Integrated Water Quality Management
POLICIES AND STRATEGIES FOR SOUTH AFRICA

1.4 GLOSSARY

WATER IS LIFE - SANITATION IS DIGNITY

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

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Water Resource Planning Systems

Water Quality Planning

WATER QUALITY MANAGEMENT POLICIES AND STRATEGIES FOR SOUTH AFRICA

WATER QUALITY MANAGEMENT GLOSSARY

Report Number 1.4

P RSA 000/00/21715/6

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PREFACE

Background

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, especially considering the levels of water scarcity, with frequent droughts, increasing water demands, and deteriorating resource water quality.

The deterioration in water quality is a factor of growing concern. Importantly, ***deteriorating water quality is an economic and developmental issue****, and should be addressed as such. Without a change in how water resources are managed, worsening resource water quality will continue to erode the socio-economic benefits from, and increase the costs associated with, the use of the country's water resources.*

In light of the above, the Department of Water and Sanitation (DWS) embarked on a journey to revise, update and consolidate its policies and strategies for managing the quality of the water in the Country's water resources and to develop a pragmatic plan for the conversion of the Integrated Water Quality Management (IWQM) Policy and Strategy into practice.

Integrated Water Quality Management Policy and Strategy

Since the inception of this initiative, several supporting documents were developed that aimed to establish the status quo with respect to water quality, its management practices and instruments, the challenges in South Africa and the institutional arrangements. ***A review of existing policies, strategies, and other relevant documents****, both locally and internationally was used to i) analyse the root cause of the water quality issues; ii) determine the gaps in the IWQM approaches that have been used; iii) understand impacts that emerging trends may have on water quality (e.g. climate change, unconventional gas exploration, amongst others) and iv) look for innovative practices for IWQM.*

Based on these learning's, the ***IWQM Policy*** *sought to amalgamate and describe an integrated, inclusive and adaptive approach to IWQM, that built on the tenets of sustainable development coupled with addressing the identified gaps in the policy framework. The IWQM Policy sets out the vision, goal, values, underlying principles and policy responses for managing the quality of our water in our surface and underground water resources.*

The ***IWQM Strategy*** *sets out those strategic actions which are required to be undertaken in order to realise the vision and goals for water quality in South Africa. It articulates the broader process of Integrated Water Quality Management and provides the prioritised strategic actions that need to take place over a short to medium term.*

The Implementation Plan *outlines the pragmatic approach to strategic implementation and clearly articulates roles and responsibilities for the implementation of key activities and provides the linkages and dependencies between these activities.*

The Monitoring and Evaluation Framework *articulates the indicators to be monitored to determine the progress of the actions to be implemented and provide the foundation required*

to manage water quality adaptively. It also outlines the reporting structures and processes to be followed.

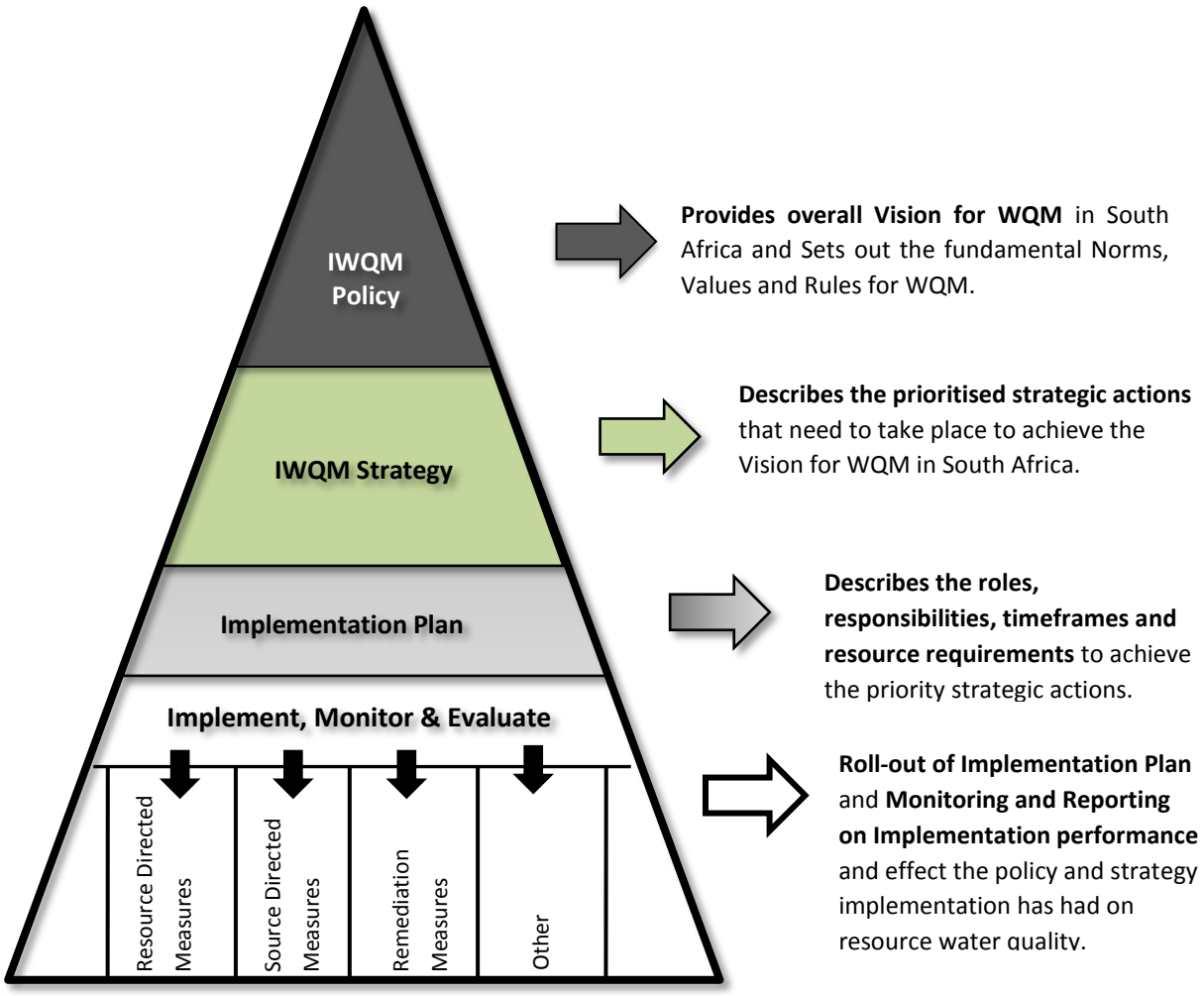

Figure P-1: Relationship between Policy, Strategy, and Implementation

The assessment phase of the project informed all three areas as reflected above.

Stakeholder Engagement

Given that the management of water quality constitutes an effort that is serviced and maintained by various role-players, a key element of the development of the IWQM Policy, Strategy and Implementation Plan is the involvement of relevant role-players, at a level where they may provide strategic and operational direction in the conceptualisation and finalisation of key areas and outputs. Consequently, a Stakeholder Consultation and Communication Strategy was developed to inform, consult, involve, collaborate and where possible empower the relevant key players by providing a strategic framework to: -

- ***Engage in policy and strategy development processes*** *of the key issues, priorities, guiding principles, and approaches regarding the IWQM Policy and Strategy.*
- ***Enhance the product*** *through inputs from stakeholders;*

- ***Establish Ownership and buy-in*** *of both the process and outcomes to ensure that stakeholders can relate and identify with the IWQM Policy and Strategy;*
- ***Facilitate Implementation:*** *a key result under this objective is the implementation of the Policy and Strategy. This will involve iterative process of learning-by-doing approach so that the implementation of the Policy and Strategy can serve as both a refining process and a learning curve;*
- ***Provide capacity development*** *and support through strategic collaborative efforts. This ensures that the necessary skills and capacities are shared between and among stakeholders;*
- ***Create awareness*** *and enhance the level of understanding on issues about the IWQM Policy and Strategy, in order to improve and strengthen active stakeholders' participation in WQM;*
- ***Consider appropriate mechanisms*** *for communication and publicising of the IWQM Policy and Strategy.*

Based on the fact that IWQM has environmental and social impacts, among others, it was imperative that consultation not be a single conversation but a series of opportunities to create an understanding about WQM amongst those it will likely affect or interest, and to learn how these internal and external parties view the initiative and its associated risks, impacts, opportunities, and mitigation measures. Listening to and incorporating stakeholder concerns and feedback is highly considered as a valuable source of information that can improve the design and outcomes of policy and strategy and help identify and control external risks. It is envisaged that the consultations done during this initiative form the basis for future collaboration and partnerships.

The Stakeholder Consultation and Communication Strategy focussed internally to relevant Government Departments and externally to targeted stakeholders.

- ***Internal to Government*** *- The purpose of targeting members within the Government Departments and its institutions (CMAs, Water Boards and other water management institutions) was to ensure that there was holistic preparation of staff at all levels. These staff have a range of interests that function at differing strategic levels within the Government and as such have different capacity building requirements.*
- ***External to Government*** *- There are a range of stakeholders that are interested and affected by the IWQM Policy, Strategy and Implementation Plan. These include the private sector, research and academia, civil society including NGOs, umbrella organisations such as the South African Local Government Association (SALGA), the South African Cities Network (SACN), the Chemical and Allied Industries Association (CAIA), Business Unity South Africa (BUSA), AgriSA, the Chamber of Mines, amongst others. The purpose of targeting these stakeholders was to solicit their input, create awareness and guide external stakeholders on water quality management issues, strengthen the understanding of the policy, and strategy and their implications, and strengthen collaborative systems. Moreover, it is important for the successful implementation of the policy and strategy that external*

stakeholders become more engaged in both developing the policy and strategy as well as through the implementation of the policy and strategy.

Way Forward

A*s sector lead, the Department understands that the management of water resources requires a sector-wide approach and this is a central theme to the implementation of the National Water Resources Strategy. Similarly, the management of water quality requires a broader engagement that moves roles and relationships beyond that of user, stakeholder, Policy-maker and regulator, but towards one of cooperation, partnership and stewardship. This necessitates the development of robust and pragmatic management instruments, supported by effective communication and capacity building, both internally to the Department and externally to the larger sector.*

DOCUMENT INDEX

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Afred Nzo District Municipality
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Agri Western Cape
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Alliance for Water Stewardship
Amatola Water
Anglo American
AquaEco
ASA Metals
Association of Cementitious Material Producers
Award
Bloem Water
Bosch Capital
Breede-Gouritz Catchment Management Agency
Buffalo City Metropolitan Municipality
Centre for Environmental Rights
Chamber of Mines
Chemical and Allied Industries' Association
Chris Hani District Municipality
City of Cape Town Metropolitan Municipality
City of Johannesburg Metropolitan Municipality
City of uMhlathuze
Clean Stream Environmental Consulting
Council for Geoscience (CGS)
Council of Scientific and Industrial Research
Crocodile River Irrigation Board
De Beers
Department of Energy
Department of Environmental Affairs
Department of Health
Department of Higher Education and Training
Department of Human Settlement
Department of International Relations and Cooperation
Department of Mineral Resources
Harmony Mines
Department of National Treasury
Department of Planning, Monitoring and Evaluation
Department of Public Enterprises
Department of Rural Development and Land Reform
Department of Science and Technology
Department of Tourism
Department of Trade and Industry
Department of Water and Sanitation
DH Environmental Consulting (Pty) Ltd
Digby Wells
East Rand Water Care Company
Eco Monitor
Eco- Owl Consulting
Emifula Riverine Consultants
Endangered Wildlife Trust
EOH Coastal and Environmental Services
Eskom
Ethekwini Metropolitan Municipality
Exova BM TRADA
Exxaro
Federation for a Sustainable Environment
Federation of Southern African Gem and Mineralogical Societies.
Fezile Dabi District Municipality
Frances Baard District Municipality
Free State Department of Agriculture and Rural Development
Free State Department of Health
Fresh Produce Exporters Forum
Freshwater Consulting cc
Galago Environmental
Gamtoos Irrigation Board
Gauteng Deptartment of Health
Geo Arc
Glencore
Goadex Engineering and Water Science Consultants
Golder Associates
Goldfields
Govan Mbeki Municipality
Green Cape Sector Development Agency
Manten Marina
Marico River Conservation Association

Limpopo Department of Agriculture and Rural Development
Ikamva
Iliso Consulting
Impala Platinum
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International Water Management Institute
iSAT
Isiqalo Cooperative
Jaco Consulting
Jantech
JCP Steel
JG Afrika
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Johannesburg Water
Joint Water Forum
Jones & Wagener
Kaap River Irrigation Board
Kakamas Water User Association
Komati Basin Water Authority
Komati River Irrigation Board
Kumkani FM
KwaDukuza Local Municipality
Kwa-Zulu Natal Agricultural Union
La Brie Estate
Land bank
Lebalelo Water User Association
Lemogang womens health
Lepelle Northern Water
Lephalale Local Municipality
Letaba Water User Association
Letsemeng Local Municipality
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Limpopo Proto-Catchment Management Agency
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Lonmin
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Magalies Water
Makane Local Municipality
Maluti Water
Mangaung Metropolitan Municipality
Rhovan Operations
Rockwell Diamonds
Rowing SA
Masilonyana Municipality
MBB Consulting Services
Merafong City Local Municipality
Midvaal Water Company
Modikwa Platinum Mine
Mogalakwena Local Municipality
Mogalakwena Mine
Moses Kotane Local Municipality
Mpumalanga Water Caucas
Municipal Infrastructure Support Agent
Mzimvubu -Tsitsikamma proto CMA
Nala local municipality
Naledi Local Municipality
Naledzi Environmental Consulting
National African Farmers' Union
National Business Initiative
Nepad Business Foundation
New World Water Sanitation
North West Department of Rural, Environment and Agricultural Development
North West University
Northern Cape Department of Agriculture and Land Reform
Northern Cape Department of Environment and Nature Conservation
Northern Cape Provincial Government
Ntuzuma Enviro Cooperative
OR Tambo District Municipality
Orange Proto-Catchment Management Agency
Oranje-Riet Water User Association
Overstrand Municipality
Palabora Copper
Petra Diamonds
Phumelela Local Municipality
Pilanesberg Platinum Mines
Pioneer Foods
Platmines SA
Polokwane Local Municipality
Pongolo-Umzimkhulu Proto-Catchment Management Agency
PPC Cement
Prime Africa
Prop 5 Corporation
Randwater
RE-Solve
Rhodes University (Institute for Water Research)
University of the Free State
University of Venda
University of Witwatersrand

Royal Bofokeng Platinum
Royal Haskin
Samancor Chrome Limited
SANParks
Sasol
Save the Vaal
Scherman Colloty & Associates
Sedibeng Water
SeeSaw
SEMBCORP Silulumanzi
Sephaka Cement
Sibanye Gold
Sidebelo Platinum Mines
Softchem
Source Point
South African Logal Government Association
South African National Biodiversity Institute
South African Sugar Association
SRK Consulting
Stellenbosch Municipality
Stellenbosch University
Stellvine
Strategic Water Partners Network
Swartland Municipality
T Squared Corporate Solutions
Tlokwe Local Municipality
Tlou Consulting
ToxSolutions
Trans Caledon Tunnel Authority
Transnet
Tshegofents Facilities and Engineering
Tsogang Local Municipality
Tswane Local Municipality
TTM Water Quality Engineering
Umfula Wempilo Consulting
Umgeni water board
Umzinyathi District Municipality
University of Cape Town
University of Fort Hare
University of Johannesburg
University of KwaZulu-Natal
University of Pretoria
Usapho Consulting
Vaal Catchment Management Agency
Vele Colliery
Vhembe Water User Associations
Vin Pro
Vunene Mining
Water Institute of South Africa
Water Research Commission
Western Cape Department of Agriculture
Western Cape Department of Environmental Affairs and Development Planning
Western Cape Government
White River Valley Conservation Board
Wildlands
Wildlife and Environment Society of South Africa
WineTech
World Wildlife Fund
Xylem Water Solutions

GLOSSARY OF WATER QUALITY TERMS

Abatement. Reducing the degree or intensity of, or eliminating pollution.

Abiotic. In the absence of living organisms.

Absorption. The process by which chemicals in gaseous, liquid or solid phase are incorporated into and included within another gas, liquid or solid chemical.

Accident site. The location of an unexpected occurrence, failure, or loss, either at the source of the pollution, or along a transport route, resulting in a release of hazardous materials.

Acid Mine Drainage. Effluent generated when sulphide bearing minerals, often in the form of pyrite (which is iron-sulphide or FeS_2 found inter alia in reefs mined for gold), are exposed to oxygen and water. This process, termed pyrite oxidation, is characterised by the generation of sulphuric acid and dissolved iron. Apart from iron, the associated decreasing pH is also conducive to the mobilisation of various other metals, such as copper, lead, aluminium, manganese and uranium.

Acid Rain. Also known as acid deposition. Rain or other type of precipitation which contains acids and acid forming compounds and has a pH<5.6. It can cause acidification of open water bodies, with harmful effects on the aquatic flora and fauna, and damage to terrestrial vegetation. Acid deposition is caused mainly by atmospheric sulphur dioxide produced by the burning of coal and other fossil fuels, which is precipitated as sulphuric acid and sulphates and by nitrogen oxides emitted from fossil fuel burning and vehicle exhausts, which form nitric acid and nitrogen dioxide.

Acid rock drainage. The acidic water that is created when sulphide minerals are exposed to air and water and, through a natural chemical reaction, produce sulphuric acid.

Acid. Substance that releases H+ ions (protons) in solution and thus causes a rise in proton concentration of the solution. Acid solutions also have a pH of <7

Activated sludge. Residue that results when primary effluent is mixed with bacteria-laden sludge and then agitated and aerated to promote biological treatment. This speeds up the breakdown of organic matter in raw sewage undergoing secondary waste water treatment.

Acute effect. An adverse effect on any living organism which results in severe symptoms that develop rapidly; symptoms often subside after the exposure stops.

Acute exposure. A single exposure to a toxic substance which may result in severe biological harm or death. Acute exposures are usually characterized as lasting no longer than a day, as compared to longer, continuing exposure over a period of time.

Adsorption. The adhesion of gas molecules, ions or solids to the surface of solids.

Agricultural pollution. The liquid and solid wastes generates from agricultural activities, including runoff and leaching of pesticides, fertilisers and salts, erosion and dust from ploughing, animal manure and carcasses and crop residues and debris.

Agrochemical. A contraction of agricultural chemical, is a generic term for the various chemical products used in agriculture such as pesticides, insecticides, herbicides, fungicides and nematicides.

Air pollutant. Any substance in air that could, in high enough concentration, harm man, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of airborne matter capable of being airborne. They may be in the form of solid particles, liquid droplets, gases, or in combination thereof. Generally, they fall into three main groups: (1) those emitted

directly from identifiable sources (2) those produced in the air by interaction between two or more primary pollutants, or by reaction with normal atmospheric constituents, with or without photo-activation and (3) which cannot be identified as having emanated from a single identifiable source or fixed location.

Air pollution episode. A period of abnormally high concentrations of air pollutants, often due to low winds and temperature inversion.

Air pollution. Any change in the composition of the air caused by smoke, soot, dust (including fly ash), cinders, solid particles of any kind, gases, fumes, aerosols and odorous substances.

Algae. Simple, chiefly aquatic, non-vascular plants (i.e. without roots, stems and leaves) that grow in sunlit waters in relative proportion to the amounts of nutrients available. Typical examples are pond scums and phytoplankton.

Algal blooms. Sudden spurts of algal growth that can affect water quality adversely, primarily by lowering the dissolved oxygen in water and that indicate potentially hazardous changes in the local water chemistry.

Algal. Pertaining to algae.

Alien species. Animals and plants that invade and becoming established in areas where they do not naturally occur.

Alkaline. In an environmental context, having a pH above 8,4. In a pure chemical context, having a pH above 7.

Alkalinisation. The process of making or becoming (more) alkaline.

Alkalinity. The ability of water to neutralize acid to a specific pH.

Allocatable water quality. The maximum worsening change in any water quality attribute away from its present value, that maintains it within a pre-determined range reflecting the desired future state (typically defined by resource quality objectives). If the present value is already at or outside the pre-determined range, this indicates that none is allocable and that (a) reduced pollution loads relating that affected attribute(s), and/or (b) remediation of the resource may be necessary.

Allocation plan. A part of a water resource management framework plan, developed as a sub-strategy of a catchment management strategy, which specifies what the available (allocatable) water is and how it will be apportioned among water users in the water management area.

Ambient Measurement. A measurement (usually of the concentration of a chemical or pollutant) taken in an ambient medium, normally with the intent of relating the measurement value to the exposure of an organism that contacts the medium.

Ambient Water Quality. Natural concentration of water quality constituents prior to mixing of either point or nonpoint source load of contaminants. Reference ambient concentration is used to indicate the concentration of a chemical that will not cause adverse impact to human or ecosystem health.

Ambient. Surrounding, as in the surrounding environment.

Anaerobic bacteria. Microorganisms that can live in the absence of gaseous oxygen usually be using a chemical other than oxygen as an electron acceptor. Common 'substitutes' for oxygen are nitrate, sulfate, and metals such as iron.

Anaerobic process. Anaerobic processes are processes that involve retention under anaerobic conditions and are typically used for treating wastewater with high concentrations of biodegradable organic materials, such as concentrated domestic wastewater, biosolids, animal manure slurry, and food processing wastes.

Anaerobic. Life or processes that occur in the absence of oxygen.

Animal husbandry. Is the management and care of farm animals by humans, which involves the further development of genetic

qualities and behaviours considered to be advantageous to humans.

Anion. Negatively charged ion (atom or molecule). Nitrate and chloride are examples of anions.

Anoxic hypolimnion. In water resources, the warm surface layer is called the epilimnion, and the cooler bottom layer the hypolimnion. Under anoxic conditions, nutrients such as phosphorus and nitrogen are released from the bottom sediments to the overlying water, where it ultimately promotes additional algal production, organic matter decomposition, and hypolimnetic oxygen reduction over a greater area.

Anoxic. Anoxic waters are areas of sea water, fresh water, or groundwater that are depleted of dissolved oxygen and are a more severe condition of hypoxia. The US Geological Survey defines anoxic groundwater as those with dissolved oxygen concentration of less than 0.5 milligrams per litre.

Anthropogenic. Generated by human activity.

Aquatic ecosystem. Complex of biotic and abiotic components of natural waters. The aquatic ecosystem is an ecological unit that includes the physical characteristics (such as flow or velocity and depth), the biological community of the water column and benthos, and the chemical characteristics such as dissolved solids, dissolved oxygen, and nutrients. Both living and non-living components of the aquatic ecosystem interact and influence the properties and status of each component.

Aquatic toxicology. The study of the effects of manufactured chemicals and other anthropogenic and natural materials and activities on aquatic organisms at various levels of organization, from subcellular through individual organisms to communities and ecosystems. Aquatic toxicology is a multidisciplinary field which integrates toxicology, aquatic ecology and aquatic chemistry

Aquifer. Underground accumulation of water in certain types of geological formations that is capable of transmitting groundwater rapidly enough to directly supply a borehole or spring.

Artificial recharge. The unnatural addition of surface waters to groundwater. Recharge could result from reservoirs, storage basins, leaky canals, direct injection of water into an aquifer, or by spreading water over a large land surface.

Assimilation. The ability of a body of water to purify itself of pollutants. This includes the uptake of elements and simple inorganic compounds such as NH_4, CO_2 and N_2 by autotrophic organisms (such as chlorophyll-containing plants and bacteria) from the environment and their incorporation into complex organic compounds (i.e. for use as nutrient sources).

Autonomous entity. An entity that is self-governing, and thus functions independently without control by others.

Baseline Monitoring (in unconventional gas exploration). Means monitoring of key indicators to establish reference conditions of potentially affected water resources prior to stimulation (pre-exploration and production exposure) to form the basis for a change over time assessment

Baseline Risk Assessment (pollution incidents). A baseline risk assessment is an assessment conducted before clean-up activities begin at a site to identify and evaluate the threat to human health and the environment. After remediation has been completed, the information obtained during a baseline risk assessment can be used to determine whether the clean-up levels were reached

Baseline Scenario (water quality). A scenario in which current conditions (i.e., without any change in volume, frequency or duration in water or concentrations of substances in

water) are projected into the future. The baseline scenario forms a comparative basis for one or more "water quality scenarios" in which the effect of introduced substances or volumes of water are simulated into the future.

Basic sanitation. The prescribed minimum standard of services necessary for the safe, hygienic and adequate collection, removal, disposal and purification of human excreta, domestic waste water and sewage from households including informal households.

Basic water supply. The prescribed minimum standard of water supply services necessary for a reliable supply of sufficient quantity and quality of water to households, including informal households, to support life and personal hygiene.

Benchmarks. Benchmarks are simply intermediary points for targets. They are used as a point of reference for evaluating performance or level of quality. Benchmarks serve as the guideposts for tracking progress whereas targets mark the envisioned levels of accomplishment.

Benthic Zone. The benthic zone is one of the ecological regions of a body of water. It comprises of the bottom of the water body (sea, lakes, rivers or other water body), the sediment surface, and some sub-surface layers. Organisms living in this zone, that is, on or in the bottom of the body of water, are called benthic organisms. In contrast, the pelagic zone is the descriptive term for the ecological region above the benthos, including the water-column up to the surface.

Best Practicable Environmental Option (BPEO). Defined by the National Environmental Management Act, 1998 (Act No. 107 of 1998) as the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost that is acceptable to society, in the long-term as well as in the short-term.

Best practical means. The minimum set of decisions and management actions needed to meet the requirements of present/prescribed legislation.

Bioaccumulation. The process by which chemicals are taken up and stored over time by an organism either directly from exposure to a contaminated medium or by consumption of food containing the chemical.

Biochemical oxygen demand. Refers to the test applied to measure Biological Oxygen Demand. The biochemical oxygen demand (BOD) test tries to closely model an aerobic wastewater treatment system and the natural aquatic ecosystem. It measures oxygen taken up by the bacteria during the oxidation of organic matter. The test usually runs for a five-day period, but can run 7 or 10 days as well, depending on specific sample circumstances. BOD is typically reported as a 5 day BOD and at 20^{o}C and reported as milligrams of oxygen consumed per litre (mg O/L). BOD is used by regulatory agencies for monitoring wastewater.

Biocide. A poisonous substance (such as an algaecide or fungicide) that destroys or inhibits the growth or activity of living organisms.

Biodiversity. A measure of the number and relative abundance of biological species within a specific area

Biological Oxygen Demand (BOD). The amount of oxygen consumed by aerobic biological organisms (biota) in water, to break down organic material present in a given water sample at a certain temperature over a specific time period. Higher organic loads require larger amounts of oxygen and may reduce the amount of oxygen available for fish and aquatic life below acceptable levels. Also refer to N-BOD treatment facilities and monitoring surface water quality

Biome. A Large ecological region characterised by similar vegetation and climate (such as the deserts, tundra, fynbos etc.) and groupings of living organisms in it.

Biomonitoring. The gathering of biological information in both the laboratory and the field for the purpose of making an assessment or decision, or determining whether or not quality objectives have been met.

Biosphere. The entire area occupied by living organisms, or favourable for their occupation, i.e. all living organisms of the earth and its atmosphere.

Biota. Animal and plant life characteristic of a region or system.

Biotic. Of or pertaining to living organisms.

Brackish water. Brackish water (less commonly "brack water") is salt water and fresh water mixed together, generally with a lower salinity than seawater.

Buffer zone. Zone used to protect natural resources and limit the impact of one land-use on another. Aquatic buffer zones are the zones of land between a water resource and the adjacent land and are typically designed to act as a barrier between human activities and sensitive water resources thereby protecting them from adverse negative impacts. Buffer zones associated with water resources have been shown to perform a wide range of functions, and on this basis, have been proposed as a standard measure to protect water resources and associated biodiversity.

Buffered. Resistant to change, usually used in the context of pH, where if no buffer is present and a strong acid or strong base is added to water, the pH will change dramatically.

By-product. Material, other than the principle product, that is usually generated as a consequence of an industrial process.

Capacity building. The process whereby people are enabled to better perform defined functions either as individuals, through improved technical skills and/or professional understanding, or as groups aligning their activities to achieve a common purpose

Carcinogenic. Substances that have the ability to cause cancer. Benzene, beryllium, asbestos, vinyl chloride, and arsenic are known human carcinogens.

Catchment Management Agency (CMA). A water management institution that is a statutory body governed by a board, representing the interests of water users, potential water users, local and government and environmental interest groups. It manages water resources within a defined water management area.

Catchment visioning. Development of a collective vision of catchment stakeholders and using it to steer diverse activities towards a common purpose. High level goal/aspiration. Catchment visioning process involves people living in a particular catchment determining their water usage requirements and then translating this into objectives reflecting those requirements.

Catchment. The area from which rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points. The land area from which a river or reservoir is fed, also known as a drainage basin or watershed.

Cation. Positively charged ion (atom or molecule).

Chemical Oxygen Demand (COD). Indicative measure of the amount of oxygen that can be consumed by chemical reactions in a solution. Whereas BOD measures the amount of organic carbons that bacteria can oxidize, COD is the total measurement of all chemicals in the water that can be oxidized.

Chloride. It is one of the major anions found in water and wastewater.

Chlorofluorocarbons (CFCs). A family of inert nontoxic, and easily liquefied chemicals used in refrigeration, air conditioning, packaging and insulation or as solvents and aerosol propellants.

Citizen science. This is the involvement of the public in scientific research – whether community-driven research or global investigations.

Class. Management class of a water resource as determined by the classification system (Section 13 of the NWA). Preliminary class is a class that has not yet been Gazetted. The Management Class may range from minimally used to heavily used and describes the desired condition of the resource, along with the degree to which it may be utilised. Resource Quality Objectives and the Reserve are used to state clear goals and requirements for the attainment of the Management Class

Classification system. Method used to classify (determination of RQOs and reserve) South Africa's water resources into Management Classes to assist in water use allocation and management on a sustainable basis.

Cleaner production. A comprehensive preventive approach to environmental protection, including conservation; elimination of toxic and dangerous raw materials and product constituents, and reduction at source of the quantity and toxicity of all emissions and wastes being emitted to air, land and water.

Climate Change. A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards.

Coalbed Methane. Is petroleum (in any state) occurring naturally in association with coal or oil shale, or in strata associated with coal or oil shale development.

Coastal zone. The area of land and sea along the coast, including estuaries, onshore areas and offshore areas; wherever they form an integral part of the coastal system area is specified by the high watermark.

Compliance monitoring programme. A monitoring programme designed to measure, assess and report on a regular basis the degree to which individual water users are remaining within (*i.e.* complying with) the conditions defined in their water use authorisations (e.g. licences).

Compulsory licensing. Compulsory licensing will apply if: it is desirable that water use in respect of one or more water resources within a specific geographic area be authorised; to achieve a fair allocation of water from a stressed water resource; when it is necessary to review prevailing water use to achieve equity in allocations; to promote beneficial use of water in the public interest; to facilitate efficient management of the water resource and to protect water resource quality.

Concentration. The abundance of a constituent divided by the total volume of a mixture. Also defined as the ratio of solute in a solution to either solvent or total solution. Unit examples of concentration include ppm and mg/l.

Conductivity. The ability of water to conduct an electrical current. This depends on the number of ions in solution and is a measure of the total quantity of salts dissolved in the water. It is also used as a measure of salinity.

Conservation (resource). The protection of the aquatic ecosystem so that it is able to provide a desired range of ecosystem goods and services sustainably (including water) to society.

Conservation (water). The efficient use and saving of water achieved through measures such as water saving devices, water-efficient processes, water demand management and water rationing.

Consolidation. The action or process of combining a number of things into a single more effective or coherent whole.

Contaminated. Water made less fit for its intended purpose by exposure to or addition of a poisonous or polluting substance. Any physical, chemical, biological or radiological substance in water, making it impure.

Co-operative governance. The sum of the many ways that individuals and institutions, public and private, manage their common affairs. It is a continuing process through which conflicting or diverse interests may be accommodated and co-operative action may be taken. It includes formal institutions and regimes empowered to enforce compliance, as well as informal agreements that people

and institutions either have agreed to or perceive to be in their interest.

Co-regulation. An interactive relationship between the regulator and the regulated. Normally, the public authorities (regulator) will prescribe the environmental objectives, while the regulated industry will choose the methods to achieve the objectives.

Corrosive. A chemical agent that reacts with a surface, causing it to deteriorate or wear away.

Cost benefit analysis. Estimate and comparison of short-term and long-term costs (losses) and benefits (gains);

Cultural resources. Natural features and features adapted and created by humans in the past and present. These features are the result of continuing human cultural activity and reflect a range of community values.

Cumulative effects. The combined environmental effects over time of multiple land and water use activities, typically in a catchment area. This is particular evident when chemicals that do not break down in the ecosystem are released to the environment and accumulate at various points in the catchment.

Cumulative impact. The collective impacts of several operations involving human activities, including mining, grazing, farming, timbering, water diversion or discharge, and industrial processing, also includes future impacts not immediately observable. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Cyanobacteria. Also known as blue-green algae, are a phylum of bacteria that obtain their energy through photosynthesis, and are the only photosynthetic prokaryotes able to produce oxygen.

Decision-making. An intellectual activity comprising the making of a rational choice between alternatives.

Degradation (chemical) the process by which a chemical is reduced to a less complex form**.**

Degradation (water quality) Increase in contamination levels and reduction in fitness for use of water

Denitrification. The anaerobic biological reduction of nitrate (NO_3) to nitrogen gas (N_2).

Denitrifying bacteria. Various bacteria (such as *Thiobacillus denitrificans* and *Paracoccus denitrificans*) that bring about denitrification (commonly putrefactive organisms of manure and soil).

Desertification. Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities.

Desulfurization. Removal of sulphur from fossil fuels to reduce pollution.

Dilution ratio. The relationship between the volume of water in a stream or river and the volume of incoming water; it affects the ability of the stream or river to assimilate waste.

Dioxin. Any of a family of compounds chemically as dibenzo-p dioxons, which has a nucleus a triple-ring structure consisting of two benzene rings connected through a pair of oxygen atoms. Originate as unwanted chemical by-products of incineration and some industrial processes. Dioxins bioaccumulate in fish and wildlife and are harmful to human health.

Discharge area. An area where groundwater moves toward or is delivered to the soil surface.

Disposal. Final placement or destruction of toxic, radioactive, or other wastes; surplus or banned pesticides or other chemicals; polluted soils; and drums containing hazardous materials from removal actions or accidental releases. Disposal may be

accomplished through use of approved secure landfills, surface impoundments, burial, ocean dumping, or incineration.

Dissolved solids. Inorganic or organic salts dissolved in water. ref. Total Dissolved Solids.

Drainage basin. A geographical area determined by the watershed limits of the system of waters, including surface and underground waters, flowing into a common terminus. A shared drainage basin extends of two or more administrative areas.

Duty of care principle. Every person or organisation has a duty to act with due care to avoid damage to others, or to the environment.

Ecological Infrastructure. Refers to naturally functioning ecosystems that deliver valuable services to people, such as water and climate regulation, soil formation and disaster risk reduction

Ecological succession. Manner in which ecosystems evolve and become more complex over time. This involves a change in species composition from a few early colonising pioneer species towards a more complex climax community of species.

Ecoregion. Relatively large area of land and water that contains geographically distinct assemblages of natural communities.

Ecosystem. An ecosystem consists of plants, animals and microorganisms that live in biological communities and which interact with each other and within a physical and chemical environment, with adjacent ecosystems and with the water cycle and the atmosphere.

Effluent standards. Uniform or generic (i.e. not site-specific) values of water quality variables that can be used for end-of-pipe licence conditions.

Effluent targets. Site-specific values of water quality variables that can be used for end-of-pipe license conditions, typically back-calculated from downstream Resource Water Quality Objectives or the water quality component of RQOs.

Effluent. Liquid waste or water containing waste generated by human activity. This excludes sludge.

Endocrine disrupting chemicals (EDC). Chemicals that, at certain doses, can interfere with endocrine (or hormone) systems of humans and living organisms.

Endorheic. An inward-draining or closed drainage basin that normally retains water and allows no outflow to other external bodies of water, such as rivers or oceans, but converges instead into lakes or pans. Groenvlei and Lake Sibaya are examples of endorheic systems.

Enrichment. The addition of nutrients from sewage effluent or agricultural runoff to surface water.

Environmental audit. A regular formal examination to ascertain whether or not an organisation or facility is operating in terms of its environmental performance requirements or some other measure of performance.

Environmental economics. Environmental economics includes the real and potential monetary costs and benefits to human well-being and the well-being of the biosphere as a whole, plus the sustainability of the system, when studying the flow of money in the economy.

Environmental Impact Assessment (EIA). A detailed study of the environmental (social, economic and biophysical) consequences of a proposed course of action or activity.

Environmental Management Programme (EMP). A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive environmental impacts and limiting or preventing negative

environmental impacts are implemented during the life-cycle of the project. An EMP contains elements of environmental assessment (see EIA) plus management plans. Once it has been approved, it is enforceable by law.

Environmental Management System (EMS). Documented procedures drawn up as described in an SABS Code of Practice to implement the requirements of 1S0 14000. Operating, emergency, data collection and documentation procedures are set out along with procedures for training, the transfer of information and all procedures of a complete management and quality control system.

Environmental sustainability. The ability of an activity to continue indefinitely at current and projected levels, without depleting the social, cultural and natural resources required to meet present and future needs.

Environmental values. Particular values related to the water resource that are conducive to public and/or environmental benefit/use, welfare, safety or health and that require protection from the effects of impaired water quality. Several environmental values may be designated for a particular water resource.

Ephemeral (River). Non perennial river which only exists for a short period following precipitation. It possess no flow 26 to 75 percent of time

Episodic (River). Non-perennial river which typically only flows after an episode of heavy rain. Rivers that have no flow at least 76 percent of time.

Equality. As defined in Section 9 of the Constitution, equality implies that decisions regarding water resources may not discriminate on the basis of race, gender, sex, pregnancy, marital status, ethnic or social origin, colour, sexual orientation, age, disability, religion, conscience, belief, culture, language or country of birth.

Equitable. Fair and just in the sense of being based on laws and accepted principles.

Equity. The quality of being equitable.

Estuary. A partially or fully enclosed body of water, which is open to the sea permanently or periodically, and within which the seawater can be diluted to an extent that is measurable with fresh water drained from land.

Eutrophic. A state of an aquatic ecosystem rich in nutrients, very productive in terms of aquatic animal and plant life and exhibiting increasing signs of water quality problems.

Eutrophication. The process whereby nutrients accumulate in a body of water to the extent that problems occur with excessive macrophyte, algal and cyanobacterial growth.

Evaluation. Attempts to explain why a particular outcome has occurred, how well a programme or activity was undertaken, whether it was a good thing to do, and what should be done in the future in light of the evaluation findings.

Evapotranspiration. The process of changing soil water into water vapor through the combination of soil evaporation and plant water use, or transpiration.

Existing lawful use. Lawful use of water as defined in Section 32 of the National Water Act, 1998 (Act No. 36 of 1998). This water use was legally exercised in the 2 years prior the implementation of the NWA.

Exploration (mining and unconventional gas exploration). Means the acquisition and processing of data or any other activity to define the resource target by evaluating an areas prospects, developing conceptual geological and geo-hydrological models and identification of fractures and risks with the intention of locating an economically viable resource. This definition is applicable to pilot and demonstration phases of any activity

Externality. The impact (mainly negative) of changed environmental conditions on people and/or systems that do not cause the change. Externalities are unintentional side effects of an activity affecting people other than those directly involved in the activity. e.g. high levels of pollutants in water (chemicals) can cause fish kills impacting on the profitability of commercial fishing and aquaculture.

Faecal coliforms. Bacteria derived from the intestines of warm-blooded animals, including man. Used as an indicator of faecal pollution.

Fauna. The animal life of a region.

Fitness for use. A scientific judgement, involving objective evaluation of available evidence, of how suitable water is for its intended use or for protecting the health of aquatic ecosystems.

Flood line. The flood warning system used in the United Kingdom to issue flood alerts and warnings to the public, emergency organisations and businesses.

Floodplain. A wetland area on the mostly flat or gently-sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by overtopping of the channel bank. Floodplain wetlands, as the name implies, generally occur on a plain and are typically characterised by a suite of geomorphological features associated with river-derived depositional processes, including point bars, scroll bars, oxbow lakes and levees. Floodplain wetlands must be considered as wetland ecosystems that are distinct from but associated with the adjacent river channel itself, which must be classified as a 'river'**.**

Flow-back (hydraulic fracturing). Means all hydraulic fracturing fluid and other fluids that return to the surface after hydraulic fracturing operations have been completed and prior to the well being placed into production

Fracking. Refer to hydraulic fracturing.

Fracturing fluid. Means the mixture of the base fluid and all the hydraulic fracturing additives used to perform hydraulic fracturing

Fluorides. Gaseous, solid or dissolved compounds containing fluorine that result from industrial processes; excessive amounts in food can lead to fluorosis.

General authorisation. Type of authorisation for a water use in terms of Section 21 of the National Water Act, 1998 (Act No. 36 of 1998). It replaces the need for a water user to apply for a licence in terms of the National Water Act, provided that the water use is within the limits and conditions of the applicable General Authorisation.

General waste. Waste that does not pose an immediate threat to man or to the environment.

Gross Domestic Product (GDP). Total value of final production of goods and services within a specific timeframe (usually one year).

Groundwater. Water that collects or flows beneath the Earth's surface, filling the porous spaces in soil, sediment and rocks.

Governance. Refers to structures and processes that are designed to ensure accountability, transparency, responsiveness, rule of law, stability, equity and inclusiveness, empowerment, and broad-based participation.

Geo-Site. A site where geological features are founded near the target area and includes any dolerite structures, geothermal springs and or seismic activity.

Habitat. The normal locality of a living organism defined by the set of physical, chemical and biological features.

Half-life. The time required for one half of a quantity to undergo change. In radioactivity, this is the period of time in which 50% of an element's atoms decay and become transformed into other substances. The

longer the half-life of an element, the lower is its specific activity.

Hardness. As water passes through the soil, rock minerals dissolve and cause hardness. Hardness is most commonly caused by concentrations of calcium, and to a lesser extent magnesium, in the water. As a convention hardness is expressed in mg/L of calcium carbonate ($CaCO_3$). Hard water is an aesthetic concern, it can affect taste and increase soap consumption. Also when hard water is heated, deposition of scale can be noted in appliances, pipes and taps. Alternatively, soft water can increase corrosion of pipes and fixtures

Hazardous waste. Waste, including radioactive waste, which is legally defined as “hazardous” in the state in which it is generated. The definition is based on the chemical reactivity or toxic, explosive, corrosive or other characteristics, which cause, or are likely to cause, danger to health or to the environment, whether by itself or when in contact with other waste.

Heavy metals. Metals that have a relatively high density and is toxic or poisonous at low concentrations.

Hydraulic fracturing. Also referred to as "fracking", means injecting fracturing fluids into the target formation through the exploration or production well at a force exceeding the parting pressure of the rock to induce fractures through which naturally occurring hydrocarbons can flow.

Hydrocarbons. Organic compounds that are comprised of only hydrogen and carbon atoms. They are found in many places, including crude oil and natural gas.

Hydrological cycle. The cyclical flow of water, from rainfall to rivers, to evaporation and cloud formation.

Hydrological. Pertaining to water flow.

Hydrosphere. The area of occurrence, distribution and movement of water on and under the land surface.

Hypersaline. Containing excessive quantities of salts.

Hypertrophic. Containing excessive quantities of nutrients.

Indigenous. Born, growing, or produced naturally (native) in an area, region, or country.

Industrial. Resource use patterns linked to or influenced by commercial / industrial benefits.

Informal settlement. A small or large group of houses (often of a temporary nature) erected on land, of which the majority have not formally been proclaimed and serviced for residential use.

Infrastructure. The basic physical and organizational structures and facilities (e.g. buildings, roads, power supplies) needed for the operation of a society or enterprise.

Inorganic chemicals. Chemical substances of mineral origin, not of basically carbon structure.

In-stream habitat. Includes the physical structure of a watercourse and the associated vegetation in relation to the bed of the watercourse.

Integrated catchment management (ICM). A systems approach to the management of natural resources, particularly water resources, within the bounds of a geographical unit based on the catchment area of a river system.

Integrated environmental management (IEM). A philosophy that prescribes a code of practice for ensuring that environmental considerations are fully integrated into all

stages of the development process, in order to achieve a desirable balance between conservation and development.

Integrated Resource Management. A comprehensive planning process that takes into account all the available resources to ensure that long term sustainable benefits are achieved.

Integrated Water Quality Management. Aims to achieve specific objectives by applying an integrated approach to water quality management across and within geographical units, from international to local levels. It recognises that the management of water resource quality and that of drinking water quality are inextricably linked, it takes into account the impact of atmospheric conditions and land use as a context to the cycle, as well as the activities of raw water users. It includes the linkages between surface and ground water and fresh and marine water as well as between those sources of water and the socio-ecological systems in which they occur.

Integrated water resource management (IWRM). Philosophy of managing the water resources of a catchment in an integrated manner. It relies on the recognition that all components of the hydrological cycle are intimately linked, and each component is affected by changes in other components. It is inherent in the concept of ICM.

Inter-basin transfer. The conveyance of water across a drainage or river basin divide into another river basin or catchment. Also called trans-basin diversion.

Inter-governmental. Involving different spheres of government or different government agencies in the same sphere of government within a country. Also used to describe interactions between the governments of different countries.

Interflow. The rapid flow of water along essentially unsaturated flow paths, water that infiltrates the subsurface and moves both vertically and laterally before discharging into other water bodies

Intermittent (flow). Water flows for a relatively short time of less than one season's duration (i.e. less than approximately 3 months), at intervals varying from less than a year to several years. Intermittent rivers have a far less predictable flow regime compared to perennial or seasonal rivers, and are frequently dry for long periods in arid regions.

Internalisation of externalities. Externalities, also called external costs, spill-overs or social costs, are costs generated by a producer but paid for by someone else. A typical example is a water user that discharges polluted water into a stream. The downstream user may then need to treat the water before it can be used. This treatment in effect means that the downstream user is paying part of the production costs of the upstream user. Internalising these externalities means the polluter should be responsible for these costs.

Irrigation. The supply of water to land or crops to help growth.

Landfill. Commonly used method of solid waste disposal.

Leachate. Liquid that flows through and out of a landfill. Water that collects contaminants as it trickles through wastes, pesticides or fertilizers.

Leaching. The removal of dissolved chemicals from the soil or waste sites by the movement of a liquid. Leaching may occur in farming areas, feedlots, and landfills, and may result in hazardous substances entering surface water, ground water, or soil.

Legislation. A law or set of laws made by a government.

Load. Water quality can be measured in two ways - by concentration, or load. Load is the amount (mass) of a specific chemical or

substance that is discharged into a water body during a period of time (i.e. tons of sediment per year). Load is in its simplest form calculated as concentration x volume. Both concentration and load provide information of environmental significance, but each has limitations.

Macroeconomics. A study of national economic aggregates.

Macrophyte. A large plant able to be seen by the naked eye, especially one associated with an aquatic habitat.

Management approaches. General courses of action, including formal regulatory command-and-control methods and self-regulatory and supportive mechanisms, which enable a strategy to be implemented.

Management instruments. Detailed procedures, guidelines and software decision support that enables strategy to be implemented.

Mandate. The authority given to an elected group of people, such as a government, to perform an action or govern a country.

Mean Annual Runoff (MAR). The average total volume of stream discharge, consisting of surface flows and sub-surface flows derived from rainfall onto the catchment surface within one year, which can theoretically be utilised. Usually expressed in cubic metres of water per year.

Metabolite. Product of metabolism, and which may be taken in from the environment (e.g. amino acids and vitamins).

Metal. An element that is a good conductor of electricity and whose electrical resistance is directly proportional to absolute temperature.

Microbial contamination. Contamination by micro-organisms, some of which may be pathogenic (disease causing).

Micro-organisms. Microscopic biological organisms such as bacteria, viruses, protozoa, etc., some of which cause diseases.

Microplastic Pollution. Pollution of water resources through the introduction of particles from plastic materials that are less than 5 mm in size. They may form on land by UV degradation and fragmentation or road abrasion of larger plastic items through damage by vehicles and transport along concrete pathways, but may also enter the aquatic environment through direct release. Micro-Plastics may also come from a variety of manufactured sources, including cosmetics, clothing, and industrial processes. Their impacts include ingestion and health effect on aquatic life and the transport of harmful chemicals that have adsorbed to the microplastic surface to animals and humans.

Mineral. As defined in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002, as amended) means any substance, whether in solid, liquid or gaseous form, occurring naturally in or on the earth or in or under water and which was formed by or subjected to a geological process, and includes sand, stone, rock, gravel, clay, soil and any mineral occurring in residue stockpiles or in residue deposits, but excludes- Page 12 of 104 (a) water, other than water taken from land or sea for the extraction of any mineral from such water; (b) petroleum; or (c) peat.

Minimum requirements. A regulation or standard set by the Department that specifies the very least that should be complied with.

Mine. As defined in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002, as amended) mine means, when—

(a) used as a noun—

i. any excavation in the earth, including any portion under the sea or under other

water or in any residue deposit, as well as any borehole, whether being worked or not, made for the purpose of searching for or winning a mineral;

ii. any other place where a mineral resource is being extracted, including the mining area and all buildings, structures, machinery, residue stockpiles, access roads or objects situated on such area and which are used or intended to be used in connection with such searching, winning or extraction or processing of such mineral resource;

(b) used as a verb -

i. the mining of any mineral, in or under the earth, water or any residue deposit, whether by underground or open working or otherwise and includes any operation or activity incidental thereto, in, on or under the relevant mining area;

Mining activity. As defined in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002, as amended) means prospecting, exploration operation or production operation including all associated stockpiles, waste management infrastructure, dams and sidings under control of a holder.

Minister. The head of a Government Department

Monitoring. The measurement, assessment and reporting of selected properties of water resources in a manner that is focussed on well-defined objectives. These monitoring objectives should also be clearly linked to water resource management objectives.

Monitoring design. The definition of all aspects necessary for successful implementation of a monitoring programme. These include the monitoring variables, sampling site selection, sampling methods, sampling frequency, analytical procedures, data assessment, reporting formats, etc.

Mutagenic. Causing damage or change to the genetic material of an organism or cell.

Nanoparticle. Particles that are between 1 and 100 nanometres (nm) in size. They may be engineered (such as in the case of drug delivery systems and cancer targeting and imaging), incidentally produced (such as during the burning of biomass fuels), or occur naturally in the environment (such as crystals on plant leaves). Nanoparticles can exhibit size-related properties significantly different from those of either fine particles or bulk materials. Nanoparticles made of metals, semiconductors, or oxides are of particular interest for their mechanical, electrical, magnetic, optical, chemical and other properties. Like traditional chemical contaminants, some synthetic nanoparticles (such as silver nanoparticles) may be directly toxic to microbes, plants, and animals with drastic consequences for the affected ecosystems.

Naturally occurring hydrocarbons. An organic compound containing only carbon and hydrogen naturally occurring in petroleum, natural gas, coal and bitumen.

Nitrogenous Biochemical Oxygen Demand (N-BOD). All forms of 'reactive nitrogen' in urine and proteins (urea, uric acids, ammonia, amino acids, nitrates) are nutrients for algae and aquatic plant growth. The nitrogenous waste in municipal and industrial sewage is used by autotrophic bacteria and they use a significant amount of oxygen as an energy source and convert ammonia to nitrates. This phenomenon is called N-BOD or Nitrogenous Biochemical Oxygen Demand. The nutrient enrichment 'pollution' contributes to the eutrophication of lakes, rivers and water bodies when discharged in a final effluent. The TKN (Total Kjeldahl Nitrogen) test measures the amount of reactive nitrogen (ammonia and organic nitrogen) in the sample that can be used by autotrophic bacteria and when they do, require oxygen, thus exerting a N-BOD, which would be equal to 4.6 x TKN mg/l.

Non-point source. Pollution that occurs when rainfall, snowmelt, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers, dams, and coastal waters or introduces them into ground water.

Non-renewable resource. Resource that either cannot be renewed once it is used or lost.

Nutrient. Substance that supports growth and reproduction. In aquatic biology, the most important nutrients are nitrogen, phosphorus, silica and carbon.

Nutrient depletion. Reduction of essential nutrients (through plant uptake and removal of plant and animal residues**.**

Nutrient enrichment. A form of water pollution, refers to contamination by excessive inputs of nutrients. It is a primary cause of eutrophication of surface waters, in which excess nutrients, usually nitrogen or phosphorus, stimulate algal growth and other aquatic plants.

Offset action. An action to address an adverse environmental impact of resource use, a discharge, emission or other activity at another location to deliver net environmental benefit.

Opportunity cost. The cost of foregoing one activity for another.

Over-exploitation. Use of an environmental resource at a rate that exceeds the natural regeneration rate.

Organic. (i) Referring to or derived from living organisms. (ii) In chemistry, any compound containing mainly carbon, hydrogen and oxygen**.**

Organophosphates. Pesticide chemicals that contain phosphorus; used to control insects.

Organisational Structure. Defines how activities such as task allocation, coordination and supervision are directed toward the achievement of organizational aims. It can also be considered as the viewing glass or perspective through which individuals see their organization and its environment.

Oxidation. The addition of oxygen which breaks down the organic waste or chemical such as cyanides, phenols, and organic sulphur compounds in sewage by bacterial and chemical means.

Pan. A type of wetland or aquatic ecosystem with closed (or near-closed) elevation contours, with a flat bottom, which increases in depth from the perimeter to a central area of greatest depth and within which water typically accumulates, either permanently or periodically. Most pans occur either where the water table intercepts the land surface (such as on coastal plains along the South African coastline), or in semi-arid settings where a lack of sufficient water inputs prevents areas where water accumulates from forming a connection with the open drainage network.

Pathogen. A bacterium, virus, or other microorganism that can cause disease.

Part-per-million (ppm). Measure of concentration of a dissolved material in terms of a mass ratio (milligrams per kilogram mg/kg).

Particulate. Fine liquid or solid particles, such as duct, smoke, mist, fumes, or smog found in air or emissions.

Per capita consumption. The amount of a commodity used by each person.

Perennial river. River that flows throughout the year.

Performance monitoring programme. A monitoring programme designed to measure, assess and report on a regular basis the degree to which present resource quality conforms to resource quality objectives (RQOs), and hence whether a water resource is within its designated management class, or improving towards it or deteriorating away from it.

Persistent Organic Pollutants (POPs). Organic compounds that are resistant to environmental degradation through chemical, biological, and photolytic processes.

Pesticide. A substance used for destroying organisms harmful to cultivated plants or to animals

Petroleum. A complex mixture of naturally occurring hydrocarbon compounds found in rock. Petroleum can range from solid to gas, but the term is generally used to refer to liquid crude oil. Impurities such as sulphur, oxygen and nitrogen are common in petroleum. There is considerable variation in colour, gravity, odour, sulphur content and viscosity in petroleum from different areas.

Production (in unconventional gas).The phase that occurs after successful exploration and development and during which hydrocarbons are drained from an oil or gas field

Produced water (in unconventional gas). All fluids displaced from the geological formations, which can contain substances that are found naturally in the formations but excludes hydraulic fracturing flow-back.

pH. The negative base 10 logarithm of the hydrogen ion activity (pH = 7 is neutral; pH < 7 is acid; pH > 7 is alkaline.

Pharmaceutical contaminant. Any component that provides pharmacological activity or other direct effect in the diagnosis, cure, mitigation, treatment, or prevention of disease, or to affect the structure or any function of the body of man or animals that occurs in any concentration in a water source. Typically enter water resources through sewerage discharges or dumping of pharmaceutical products and include chemicals found in antidepressants, blood pressure and diabetes medications, anticonvulsants, oral contraceptives, hormone replacement therapy drugs, chemotherapy drugs, antibiotics and heart medications.

Physical Water Quality. Refers to the physical appearance of water. Physical water quality parameters include turbidity and temperature.

Phytoplankton. Plant plankton, (usually microscopic), found floating in a water body.

Point source. A source of pollution whose initial impact on a water resource is at a well-defined local point (such as a pipe or canal).

Policy. Guidance for decision-making and action that helps to set priorities and hence allocate human and financial resources.

Political Interference. The action of interfering with, or the process of being interfered with, by other parties (individuals or groups) that manipulate circumstances to align with their specific positions or processes or for their benefit.

Polluter-pays principle. The principle that those responsible for environmental damage must pay the repair costs, both to the environment and to human health, and must also pay the costs of preventive measures to reduce or prevent further pollution and environmental damage.

Pollution. Defined by the National Water Act as the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it:

i. Less fit for any optimal water use for which it may reasonably be expected to be used, or

ii. Harmful or potentially harmful to (a) the welfare, health or safety of human beings, (b) any aquatic or non-aquatic organisms, (c) the resource quality, or (d) to property.

Pollution mitigation. Act of reducing the impact of pollutants on the environment by acting to clean and remove, visibly reduce, or completely preventing the pollution

Pollution plume. Delineates the extent of contamination in a given medium as a result of a distribution of effluent discharges (or spills). Usually shows the concentration gradient within the delineated areas or plume of flow of contaminants

Pollution prevention. Control of the handling and discharge or disposal of hazardous substances, such that the degradation or further degradation of water resources is avoided.

Potable water supply. A source of water that can be used for human consumption.

Precautionary principle. A management approach that exercises caution when uncertainties exist, generally assuming a worst-case scenario.

Precipitation. Condensation from the atmosphere, falling as rainfall, snow, hail or sleet.

Preliminary classification. An interim classification of a water resource established in the absence of the formal classification system required by Section 12 of the National Water Act (Act 36 of 1998). A preliminary classification is permitted in terms of Section 14.

Preliminary Resource Quality Objective (RQO). An interim resource quality objective established in the absence of the formal classification system required by Section 12 of the National Water Act. Preliminary resources quality objectives are permitted in terms of Section 14.

Principle. A statement providing guidance on what should be strived for, typically acknowledging an underlying values-based assumption.

Promulgation. To make known by open declaration; publish; proclaim formally or put into operation (a law, decree of a court, *etc.*)

Protozoa. A diverse group of unicellular eukaryotic organisms.

Protection (water resource). The maintenance and improvement of the integrity of water resources including their water quality, so as to regain or sustain their capacity to provide goods and services.

Quality assurance. The implementation of all activities that minimise the possibility of quality problems occurring. These activities include (amongst others) training, defined sets of procedures, formal review processes, etc.

Quality control. The process of ensuring that recommended procedures are followed correctly by detecting and correcting quality problems when they arise.

Quality of life. Physical, psychological, social, cultural, religious and material wellbeing.

Radioactivity. The spontaneous decay of an atomic nucleus (especially of elements with a high number of protons in it) by emitting either electromagnetic radiation (gamma-radiation) or high energy particles (protons: alpha radiation, electrons: beta radiation).

Receiving waters. A river, wetland, aquifer or other water resource into which wastewater or treated effluent is discharged.

Reclamation. Describes the action of taking back possession of something that was taken away or rendered un-useable or un-inhabitable and returning it to a useable state.

Redress. To put right by compensation. In the current context, to redress is to explicitly favour persons that were subject to past discriminatory practices. It contradicts

explicitly the principle of equality. It is, nevertheless, constitutional (Section 9(2)).

Rehabilitation. An activity that is undertaken in order to restore the characteristics and functioning of a water resource to an improved condition.

Remediation. Technical term for treating dangerous materials to eliminate or reduce harm to the environment or humans. Remediation is the action of taking direct intervention in (a) degraded land, to minimise contamination risk to a water resource, or (b) a degraded water resource, to improve water quality in the water resource.

Renewable energy. Energy generated from natural resources—such as sunlight, wind, rain, tides and geothermal heat—which are renewable (naturally replenished). Renewable energy technologies range from solar power, wind power, hydroelectricity/micro hydro, biomass and biofuels for transportation.

Renewable resource. A resource produced as part of the functioning of natural systems at rates that are comparable to its rate of consumption. Limits to renewable resources are determined by flow rates and such resources can provide a sustained yield.

Reporting. The communication of the results and findings and facilitation of their use. Good reporting is essential to demonstrate accountability and inform adaptive management that improves methods of programme delivery and the achievement of outcomes.

Reserve (The). Defined by the National Water Act as the quantity and quality of water required:

i. To satisfy basic human needs by securing a basic water supply, as prescribed under the Water Services Act (Act No. 108 of 1997), for people who are now or who will in the reasonably near future, be (a) relying upon, (b) taking water from, or (c) being supplied from, the relevant water source; and

ii. To protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource.

Since the Reserve is a legally binding quantity, it is typically not subject to rivalry. However, its very nature creates excludability since water uses not encompassed by basic human needs and maintaining aquatic ecosystem health are explicitly excluded. Therefore, the Reserve is strictly a quasi-public good.

Resource Directed Measures (RDM). Resource directed measures set the goals for resource protection and are informed by the Water Resource Classification system, which allows for different levels of protection for different water resources. The RDMs also make provision for the "Reserve", defined as the quantity and quality of water required to maintain healthy aquatic ecosystems, whilst meeting the basic human requirements.

Resource quality. Includes all aspects of water quantity, water quality and aquatic ecosystem quality, the latter including the quality of in-stream and riparian habitats and aquatic biota.

Resource Quality Objectives (RQOs). Numeric or descriptive (narrative) goals for resource quality within which a water resource must be managed. They may relate to: -
(a) the Reserve;
(b) the instream flow;
(c) the water level;
(d) the presence and concentration of particular substances in the water;
(e) the characteristics and quality of the water resource and the instream and riparian habitat;
(f) the characteristics and distribution of aquatic biota;
(g) 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
(h) any other characteristic,
of the water resource in question.

These are given legal status by being published in a Government Gazette.

Resource Water Quality Objectives (RWQOs). Numeric or descriptive (narrative) in-stream (or in-aquifer) water quality objectives typically set a finer resolution (spatial or temporal) than RQOs that provide greater detail upon which to base management of water quality.

Resource-directed water quality management. An approach to water quality management that takes into account the ecosystem requirements of the water resource, whilst still providing for the needs of other water users.

Restoration. The act of repairing a site or structure that returns it back to its original condition.

Restructuring. Bringing about a drastic or fundamental internal change that alters the relationships between different components or elements of an organization or system.

Results Chains (RC's). The causal sequence for a development intervention that stipulates the necessary sequence to achieve desired objectives beginning with inputs, moving through activities and outputs, and culminating in outcomes, impacts and feedback. RC's are diagrammatic representations of the logical progression of the changes/impact that the programme (policies and strategies) expects to instigate at the intervention and outcome level through programme activities undertaken via programme interventions.

Return flows. Surface and subsurface water that leaves the field following application of irrigation water.

Riparian. Referring to or relating to areas adjacent to water or influenced by water associated with streams or rivers.

Risk assessment. A process of gathering data and making assumptions to estimate short- and long-tern harmful effects on human health or the environment from exposure to hazards associated with the use of a particular product or technology; or establishing the probability of an event occurring, the factors that could bring about that event, likely exposure levels and the acceptability of the impact resulting from exposure.

River. A linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water. A river is taken to include both the active channel and the riparian zone as a unit

Runoff. The total stream discharge of water, including both surface and subsurface flow, usually expressed in cubic metres of water yield.

Recycle/Reuse. The process of minimising the generation of waste by recovering usable products that might otherwise become wastes. Reverse osmosis is an example of a treatment process which enables the reuse of waste waters for drinking water purposes.

Salinisation. Increase in the amount of inorganic salts or dissolved solids in the water.

Salinity. The amount of dissolved inorganic solids, or salts, in the water, typically measured as Total Dissolve Solids (TDS) or Electrical Conductivity (EC). It is a very important parameter for inland freshwater systems because of the major influence that it has on the chemical and biological make-up and functioning of an inland aquatic ecosystem, on human health, agricultural activities and various industrial processes.

Sanitation. The provision of facilities and services for safe management and disposal of human urine and faeces.

Saturated formation (zone). The portion of a soil profile or geologic formation where all voids, spaces or cracks are filled with water.

Scaling. The formation of a solid layer on a surface which makes heat transfer less easy, typically occurring with water that has contains high concentrations of calcites. Hardness of the water may cause scaling on heat exchangers. In water quality management scaling typically refers to a flaky oxide film formed on a metal,

as on iron, that has been heated to high temperatures; a hard mineral coating that forms on the inside surface of boilers, kettles, and other containers in which water is repeatedly heated.

Schedule 1 use. A permissible use of water as described in Schedule 1 of the National Water Act.

Seasonal (flow). With water flowing for extended periods during the wet season/s (generally between 3 to 9 months duration) but not during the rest of the year.

Sedimentation. Sedimentation refers to the erosion, wash-off and silt load carried by streams and rivers and typically reflects the natural geophysical and hydrological characteristics of the upstream catchment.

Seepage. The slow escape of a liquid or gas through porous material or small holes.

Self-regulation. Consists of voluntary industry initiatives in the interest of ensuring environmentally sound behaviour, such as ISO14001 and the 1996 International Standard on Environmental Management Systems (EMS).

Sewerage. Infrastructure that conveys sewage or surface runoff. Includes receiving drains, manholes, pumping stations, storm overflows, and screening chambers of the combined sewer or sanitary sewer.

Sewage. Waste water and excrement conveyed in sewers.

Signposts. The indicators that should be monitored to check if critical assumptions remain valid and if implementation proceeds on schedule.

Single source intervention. The act of intervening in the impacts or requirements of a single pollution source.

Socio-economic development. The process of social and economic development in a society. Socio-economic development is measured with indicators, such as GDP, life expectancy, literacy and levels of employment.

Sodification. Increase in the amount of sodium salts in the water or soil. A concern in water used for irrigation.

Source Directed Controls (SDC). SDC's focus on managing the quality and quantity of water entering a water resource with the primary purpose of ensuring that the objectives that have been set for the water resource (typically defined by the management class and RQOs) are achieved. SDC include regulatory mechanisms such as water quality standards for waste water, waste water discharges, pollution prevention, and waste minimisation technologies

Source Management Objectives. Objectives relating to (a) incremental reduction, (b) maintenance or, under special circumstances, (c) incremental increase, in pollution loads, calculated to give effect to resource water quality objectives. They refer to the water resource management unit as a whole, not to specific water users, though they do consider technical, economic and administrative realities.

Source-directed water quality management. Management of water quality using source-based measures including pollution prevention and minimisation.

Stakeholder. An individual, group or organisation that has an interest in, or is affected by, an initiative and who may therefore affect the outcome of an initiative.

Standard methodology. Widely accepted, well-defined and tested scientific method, often used in chemical analysis.

Stewardship (Water). The responsible provision of support, supervision and guidance. An approach that focuses on the management of a common pool of resources such as freshwater resources and is based on the principle of collective accountability for the sustainable management of those resources and therefore, on collective responses. It includes the responsible use of freshwater as well as the provision of support to ensure that collectively water use is socially equitable, environmentally sustainable and economically beneficial, achieved through a stakeholder-inclusive

process that involves site and catchment-based actions. Good water stewards understand their own water use, catchment context and shared risk in terms of water governance, water balance, water quality and important water-related areas; and then engage in meaningful individual and collective actions that benefit people and nature."

Stormwater. Surface water in abnormal quantity resulting from heavy falls of rain or snow.

Strategic use. A water use (such as electricity generation) of strategic national importance, as defined in the National Water Resource Strategy or designated as such by the Minister.

Strategic Adaptive Management (SAM). A management approach that provides a structured, iterative process of robust decision making within complex and interactive social-ecological systems. Often coined as the process of 'learning by doing', it is the process of resolving uncertainty in management through monitoring, while implementing (or doing) management, with the aim of making better, more inclusive, management decisions. It is a tool which should be used not only to change a system, but also to learn about the system.

Strategy. Broad course of action focussed on the implementation of a policy.

Stress (water quality). A state in which the water quality is inadequate for the desired water use. For many uses, water quality stress exists when there is no allocatable water quality.

Stressed water resource. A water resource for which the demand for benefits exceeds the supply. This can apply either to the quantity of water or to the allocable water quality.

Subsidiarity. The process of devolving decision making down to the lowest possible appropriate level.

Suspended solids. Particles suspended in the water column.

Sustainability indicator. An indicator conveying information about progress towards sustainable development.

Sustainable development. The endeavour to ensure that future generations can meet their own needs while promoting socio-economic development and improved quality of life for all in the current generation. This should be done in a manner that uses water resources in general, and water quality in particular, within the ability of the ecosystems to satisfy such needs now and in the future.

Sewage. Waste water and excrement conveyed in sewers.

Sewerage. The infrastructure that conveys sewage or surface runoff. Includes receiving drains, manholes, pumping stations, storm overflows, and screening chambers of the combined sewer or sanitary sewer.

Systems based approach. A line of thought in the management field which stresses the interactive nature and interdependence of external and internal factors in an organisation or process.

Targets. Bring the purpose for undertaking a project into a real, defined view. Targets further justify a project by describing in concrete terms what the project's (donors/funders) investment will achieve by a certain deadline. Targets help to keep track of progress, provide a timeline both program management and donors can understand, add specificity to indicators, and (with the help of benchmarks) they break down long-term goals into incremental "tasks".

Teratogenic. Capable of causing the formation of congenital abnormalities and monstrosities in embryos.

Terrestrial ecosystem. A system of plants, animals, nutrients and elements, and the interactions between them that is found on the land.

Theories of Change (ToC). ToC link outcomes and activities to explain HOW and WHY the desired change is expected to come about. Theories of Change require justifications at each step – there is need to articulate the hypothesis about why something will cause something else (it is a causal model).

Tolerance limits. The limit to which a plant or animal can withstand changes in the environment (*e.g.* the maximum amount of pollution that a plant can withstand, and still grow in that area).

Total dissolved solids (TDS). TDS concentration (expressed as a mass per unit volume, e.g. mg/l or g/l) represents the total quantity of dissolved material, organic and inorganic, ionised and unionised, in a water sample. A common alternative to measuring TDS is Electrical Conductivity or EC which is a measure of the ability of a sample of water to conduct an electrical current. It is generally expressed in units of milli-Siemens per metre (mS/m), where a Siemen is the reciprocal of an ohm (the unit of electrical resistance). TDS and conductivity usually correlate closely for a particular type of water. For example, it has been found that, for South Africa as a whole, the TDS concentration in mg/l is approximately equal to the conductivity in mS/m multiplied by a factor of 6.6, although a multiplicand of 5.5 is somewhat more accurate for the naturally acidic waters of the south-western Cape. Natural TDS in inland aquatic ecosystems is determined by the geological formations the water has been in contact with, and physical processes such as evaporation and rainfall. Anthropogenic activities such as industrial effluents, irrigation and water reuse lead to increases in TDS and conductivity. It is important to bear in mind that TDS estimates based on conductivity measurements will be inaccurate if there is a large amount of un-ionised material (e.g. dissolved organic carbon) in the water because conductivity measurements only take ionised material into account.

Total suspended particulate matter. The total amount of particulates of all sizes suspended in water.

Total Maximum Daily Load (TMDL). The maximum amount of a pollutant that a waterbody can receive and still meet its water quality objectives and an allocation of that amount to the pollutant's source. The amount, or load, of a specific pollutant that a water body can receive and still meet the water quality standard for its designated use. It is the sum of the allocations for point sources (called waste loads) and allocations for nonpoint sources (called loads) and natural background with a margin of safety (MOS). The TMDL may also include an allocation for future growth.

Toxic. Poisonous.

Toxic effect. A dose-related effect that is manifest as an impairment of the activity of the organism or of the cellular or sub-cellular system. In the current context, these effects are also limited to those that can be detected, either currently or potentially, locally or internationally, by a “toxicity test”, as defined here.

Toxicity test. A procedure to determine the toxicity of a chemical or an effluent using living organisms (usually a cell system, invertebrate or fish). A toxicity test measures the degree of effect on exposed test organisms of a specific chemical, compound or effluent compared with an unexposed control.

Toxicant. A chemical substance capable of causing a toxic effect.

Toxicity. The degree to which a water exhibits toxic effects.

Trace elements. A chemical element whose concentration (or other measure of amount) is very low (a "trace amount").

Transboundary basin. A basin that transverses two or more administrative boundaries (such as states or countries).

Triggers. Are the threshold values of these indicators. When these thresholds are crossed then adaptive responses should be activated.

Turbidity. The cloudiness or haziness of a fluid caused by suspended solids that are usually invisible to the naked eye.

Un-buffered. Not resistant to change.

Unconventional (oil and gas production). Is a term for oil and natural gas that is produced by means that do not meet the criteria for conventional production.

Underground coal gasification. The conversion of coal to gas underground by ignition of coal seam, involving the drilling of a two well system into the coal seam, one for injection of the oxidants and another to bring the product gas to the surface, with a connecting path.

Uniform Effluent Standards. Standards set to regulate the discharge of point sources of pollution by enforcing compliance with effluent quality standards. Often leads to a cumulative pollution effect.

Urban runoff. Surface runoff of rainwater created by urbanization. This runoff is a major source of flooding and water pollution in urban communities worldwide.

Urban. In, relating to, or characteristic of a town or city "the urban population"

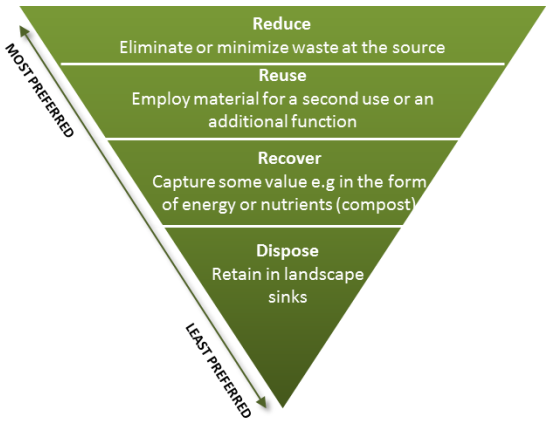
Urbanisation. The process by which an increasing proportion of an area's population becomes concentrated in (legally or statistically defined) urban areas.

Volatile organic compounds. Any organic compound having an initial boiling point less than or equal to 250 °C measured at a standard atmospheric pressure of 101.3 kPa.

Vulnerability. Susceptibility to harm.

Waste. Defined by the National Water Act as including any solid material or material that is suspended, dissolved or transported in water (including sediment) and which is spilled or deposited on land or into a water resource in such volume, composition or manner as to cause, or to be reasonably likely to cause, the water resource to be polluted.

Waste management hierarchy. A hierarchy which ranks the various waste management strategies from most to least environmentally preferred. The hierarchy places emphasis on reducing, reusing, and recycling as key to sustainable materials management.



Water allocation. The apportionment of water or allocable water quality among water users.

Water Board. Government-owned Water Boards play a key role in South African water sector. They operate dams, bulk water supply infrastructure, some retail infrastructure and some wastewater systems. Some also provide technical assistance to municipalities. Through their role in the operation of dams they also play an important role in water resource management. The water boards report to the Department of Water and Sanitation. There are 15 Water Boards in South Africa.

Water-borne diseases. Are caused by pathogenic microorganisms that most commonly are transmitted in contaminated fresh water.

Water-energy-food security nexus. Means that the three sectors — water security, energy security and food security — are inextricably linked and that actions in one area more often than not have impacts in one or both of the others

Water management area (WMA). An area established as a management unit in the national water resource strategy, within which a catchment management agency will conduct the protection, use, development, conservation, management and control of all water resources.

Water Management Institution. Defined by the National Water Act as a catchment management agency, a water user association, a body responsible for international water management or any person who fulfils the functions of a water management institution in terms of the Act.

Water Users Associations. A group of water users, such as irrigators, who pool their financial, technical, material, and human resources for the operation and maintenance of a water system.

Water quality. The physical, chemical, radiological, toxicological, biological and aesthetic properties of water that (1) determine its fitness for use, or (2) that are necessary for protecting the health of aquatic ecosystems. Water quality is therefore reflected in (a) concentrations of substances (either dissolved or suspended), (b) physio-chemical attributes (*e.g.* temperature), (c) levels of radioactivity, and (d) biological responses to those concentrations, physio-chemical attributes, or radioactivity.

Water Quality Management. Water Quality Management involves the maintenance of the fitness for use of water resources on a sustained basis, by achieving a balance between socio-economic development and water resources protection. From a regulatory point of view the "business" of WQM entails the on-going process of planning, development, implementation and administration of WQM policy, the authorisation of water uses impacting on water quality, and the monitoring and auditing of the aforementioned.

Water quality management plans. Specification of management actions, responsibilities, resources and time frames to achieve the stated resource quality objectives.

Water quality monitoring. An integrated activity for evaluating the physical, chemical and biological character of water in relation to human health, ecological conditions, and designated uses.

Water quality standard. A rule establishing, for regulatory purposes, the limit of some unnatural alteration in water quality that is permitted or accepted as being compatible with some particular intended use or uses of water.

Water quality trading. A market-based, water quality management approach that aims to achieve load reduction requirements by providing economic incentives for pollutant reductions from point and nonpoint sources of pollution. The foundations of trading are that a water quality objective is established and that sources within the catchment have significantly different costs to achieve comparable levels of pollution control. Trading programs allow facilities facing higher pollution control costs to meet their regulatory obligations by purchasing environmentally equivalent (or superior) pollution reductions from another source at lower cost, thus achieving the same water quality improvement at lower overall cost. Trading scenarios include point source-point source trades, point source-nonpoint source trades, pre-treatment trades, and intra-plant trades. Trading may also involve a process where new or increased loads of contaminants may be accommodated by offsetting those loadings with quantifiable and accountable reductions through e.g. downstream interventions.

Water quality offsets. Involves compensating for impacts on a water resource at one site through activities at another site. Offsets are typically used as a means of mitigating significant residual impacts of contamination on the community affected by the contamination. Offsets are developed on a case-by-case basis depending on the particular situation and are not an alternative to remediation and management of significant contamination.

Water resource. Defined by the National Water Act as including a watercourse, surface water, estuary or aquifer.

Water sector. Encompasses all individuals involved in the management of water. The Department of Water and Sanitation leads and regulates the water sector in South Africa, develops policy and strategy, and provides support to the sector.

Water services. According to the Water Services Act (Act No. 108 of 1997) water services refers to water supply services and sanitation service

Water services authority. Any municipality responsible for ensuring access to water service in the Act, may perform the functions of a Water Service Provider, and may also form a joint venture with another water services institution to provide water services.

Water services providers. According to the Water Services Act, 1997 (Act No.108 of 1997) water services providers means any person who provides water services to consumers or to another water services institution but does not include a water services intermediary.

Water use. According to the National Water Act, 1998 (Act No. 36 of 1998) water uses include: taking water from a water resource and storing water; conducting activities that reduce stream flow; waste discharge and disposal; controlled activities (activities which could impact detrimentally on the water resource); altering the size or position of a water course; removing water found underground for certain purposes; and recreational use.

Water use licence. Enabling tool for existing or prospective water users to gain formal access to water for productive or beneficial purposes.

Watercourse. Defined by the National Water Act as a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which, or from which, water flows, and any collection of water that the Minister may declare to be a watercourse. Furthermore, reference to a watercourse includes, where relevant, its bed and banks.

Waterlogging. Waterlogging occurs whenever the soil is so wet that there is insufficient oxygen in the pore space for plant roots to be able to adequately respire.

Wetland. Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water and which land in normal circumstances support or would support vegetation typically adapted to life in saturated soil.

REFERENCES

Department of Water Affairs and Forestry (DWAF), RSA. (2006) Resource Directed Management of Water Quality. Project Document. *Appendix E*: *Glossary of terminology often used in the Resource Directed Management of Water Quality.* Edition 2. Water Resource Planning Systems Series, Sub-Series No. WQP 1.3. ISBN No. 0-621-36801-6.Pretoria, South Africa.

Ministry of Environment, Government of British Columbia. (2017) *Glossary of Water Quality Terms*. Accessed at http://www.env.gov.bc.ca/wat/wq/reference/glossary.html

Ollis, D.J., Snaddon, C.D., Job, N.M. & Mbona, N. (2013). *Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems*. SANBI Biodiversity Series 22. South African National Biodiversity Institute, Pretoria.

Pearson Education Ltd. (2000). *Henderson's dictionary of biological terms*. Twelfth Edition. Prentice Hall, England.

Roux, D.J. and Foxcroft, L.C., (2011). *The development and application of strategic adaptive management within South African National Parks. Koedoe 53(2), Art. #1049, 5 pages.*

US EPA. (2003). *Glossary of terms from Watershed Analysis and Management Guide for States and Communities*. Office of Water/Office of Wetlands, Oceans and Watersheds. Virginia, USA.

US EPA. (2008) *Impaired Waters and Total Maximum Daily Loads Glossary*. Office of Water/Office of Wetlands, Oceans, and Watersheds. Accessed at https://www.epa.gov/tmdl

US EPA. (2009) *Terms of Environment: Glossary, Abbreviations, and Acronyms*. Office of the Administrator/Office of External Affairs and Environmental Education. Virginia, USA.

US EPA. 2010. *Aquatic Biodiversity Glossary.* Office of Environmental Information. Accessed at http://www.epa.gov/wqc/biological-water-quality-criteria

US EPA. (2012) *Glossary of pesticides terms*. Office of Chemical Safety and Pollution Prevention/Office of Pesticides Programs/Information Technology and Resources Management Division. Virginia, USA.

US National Water Quality Monitoring Council. (2016). G*lossary of Water-Quality Monitoring Terms*. *U.S. Department of the Interior, U.S. Geological Survey. Accessed at* https://acwi.gov/monitoring/glossary.html

USGS. 2017. *Water Science Glossary of Terms.* U.S. Department of the Interior, U.S. Geological Survey. Accessed at: http://water.usgs.gov/edu/dictionary.html