therefore been unable to access the mine rehabilitation fund. In addition, there are significant concerns that the fund is inadequate to deal with the on-going risk of water pollution from closed mines.

Whilst the MPRDA allows for this provision, other industries are currently exempt, and in line with the “polluter pays” principle, are only liable after the fact, which is problematic. Where water pollution takes place, the enterprise-related costs of preventing the water pollution are paid by the environment and by society, rather than by the specific enterprise causing the pollution. The polluter pays principle seeks to reverse this and to achieve accountability by ensuring that pollution costs are internalised to the enterprise and are carried by the polluter. It is an internationally accepted principle that those responsible for environmental damage should pay the repair costs to the environment and to human health, as well as the costs of preventative measures to reduce or prevent further pollution and environmental damage. Downstream costs should be understood in an expanded form that covers direct costs to other water users, costs of environmental degradation over time, and indirect costs such as the costs to a community not being able to develop as a result of a lack of availability of clean water.

C.2 Policy Response

Funding mechanisms for addressing water quality challenges will be revised to recognize the significant economic and developmental impact of declining water quality and to provide sufficient funds to address the problems. Financing of water quality management initiatives will not be limited to DWS but will include other government departments and public entities, where appropriate. In addition, co-operation between government departments in water quality management will ensure greater impact for the available budget.

Improved government-wide planning, funding and implementation

DWS will conduct an analysis of the financing required for effective water quality management, similar to the Water Investment Framework. DWS will examine current funding against realistic current and future scenario needs and develop a Water Quality Management Financing Framework. The intra-governmental forum established to align implementation activities for integrated water quality management will make recommendations on the funding requirements, BPEO and the most effective use of existing state resources across the Water Sector.

Policy Principle 8: Broadened funding mechanisms

The mechanisms for funding water quality management should be broadened (that is, outside of DWS), given that water quality is impacted on by, and impacts on, many different sectors, and recognising the developmental impact of declining water quality

Policy Principle 9: Polluter pays

The costs of remedying pollution, degradation of resource quality and consequent adverse health effects, and of preventing, minimising or controlling pollution is the responsibility of the polluter

Principle 6: Administrative Penalties

A system of effective administrative penalties for water pollution offences must be adopted

Polluter Pays

The Waste Discharge Charges Strategy is the primary mechanism for operationalizing the "polluter pays" principle, and waste discharge charges will be implemented in a phased and targeted manner, beginning with those catchments in which water quality is of highest concern.

The funding implications of mainstreaming water quality issues into the business of government must be included in all related planning and budgeting processes. These include the broadening of a range of funding mechanisms outside of DWS.

Mechanisms for incentivising municipalities to address WQM: Municipal discharge is a significant challenge for WQM in South Africa and the sustained maintenance and rehabilitation of failing municipal WWTWs is a critical step in turning this around. DWS will work with National Treasury and COGTA to ensure sufficient funding through municipal

grants and municipal budgets for the rehabilitation and effective operation and maintenance of WWTWs.

Financial provisions for mine rehabilitation:

DWS, with National Treasury, DMR and DEA, will investigate the costs of long-term water pollution from closed mines, and determine

- any required changes to the financial provisions for mine rehabilitation, and
- the roles of DWS and CMAs in approving the rehabilitation work required for closed mines to minimise water pollution.

This process will build on the work being done by the Mine Water Coordinating Body (created through the SWPN to deal with water quality challenges in the Olifants catchment) which aims to determine the requirements to access the existing mine rehabilitation fund and facilitate its disbursement. In addition, new mining ventures will be required to prove, beforehand, that the long-term costs of dealing with the residual impacts associated with mining (e.g. AMD) are sufficiently catered for in the financing arrangements.

The financial provisioning should extend to all industries that are deemed "high-risk" polluters, so that provision is made up front, not after the fact.

Water Use Licence Application Fees

Licence use application fees will be revised to reflect the risk level resulting from the proposed activity, and the resulting intensity of investigation required before authorisation can be granted/refused. Fees will reflect the cost of the time required to process a licence application. For simplicity of implementation, waste discharge authorisation applications will be divided into categories of complexity and level of risk, with appropriate fees allocated to each category.

Incentivising and building partnerships with the private sector for joint WQM projects for each of the sectors: Given the significant financial resources required to deal with water quality challenges in South Africa, government will build partnerships with the private sector to mobilise private sector capacity and funding to support management and rehabilitation activities.

Policy Principle 4: Partnerships

In order to manage water quality effectively, partnerships should be developed between government, the private sector and civil society

Expanding funding options by considering financing related to grey and green infrastructure: An integrated catchment-focused approach, is necessary to protect and rehabilitate South Africa's water resources. In line with this, partnering with other institutions in the financing of grey and green infrastructure will broaden the funding streams available for WQM. For instance, SANBI's ecological infrastructure directorate funds ecological infrastructure that is critical for WQM.

D. KNOWLEDGE AND INFORMATION MANAGEMENT

D.1 Problem statement

The main function of a water quality monitoring programme is to produce data or information that will support appropriate water management decisions. The social, legal, ecological and financial implications of making incorrect decisions as a result of unreliable or non-existent data or information can be significant. Data and information must, therefore, be scientifically and legally defensible. An adaptive management approach, as promoted by this policy, is particularly dependent on information in order to inform changes to the management approach over time.

Monitoring and data management

As has been outlined in section 2, while South Africa has programmes in place to monitor water quality across the country, such monitoring is constrained by limited financial resources, inadequate numbers of suitably skilled staff, uneven availability of access to accredited laboratories for testing of samples, and the complexity of monitoring the number and variety of pollutants entering water resources, including new and emerging pollutants.

There is thus a need to expand the coverage of both raw water and wastewater quality data monitoring to enable an integrated approach that will ensure optimal evaluation of water quality across the country.

Water quality monitoring programmes function at the national, catchment (WMA) level and the local level. National monitoring programmes aim to provide information on the status and trends of water quality in the country as a whole while catchment scale monitoring programmes should collect additional information necessary for catchment management purposes. The objective of local monitoring programmes is to fulfil the information needs of local organizations and groups including local government and ensure compliance monitoring by dischargers as required by their WUL conditions. The data and information from the various levels of programmes should feed into each other to ensure more cost-effective data collection. Clarity is needed on what data is required at the national level, and what data at the catchment scale, and the institutional responsibility for such data collection, as part of a coherent national monitoring programme.

There are also challenges in translating the raw data into appropriate information useful for decision-making around waste discharge authorisations and rehabilitation actions. Lack of sufficiently technically skilled and experienced staff in DWS and CMAs compounds this challenges.

Data and information sharing between stakeholders in the water sector is relatively poor, resulting in information needs not being satisfied. There is an urgent need for a well-designed, coordinated and managed programme for collecting, assessing and disseminating data and information on water quality recorded by all entities in the water sector, including relevant or affected state departments, provincial governments, municipalities, water

management institutions and water services authorities and providers, as well as by other water users.

The sharing of water quality data and information with neighbouring countries in shared river basins is also becoming increasingly important. In SADC there are not yet common standards or systems for water quality monitoring and information management in trans-boundary river basins and aquifers, limiting the ability to effectively share information and jointly manage water quality challenges.

Research and innovation

More is work needed is in research and innovation. The context in which water quality must be managed is continually changing, not least due to the introduction of new contaminants and climate change, requiring on-going research and investigation into water quality management challenges. The NWRS2 recognises the following:

> "Research and innovation has been a major contributor to meeting the ever increasing demands for water in South Africa. The development of skills in the water sector and high-level knowledge about water is still a priority for rapid progress to be made in ensuring that all citizens of the country have safe and secure access to water of good quality."

The NWRS2 further identifies the following key strategic issues still requiring attention related to water quality knowledge and information:

- Lack of alignment of water research objectives, thrusts and programmes with the broader national policies and strategies relating to water resources management and water use
- Limited participation of sector-wide stakeholders in the setting and execution of the water-related research and innovation agenda for the country
- Availability of skills and expertise in water research
- Insufficient allocation of financial resources for water sector research and innovation.

While the Water Research Commission (WRC) continues to ensure that the strategic direction of water research in South Africa is attuned to the country's needs – including with regard to water quality – its funding is insufficient to address the increasing and on-going research and innovation needs in the water sector generally, including water quality.

The South African Bureau of Standards (SABS) produces various South African National Standards (SANS). Some address water quality, but these are not sufficient, and the budget is limited for further work in this regard.

Both the WRC and SABS are key partners of the water sector to ensure on-going research into relevant topics, knowledge and information sharing, uptake of new and appropriate technologies and continuous revision of national standards and benchmarks.

The public require access to the necessary information on raw water quality in a form that they can understand. While the results of the water quality monitoring programmes are

available from DWS, it is not always easy for a lay person to interpret the data, and more is required to ensure that the status of raw water quality is communicated. This is an important element of building an awareness of water quality problems to change behaviour and reduce pollution, but also to build a stronger civil society voice around water quality challenges in order to assist government to identify and address the issues.

Finally, and critically, as has been referred to throughout this document, there are severe skills constraints in the public sector for the management of water quality, resulting in high levels of vacancies and the employment of inadequately qualified staff. This results in ineffective implementation of water quality management programmes, including compliance monitoring and enforcement. Historically, DWS ran regular training programmes for water quality officials, resulting in a highly trained cadre of officials. However, over the past decade, these training programmes have fallen away.

The Department of Environmental Affairs has put in place training programmes for Environmental Management Inspectors (EMIs) which have seen significant improvement in the capacity in that department for compliance monitoring and enforcement. DWS is beginning to make use of this training to build CME capacity within the Department.

D.2 Policy Response

Monitoring, evaluation and reporting

DWS, with DEA, CMAs, international river basin commissions, and other relevant government entities, will develop a national water quality monitoring and evaluation system that sets out the roles and responsibilities of different government departments and spheres of government in the collection of raw water quality data and the provision of requisite data in a standardised form to DWS. DWS will be responsible for the national assessment of water quality based on this data.

The information provided by the above monitoring and evaluation system will be used to support co-learning process amongst key stakeholders and decision-makers in order to inform amendments and improvements to management approaches.

DWS, with the WRC and CMAs, will investigate the options provided by recent technological developments to improve water quality monitoring as well as data storage and management across the country.

DWS will report annually to Parliament on the state of water quality in the country, including the performance of local government management of waste water through the Green Drop report. To achieve this, DWS with strengthen its role in the monitoring and evaluation of performance by local government.

Citizen based monitoring

DWS, with the WRC and CMAs, will lead the development of a programme to create and support citizen-based monitoring programmes to augment the government monitoring systems. This is in line with the SADC Regional Strategic Action Plan (RSAP IV) for water,

which promotes the use of citizen science to monitor river water quality status in selected river basins/reaches.

In citizen-based monitoring, citizens and scientists work together to monitor and evaluate water quality in order support government programmes. Global experience in this regard can offer guidance on such programmes, while the WRC is well placed to support the development of tools for citizen based monitoring, such as the Mini-SASS app which is already in place to monitor aquatic ecosystem health. Partnerships with the private sector can also support such programmes and the ability to collect resulting data.

Public access to information

Water quality data collected by public sector institutions will be made available to the public in line with the constitutional right of access to any information held by the State and any information that is held by another person and that is required for the exercise or protection of any rights.

Policy Principle 14: Collection, use and protection of data

Data on water quality must be standardised, collected, managed and protected as a strategic asset for monitoring, management and research purposes and to support co-learning and adaptive management

Policy Principle 15: Publicly available information

Information and data on water quality and waste discharges must be available in the public domain and be used to enhance public awareness and education and to support adaptive management approaches

Research and innovation

In order to develop and encourage water quality research and innovation in South Africa and our shared river basins, the WRC will lead the sector to:

- develop a national water quality research plan that addresses the entire innovation value chain (idea generation, idea conversion and idea diffusion) and includes contributions from the social sciences, economics, natural sciences and engineering disciplines to research and development – this will include identification of new areas of research required, such as emerging pollutants, and the different impacts of pollution on women and men.
- promote the transfer of technologies and tools for the benefit of the water sector and the alignment of applied research priorities throughout the water value chain to ensure that water research directly contributes to the resolution of water sector challenges
- investigate and improve funding for water quality research
- promote innovation and knowledge sharing to support new and appropriate technology uptake. There will be a specific focus on supporting municipalities to use appropriate and new technology; and designing, developing and marketing new technology and approaches in partnerships with the private sector, civil society and the research community. In this regard, the WRC, the Department of Science and

Technology will continue to develop and enhance the impact of the Water Technologies Demonstration Programme (WADER) which aims to pull together the applied R&D and commercialisation stages of the water innovation continuum and to bridge the gap between water research and the market to achieve a connected water innovation system that delivers socio-economic benefits for South Africa.

Capacity building and training

The existence of a highly trained and competent cohort of officials in DWS, CMAs, DMR and DEA/PDEAs is critical if the state is going to be able to manage the water quality challenges facing the country. DWS and DEA will develop appropriate on-the-job training programmes for officials from all relevant state institutions to improve the capacity of government to adequately regulate activities with impacts on water quality, and to improve the compliance monitoring and enforcement capacity of the state. This will build on the work done by the Water Sector Leadership Group Skills Task Team, and will be implemented through the DWS Learning Academy as well as other learning programmes. Skills in adaptive management approaches to managing complex systems is a competency that needs to be developed in all departments involved in water quality management.

DWS, in partnership with DEA, will also make training available to civil society organisations active in the water sector to enable their informed participation in water quality management processes, particularly in areas where water quality is under severe threat.

In addition, DWS, in collaboration with COGTA, will develop the necessary regulations to ensure the professionalization of key water services positions in Water Services Authorities to ensure that the staff responsible for the management of water and waste water systems at municipal level have the necessary competencies. There has some work been done on training of waste water treatment works operators, and standards are being developed under the South African Qualifications Authority (SAQA).

DWS will continue to provide bursaries for students to study water quality-related subjects at universities in order to provide a pool of qualified recruits for the state

.

4. CONCLUSION

Integrated water quality management, as outlined in this Policy, is crucial if we are to achieve equitable and environmentally sustainable social and economic development in South Africa. This will enable us to achieve our social and economic goals, and will give force to the right to water and the right to an environment that is not harmful to health or wellbeing, as enshrined in the Bill of Rights in the Constitution.

Some of the elements of the policy are implementable within the current legislative framework, while other elements will need amendments to the NWA, and possibly to the NEMA and the CARA. Such legislative amendments are a critical part of protecting and restoring water quality in South Africa, and include:

- Amendment to allow reclassification of the resource class;
- Amendment to allow for the declaration of protected water source areas;
- Amendment to allow for the categorisation of polluting industries, based on risk;
- Amendment to allow for the promulgation of a Money Bill for the Waste Discharge Levy; and
- Amendment to allow for administrative penalties.

In addition, successful implementation of this policy will require the establishment of effective inter-departmental structures, systems and processes, and possibly the development of Memoranda of Understanding between key government departments and entities.

This policy is based on the recognition that water quality is a key developmental issue, with significant economic implications at all levels of society. The policy outlined in this document, and the legislation that will arise from it, is therefore vital for the future of all South Africans. It will provide government at all levels with the tools that are required to fulfil its role as custodian of our valuable and limited water resources.

The policy will form the basis of an Integrated Water Quality Management Strategy, which will set out how the policy imperatives that are detailed here will be implemented, by whom they will be implemented, and over what time frames. It is critical, given the Inter-departmental framing of the water quality management policy, that the Strategy is developed in close consultation with the relevant departments and entities that will be responsible for its ultimate acceptance and implementation.

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ANNEX 1: DEFINITION OF WATER QUALITY

Water quality is the term used to describe the physical, chemical, biological and aesthetic properties of water that determines its fitness for a variety of uses and for the protection of the health and integrity of aquatic ecosystems (DWAF, 1996). Physical water quality concerns refer to changes in the physical properties of the water such as the water temperature, water clarity, odour, taste, pH, etc.

Concerns related to the **physical properties** of water bodies include:

- Artificial changes to the temperature of the water because of cold or heated effluent discharges;
- Changes in water clarity due to increased suspended sediment loads;
- Changes in the dissolved oxygen content of the water due to warmer water temperatures or the discharge of oxygen-consuming compounds in the water;
- Unnatural odours due to chemical discharges or the decomposition of organic material in the water;
- The presence of urban litter (*e.g.*, building rubble, plastic containers, and food wrappers) in urban streams; and
- Unnatural tastes due to chemical discharges or the breakdown of blue-green algae in the water.

Chemical water quality concerns refer to changes in the chemical properties of the water such as dissolved salts, the pH, dissolved nutrients, etc. These concerns include:

- An increase in salinity of the water due to irrigation return flows or the discharge of industrial effluents into water bodies, resulting in an increase in concentrations of total dissolved salts;
- An increase in the nutrient content of the water caused by the discharge of nutrient-rich treated and untreated domestic effluents and the inflows of agricultural runoff into rivers and water courses;
- Acidification of streams and rivers due to the inflow of acid mine drainage into these water bodies and/or atmospheric deposition;
- The presence of agro-chemicals in water bodies from pesticides and herbicides used to control agricultural pests; or
- The presence of radioactive material in the water from upstream mining activities.

Biological water quality concerns refer to changes in the biological properties of the water such as the presence of algae in the water, harmful bacteria and pathogens, as well as the health of biota such as fish, invertebrates, or aquatic reptiles and animals, etc. These concerns include:

- Blooms of harmful algae as a result of enrichment of the water with plant nutrients;

- Increase in water borne pathogens as a result of raw or partially treated domestic wastewater discharges or leaking sewers;
- Fish kills as a result of low dissolved oxygen concentrations, high suspended sediment levels, or spills of toxic agro-chemicals into the water;
- Impairment of the endocrine systems of aquatic organisms due to the presence of endocrine disrupting chemicals (EDCs) in the water; and
- Death of crocodiles as a result of poor water quality and other wildlife caused by high concentrations of toxic cyanobacteria.

ANNEX 2: DWS OPERATIONAL POLICIES AND STRATEGIES PERTAINING TO WATER QUALITY MANAGEMENT

Existing policies, guidelines and regulations in DWS pertaining to water quality management include:

- Water Quality Management Policy and Strategy for the RSA (DWAF, 1991);
- Resource Directed Management of Water Quality Policy and Strategy (DWAF, 2006);
- Policy and Strategy for Ground Water Quality Management (DWAF, 2000),
- Strategic Framework for National Water Resource Monitoring Programmes (DWAF, 2004);
- Regulation 704 (1999) on use of water for mining and related activities aimed at the protection of water resources;
- Regulation 810, which developed a system for the classification of water resources (DWA, 2010);
- Best Practice Guidelines for Water Resource Protection in the South African Mining Industry (DWAF, 2006); and
- Blue and Green Drop system (DWA 2009 and DWA 2010).

In addition to these policies, DWS has developed or is developing a range of more specific policy documents that are relevant to water quality management, which include:

- A Climate Change Adaptation Strategy for Water which reaffirms the objectives of the National Climate Change Response (NCCR) White Paper and has as its primary objectives:
    - To effectively manage inevitable climate change impacts on the country's water through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity.
    - To make a fair contribution to the global and regional effort to promote the application of integrated water management as a priority tool to reduce climate vulnerability and to ensure that water management systems are well adapted to increased climate variability.
- The Mine Water Management Policy, which aims to enhance the legislative and regulatory role of DWS in relation to mine water. The policy is one of the mechanisms to protect and ensure sustainable use of the country's water resources as provided for in the NWA. The policy will enable implementation of interventions and the enforcement of compliance in relation to mine water management, including acid mine drainage.
- The Sustainable Hydropower Development Policy which sets out the policy position in terms of the establishment and development of hydropower on existing DWS

infrastructure as well as within the water resources of South Africa as part of long term interventions by DWS in supporting sustainable power supply in South Africa.

- The Water for Development: Sustainable Livelihoods policy which aims to enhance accessibility to financial support for water development (with priority given to rural communities) and also to create an enabling environment for Historically Disadvantaged Individuals (HDIs) to develop sustainable livelihoods based on improved access to water.
- The Water Stewardship Policy, which explores avenues for effective water stewardship involving the public and private sectors to safeguard against the depletion and degradation of water resources.
- The Wetland Policy, which takes a no-net-loss approach. Objectives of particular particularly relevance to this water quality policy are:
    - Management (ensure protection, avoid, reduce and prevent degradation, remedial action)
    - Shared vision with relevant sectors/ spheres of Government
    - Implementation of co-operative government arrangements
    - Ensure compliance to licensing requirements and compliance to NWA
    - Establish and operate a national wetland monitoring and information system

In addition, DWS is in the process of developing polices for hydraulic fracturing, private sector investment in the water and sanitation sectors, and water and industrialisation.

ANNEX 3: CURRENT ROLES AND RESPONSIBILITIES OF GOVERNMENT DEPARTMENTS AND AGENCIES IN WATER QUALITY MANAGEMENT

The Department of Water and Sanitation is the apex department in relation to water quality management, and will lead the co-ordination and alignment of policy, legislation and implementation and put in place the necessary institutional arrangements under the Inter-Governmental Relations Framework Act of 2005 (IGRFA) to ensure a government-wide approach to integrated water quality management; DWS and DEA/PDEAs will develop a co-ordinated and joint water quality compliance monitoring and enforcement system to optimize the use of government resources and to achieve maximum impact;

The National and Provincial Departments of Environmental Affairs are responsible for the implementation of the National Environmental Management Act and for conducting EIAs on development projects. The DEA must ensure, in consultation with DWS/CMAs, that water quality impacts are sufficiently dealt with in EIAs and through a co-ordinated approach with DWS to compliance monitoring and enforcement;

The National and Provincial Departments of Agriculture are responsible for the implementation of the CARA and for agricultural policy; responsible for promoting agricultural practices that reduce water pollution. In reviewing the CARA, the Department of Agriculture will take into account the need to reduce the water pollution arising from current agricultural practices. The Department will, in line with the approach outlined in the draft Policy on Sustainable Agriculture, promote sustainable agricultural practices that, amongst other things, will contribute to the reduction of water pollution arising from agricultural areas. The Department will also ensure improved enforcement.

The Department of Mineral Resources is responsible for approving EMPs and for the regulation and control of mining waste. In exercising this responsibility, DMR is required to ensure that DWS/CMAs are involved throughout the process of mine authorisation, and that no authorisation for mining is given without a water use authorisation from DWS, which will include stringent water quality management conditions. In addition, DWS, DMR and DEA will develop a joint process for mine closure which effectively addresses the potential long-term water quality impacts of the mine. Work has already begun in this regard through the Inter-departmental Project Implementation Committee (IPIC) on integrating licencing for the mining sector. To ensure that the authorisation processes associated with mining are aligned, all four acts (NWA, NEMA, CARA and MPRDA) will be amended as required. DMR is also responsible for promoting mining practices that reduce pollution.

The Department of Rural Development and Land Reform is responsible for the administration of the SPLUMA which aims, amongst other things, to (i) provide a framework for spatial planning and land use management in South Africa; (ii) to specify the relationship between the spatial planning and the land use management system and other kinds of planning; and (iii) to provide for inclusive, developmental, equitable and efficient spatial planning at the different spheres of government. DWS and CMAs are responsible for the

development of Catchment Management Strategies which are a critical planning tool in managing water quality. It is important that this function of DWS/CMAs is taken into account in the implementation of the SPLUMA, and that there is sound co-ordination between DWS/CMAs and the DRDLR in order to ensure effective alignment of land-use planning and water resources planning in the country.

The Department of Energy is responsible for developing an integrated energy plan for South Africa, and in doing so, should engage closely with DWS to understand and take consideration of the water related implications of energy choices, including the water quality implications, such as, for example, acid mine drainage resulting from coal mining for thermal power generation, long-term radioactive pollution from nuclear power options or unconventional gas and oil sources.

The National and Provincial Departments of Health have a critical role to play in epidemiological studies to understand the impacts of poor water quality on human health, including the different impacts on women and men. These studies will be done in consultation with DWS and in partnership with the WRC and Minerals Research Council, and the resulting information will be used to inform water quality management actions.

Municipalities have a regulatory role in relation to ensuring that ***by-laws*** regarding solid waste management and storm water management systems reduce water pollution from municipal areas, and in this regard they carry part of government's responsibilities for preventing and reducing water pollution, and must ensure that management and control of such forms of diffuse water pollution are clearly addressed in their Water Services Development Plans. At the same time, local governments are responsible for sanitation provision and waste water treatment works, which are critical in the striving for improved water quality. In this regard, the DWS, working with the national and provincial departments of Cooperative Government, has a regulatory role to ensure that WWTWs are duly licensed under the NWA, that local governments ensure that their WWTWs meet discharge standards, and to take action to ensure compliance by municipalities. In this regard, DWS will implement its internal protocol on engagement with municipalities, including taking legal action where necessary

Catchment Management Agencies (CMAs) are agencies of DWS with delegated functions under the NWA. As such, they must act in alignment with the NWRS2 and the policy of DWS, and must ensure that, at the catchment scale, effective co-ordination of planning and implementation takes place between the relevant government departments.

In line with the principles of subsidiarity enshrined in Agenda 21, and in the White Paper on a National Water Policy for South Africa, the management of water quality will be delegated to CMAs, with DWS providing the necessary oversight, national strategic guidance, and control of transboundary matters. The CMAs will also build the necessary capacity to take action under section 19 (3-6) of the NWA, which is a responsibility allocated to them by the NWA. The CMAs CMFs and Catchment Committees will be used as appropriate.