water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

National Eutrophication Strategy Project: Situation Assessment and Gap Analysis Report

Project Steering Committee Meeting 1 (Virtual Meeting

Directorate: Sources Directed Control

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INTRODUCTION

Background

- It is the **MANDATE** of the Department (DWS), as the **CUSTODIAN** of the country's water resources to **PROTECT** water resource for the benefit of all people and the environment.
- Eutrophication constitute a major threat to the provision of raw potable and irrigation water in South Africa
- Eutrophication is recognized as one of the priority water quality issue in SA (IWQMP, 2016).

Definition

- **Eutrophication** is defined as a process of nutrient enrichment and the associated excessive plant growth such as algae and macrophytes in water bodies, which can be seen as either a natural aging process in lakes or accelerated by human impacts (Point and or Non-Point sources of pollution).

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Purpose of Component 2: Situation Assessment and Gap Analysis

- To identify current as well as emerging eutrophication issues, causes, impacts and challenges.
- The identification of the causes and challenges were conducted through the following:
  - Review of existing literature;
  - Models and maps;
  - Photographs and other relevant information relevant to the development of the Strategy.

CLIMATE AND EUTROPHICATION

- Sensitive factors that affects climates such as temperature, precipitation, wind, and solar radiation also affect trophic conditions in water bodies (Nazari-Shabian et al., 2018).

➢ Temperature

- Temperature is an important environmental factor that influences chemical and physical properties in water ecosystems such as pH, salinity, solubility and diffusion rates
- Projections show that global surface temperature will increase in future which is expected to be alterations in water resource temperature (Ihnken, 2010).

➢ Precipitation

- Change in hydrological regimes are also consequences of climate change
- It is projected that intense extreme precipitation events will occur and cause more erosion and resuspension of sediments
- Resulting in higher concentrations of sediments and nutrients in receiving water bodies (Whitehead et al., 2009).

Wind

- **Direct effects**: blowing of algea from the water resource to the lakeshore or river banks
- **Indirect effect**: disturbances caused by the wind which can circulate water and mix different layers of water column (mixture of nutrients and acceleration release of nutrients in sediments).

Solar Radiation

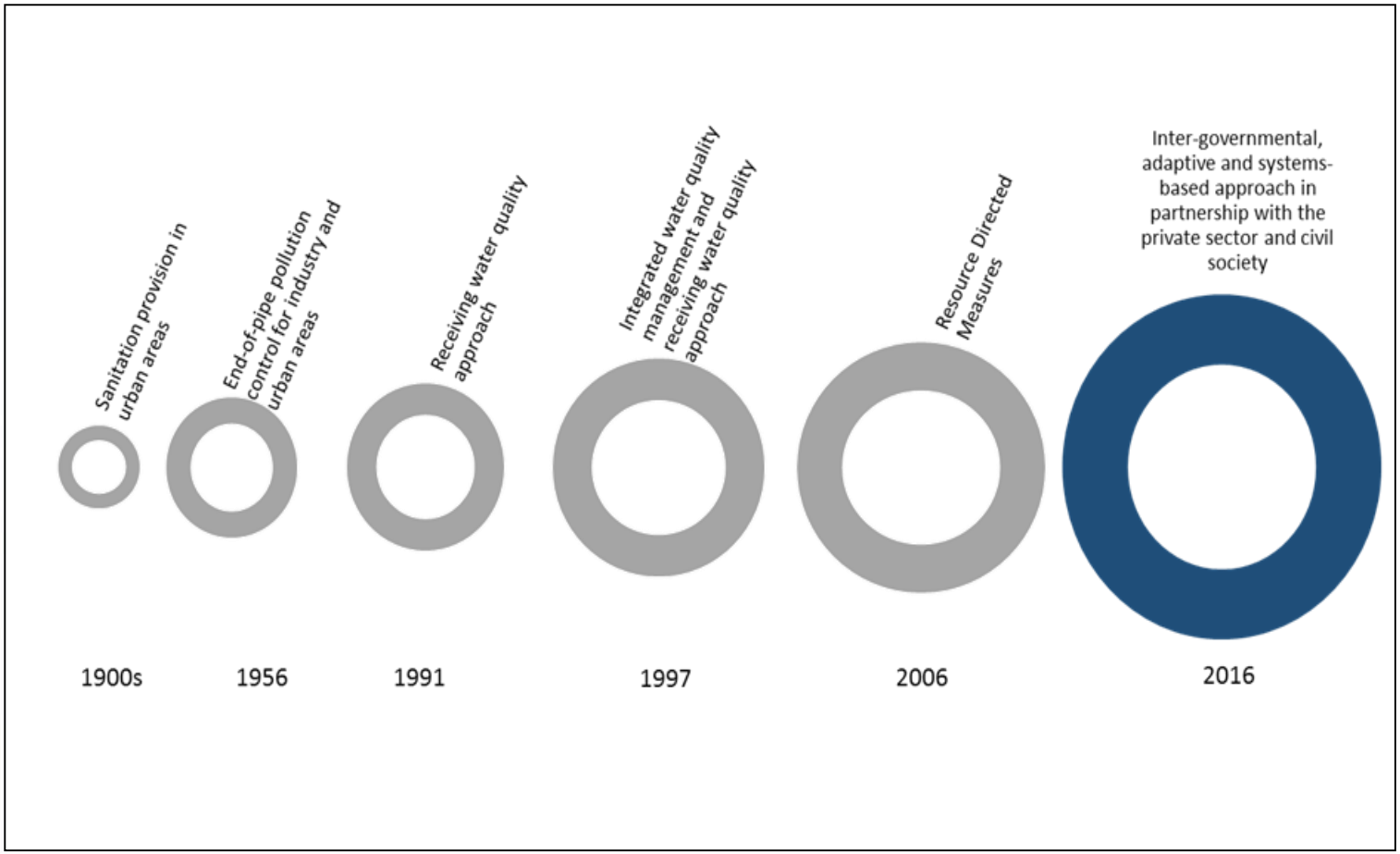
- Solar radiation plays a crucial role in photosynthesis in different ecosystems
- Sufficient sunlight increases water temperature and the presence of nutrients altogether provide suitable conditions for the growth of algae and phytoplankton, finally resulting in water eutrophication.

POLICY AND LEGISLATIVE FRAMEWORK

- **Sustainable Development Goals (SDGs) 6**
  - SDGs are management tools to help developing countries to implement strategies towards sustainable developments (SDNS, 2015)
  - Target 6.3: addresses water quality issues and progress towards targets assessed on basis of two indicators:
    - ✓ Proportion of wastewater safely treated (by 2020)
    - ✓ Proportion of water bodies with good water quality (by 2030)

- **South African Constitution, 1996 (Section 24)**
  - National Environmental Management Act (NEMA – Act 107 of 1998)
  - Water Service Act (WSA – Act 107 of 1997)
  - National Water Act (NWA – Act 36 of 1998)
    - ✓ National Water Resource Strategy
    - ✓ National Water and Sanitation Master Plan
    - ✓ Catchment Management Strategies
    - ✓ Water Resource Classification Systems
    - ✓ Resource Quality Objectives
    - ✓ The Reserve
    - ✓ Pollution Prevention Measures
    - ✓ Water Uses

- **The Evolution of Integrated Water Quality Management**



EUTROPHICATION CHALLENGES IN SA

Currents Status of Eutrophication in the Country

- South African water resources are still under stress (Mwangi, 2014).
- Many of the country's impoundments and rivers show high levels of nutrient enrichment and eutrophication related problems (DWA 2011).
- Most of the highly impacted reservoirs are located in the economic heartland of the country, which has an extant regional water quality crisis with others showing serious eutrophication potential in other parts of the country (Harding, 2015).
- There is a rapidly worsening eutrophication condition in the reservoirs, due to increasing rate of agricultural, runoff and WWTW effluent flowing into the water resources (Cullis et. al. 2018).

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- **Green Drop System**
  - The system was designed (2008) to ensure that WWWT improve their operations to avoid polluting water resources
  - 449 out of 852 municipal wastewater systems were assessed for first Green Drop certificate programme:
    - ✓ 5% (32 WWTW) achieved the Green Drop Status (scored 90% and above)
    - ✓ 39% achieved from 50-89% (there is a room for improvement); and
    - ✓ Remaining 56% scored below 50% (which was of great concern)
  - It was found that skills shortages was the results of non-compliance (DWA, 2009).

Sources of Eutrophication

Driver	Sources
• Wide-spread discharge of raw or inadequately treated municipal sewage. • Raw sewage overflows. • Diffuse runoff and drainage from fertilized cultivated land.	**Point Source**: • Dysfunction in many municipalities • Inadequate cooperative governance and cross-regulatory interfaces between DWS and the affected municipalities, COGTA and various other government institutions.
	Diffuse/Non-Point Source: • Inappropriate farming practices, • Inadequate cooperative governance and cross-regulatory interfaces between DWS and the DAFF and its provincial counterparts and various other government institutions hinders the management of these phenomena.

Major Causes of Eutrophic in SA

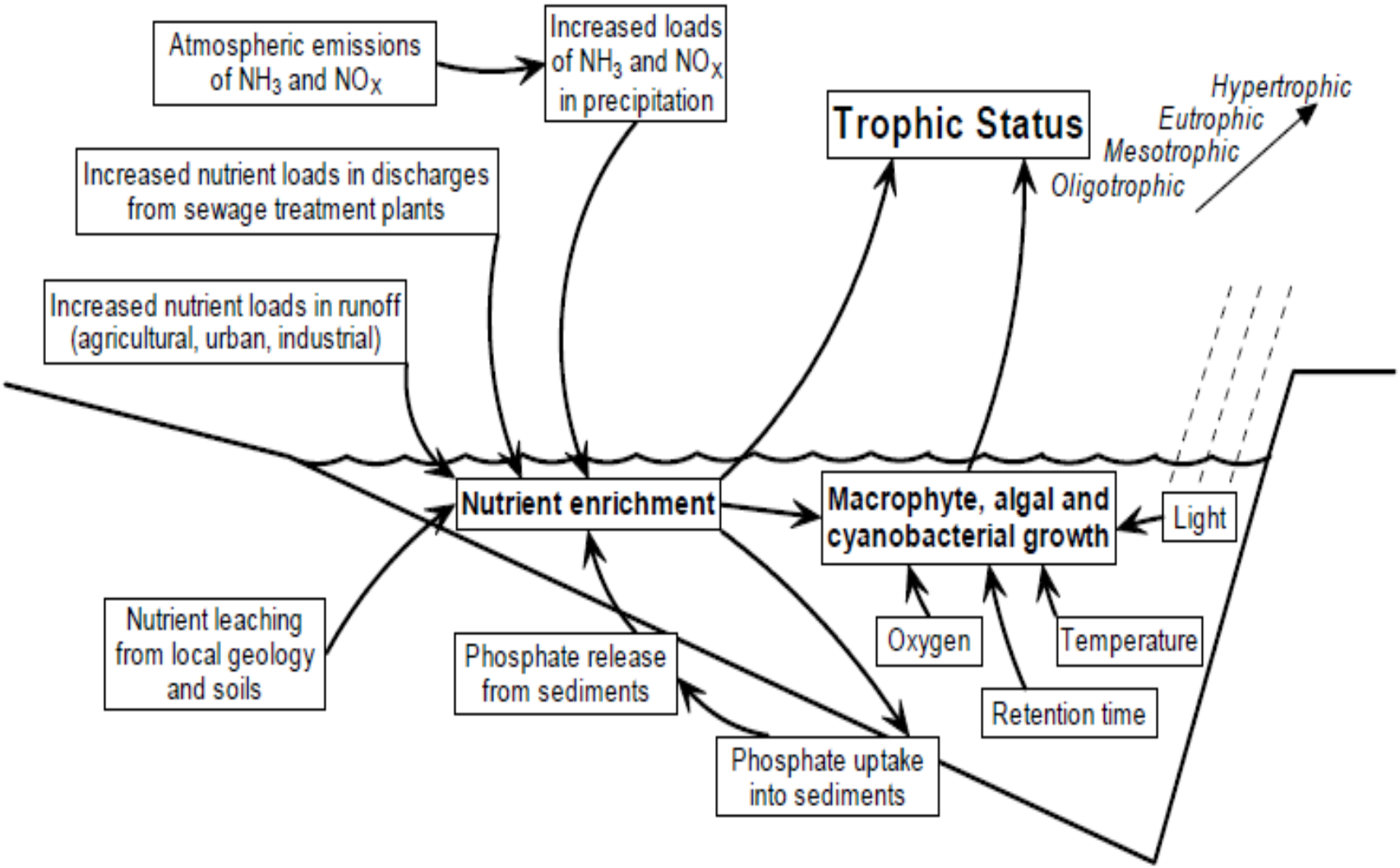
Natural causes

- Nutrients leaching from local geology and soils

Unnatural causes

- Atmospheric Ammonia and Nitrogen dioxide resulting in Increased loads of NH_3 &NO_2 In precipitation
- Increased nutrient loads in discharges from WWTWs.
- Increased nutrient loads in Agriculture and urban runoff.
- Excessive nutrient loads in Industrial wastewater.

Nutrient cycle indicating causes of eutrophication (DWAF, 2002)



Impacts of Eutrophication in SA

Impacts	Situations resulting from the impacts
Ecological impacts	• Disturbances to biodiversity
Human and Aesthetic impacts	• Odour and taste problems • Morbidity and mortality • Malaria trap
Recreational Impact	• Decreased recreational use • Decreased access to waterways
Economic impacts	• Increased water treatment costs • Stock losses • Corrective action costs • Loss of property value

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Monitoring

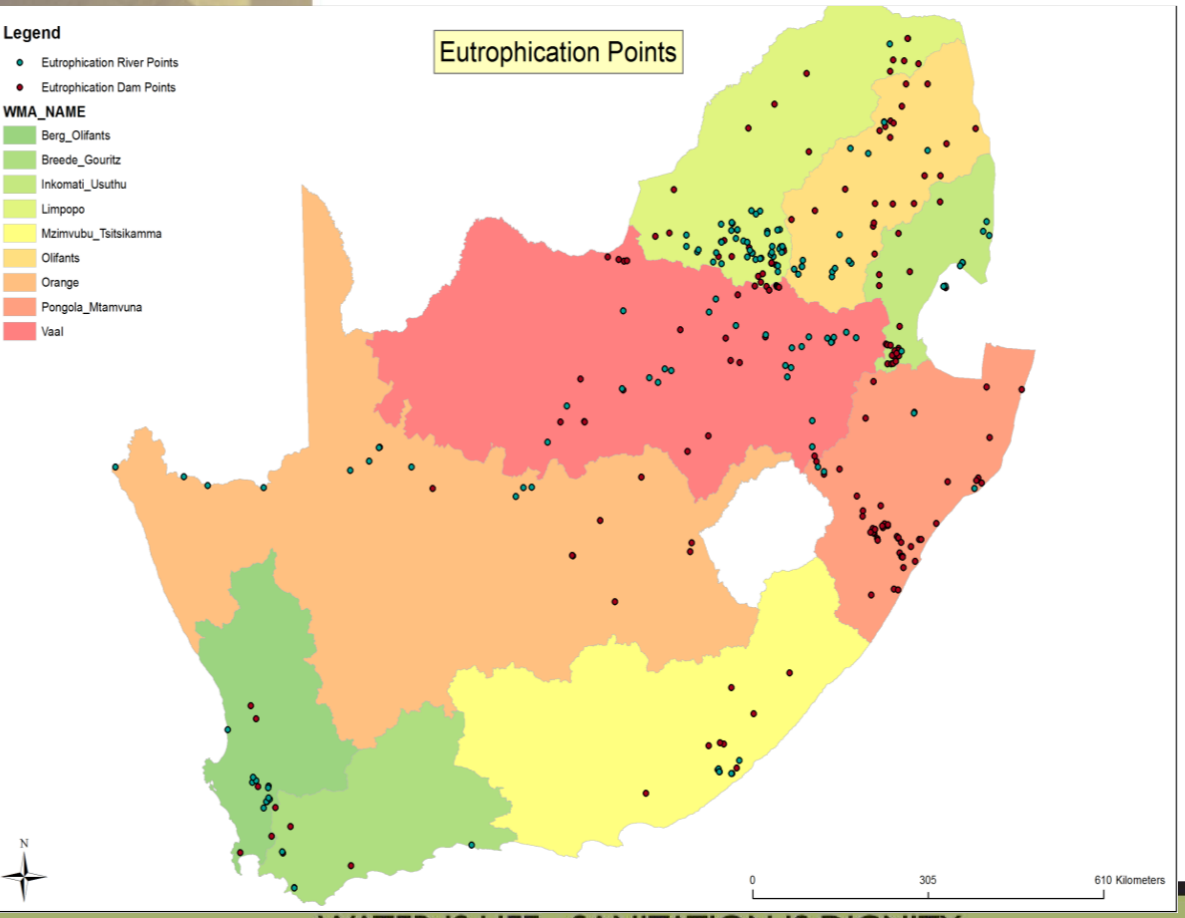
➢ The Monitoring Networks

- Establishment of national monitoring system as per Chapter 14 of the NWA
- Monitoring programme as stipulated in the revised National Water Resources Monitoring Networks (2016):
  - Hydrological: measuring rivers, dam levels and evaporation
  - Geohydrological: measuring groundwater levels, chemistry and isotopes
  - Surface Water Quality: chemical, microbial, **eutrophication,** radioactive and toxicity
  - Biological: aquatic ecosystem health *i.e. REMP.*

➢ National Eutrophication Monitoring Programme (NEMP)

- Objectives of NEMP:
  - To give a national perspective on the current trophic status of monitored sites;
  - To determine the nature of eutrophication problems in SA Aquatic systems; and
  - To determine the trend in trophic status in order to inform planning.

- Current spatial network coverage of NEMP eutrophication sites in SA



- NEMP has 451 registered sites
  - 320 dams/lakes
  - 131 river sites

- Challenges: decline in monitoring due to lack of funds, lack of capacity and non-functional and under capacitated laboratories.

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- Integration of Earth Observations into the Eutrophication Monitoring Programme (EONEMP)
  - Project "Integration of Earth Observations into the Eutrophication Monitoring Programme (EONEMP)" made use of satellite earth observations (remote sensing) for monitoring cynobacteria blooms and eutrophication in SA.
  - Project Collaboration: WRC, DST and DWS
  - EONEMP was designed to enhance the NEMP
  - Remote sensing affords the opportunity to:
    - Monitor at unparalleled spatial scale;
    - Frequency; and
    - Consistency.
  - Challenges: The estimated cost for the whole country amounts to approximately R45 million per year.

MEASURES IN PLACE TO MANAGE EUTROPHICATION IN SA

WATER RESOURCES PROTECTION MEASURES:

- RDM
- SDC
- RQOs

DWS REGULATORY MECHANISMS:

- Regulation of Section 21 Water Use
- Blue and Green drop certification programme
- WDCS

POLICY FORMULATION AND DEVELOPMENT OF BEST MANAGEMENT PRACTICES:

- Guidelines
- Revision of WQM Policies& Strategies

IN-LAKE EUTROPHICATION MANAGEMENT PRACTICE PROJECTS

GAP ANALYSIS AND REQUIRED INTERVENTIONS

➢ **GAPS**

Insufficient Monitoring	• Gaps in data have attributed to a lack of funds and budget cuts • Travel constrains • Delays in contracting accredited labs to conduct analysis
Delay in the implementation of the Protection and Regulatory Measures	• Delay in implementation of the RDM measures, WDCS and the review and optimization of the monitoring networks e.g. EONEMP
Lack of capacity	• Lack of capability in the regional offices to implement management programmes for water resources
Lack or limited Research, Technology and Intervention	Inadequacy of the country's policy and approach to eutrophication control over the last two decades

Required Interventions

- Eutrophication is the pollution problem that requires immediate attention and application of proper waste management principles/interventions.
- The main focus is on waste management, source and impact control *i.e.* to reduce the nutrients via waste minimization and source control.
  - Identify data and information gaps;
  - Review national eutrophication management guidelines e.g. NEMP;
  - Develop/Update national eutrophication monitoring information management system;
  - Management of complex organic compounds and various thematic water quality issues leading to nutrient enrichment;
  - Regulation (e.g. enforcement regarding municipalities to comply with 1.0 mg/l phosphate standards);
  - Controlling the output of nutrients from point source by setting standards for N and P emissions and applying specific waterwater or air emission control technologies. This applies particularly to removal from waterwaters of all types;
  - The development of a long-term research and capacity building programme to support all other activities i.e. training, research and awareness campaigns;
  - Application of lessons learned from local case studies (such as, Hartebeespoort Rehabilitation/Remediation pilot project) which displays key concepts that could inform the strategy; and
  - The acceptance and commitment of all parties to co-operative governance on eutrophication management and control.

THANK YOU!