THEME 3: CONTRIBUTION TO SUSTAINABLE DRINKING WATER AND WASTE WATER QUALITY MANAGEMENT

MINISTERIAL INTERACTIVE SESSION
WITH WATER & SANITATION SECTOR

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WATER IS LIFE - SANITATION IS DIGNITY

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

THEME 3: CONTRIBUTION TO SUSTAINABLE DRINKING WATER AND WASTE WATER QUALITY MANAGEMENT (BLUE AND GREEN DROP)

1. Background

- The changes in South African society, our growing population and the urgent need for the equity of access to water, are placing increasing demands on what is, although renewable, a limited resource. The Department, as the custodian of the country's water resources, has a responsibility to ensure that water resources are managed, developed, conserved, used, protected and controlled in a sustainable manner. In addition, the Department is also faced with the need to create an enabling environment for the provision of basic water supply and this has been the subject of contestation within service delivery protests countrywide.

- Provision of access to sufficient water is a right enshrined in our Constitution. The country has made good progress in the provision of basic water services. However, it cannot be said that this right has been realised if the quality of that water poses health risks for the beneficiaries and increases the cost of treating water to potable standards. Drinking water quality is a significant challenge and while there are improvements in some areas, there are still major risks that must be mitigated as service expansion increases. In some areas the operation and maintenance load has also increased leading to non-adherence of standards.

- The deterioration of raw water quality threatens the effective functionality of water treatment plants and requires more demanding and costly treatment processes. The poor quality of discharged effluent is also contributing to rising eutrophication and bacteriological contamination of rivers and dams and impacting on the nature of the flows through tunnels, pipelines and canals due to heavy algal loads. As a key barrier to safe water supply, waste water treatment must be given more focused regulatory attention.

- Incentive-based regulation (Blue Drop Certification Programme) was introduced in 2008 by DWS to proactively measure all aspects contributing to a sustainable water services business, and provision of safe water to the citizens of South Africa. This programme incorporated the World Health Organisation's (WHO) Water Safety Planning Concept as the basis for proactive, risk-based approach to water quality management from catchment to consumer. Since then, DWS has been measuring and monitoring the risk of each water supply system based on performance against the Blue Drop criteria enabling the Water Services Authority (WSA) and DWS to identify, prioritise and implement targeted and specific interventions to improve performance.

- This risk-based approach also includes compliance to the South African National Standard for Drinking Water (SANS 241) which is the minimum requirement for drinking water that is considered safe for human consumption. SANS 241 requirements include the microbiological, aesthetic, chemical and physical parameters and acceptable levels that do not pose a risk to human health over a lifetime of consumption. It also provides direction on the evaluation of water quality risks from catchment to consumer, monitoring and verification of water quality to enable the management of any identified risks and assurance that the water is deemed to present an acceptable human health risk.

2. Trends in drinking water quality risk management

As per the DWS's mandate to regulate water services in the country, the 2016 Blue Drop Progress provides feedback and progress on the status and trends of municipal water services against specific risk components which form part of risk-based regulation. Figure 1 below shows that:

- The percentage of systems in low risk category have steadily increased from 2012 to 2014 followed by a slight decrease in 2016.
- The opposite is noted for the number of systems in high and critical risk categories which have decreased from 2012 to 2014 and then increased in 2015.
- The percentage of systems in high risk categories decreased between 2015 and 2016 while critical risk categories have continued to increase in 2016 accounting for 11.9% of all systems indicating a decline in performance.
- The observed increase in systems under critical risk is due to:
    - Lack of sufficient data and insufficient monitoring by water services authorities,
    - Aging infrastructure including vandalism,
    - Lack of operations and maintenance (O&M), and
    - Lack of implementation of risk management plans (water safety plans).

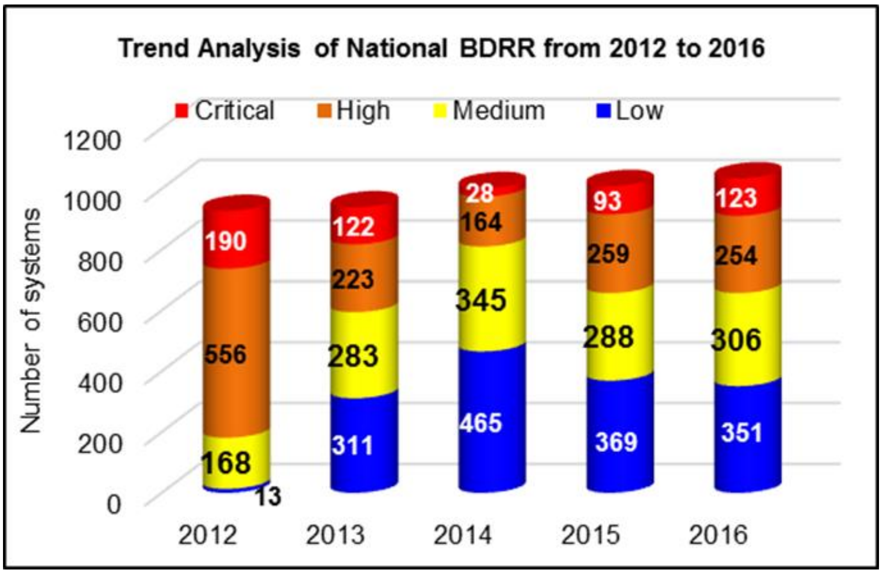

Figure 1: Trends analysis of National BDRR

3. Trends in waste water quality risk management

- Green Drop Risk Rating (GDRR) serves as a precautionary tool for water services authorities to implement strategic and operational decisions to improve service delivery or mitigate identified risks. The GDRR focuses on wastewater risk abatement planning, design capacity vs operational flow, technical skills and effluent compliance. It should not be confused with the Green Drop status, but the latter may not be achieved without meeting the requirements of the GDRR. Figure 2 below shows the national risk profile from 2008 to 2014.

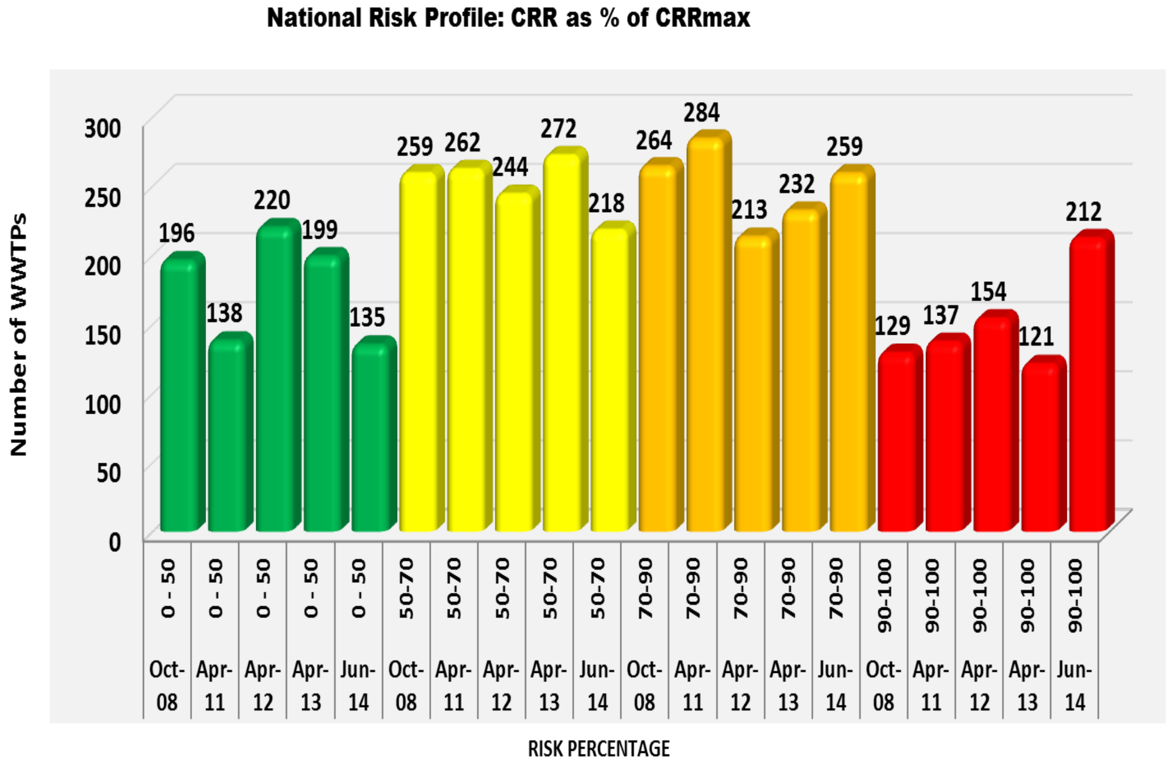

Figure 2: National risk profile

The increase in systems under critical risk is due to the following:

- Lack of data loading on the Green Drop System: Municipalities are not uploading the effluent water quality data on the systems.
- Lack of operations and maintenance: This leads to effluent failures and thus pollution of water resources.
- Lack of required technical skills leading to the failure of the entire waste water treatment plant and therefore pollution.
- Aging infrastructure and vandalism
- Lack of implementation of risk management plans (waste water risk abatement plans)

The DWS initiated the Green Drop Progress Assessments in 2017 and is in the process of finalizing these.

4. Challenges

Several impediments to the supply of basic water services include but not limited to:

- Lack of data or non-submission of data
- Inadequate investment in maintenance, rehabilitation and replacement of old infrastructure.
- Inadequate asset management is compromising water quality and reliable supply in all areas, and jeopardizing growth and development.

- Drinking water quality management is inadequately funded at municipal level, especially funding for sampling and analysis
- Lack of resources, i.e. trained staff and budget; and
- Non adherence to municipal by-laws.
- Use of appropriate technology is important.
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C. INTEGRATED WATER QUALITY MANAGEMENT

1. Introduction

South Africa is facing a large and complex water challenge, which, if not addressed effectively, has the potential to limit the economic growth potential of the country.

The deteriorating quality of water in rivers, streams, dams, wetlands, estuaries and aquifers:

- Reduces the amount of water available for productive use,
- Increases the costs of doing business as when water quality declines, many businesses are forced to treat water before using it,
- Impacts on the health of citizens with productivity falling as more work days are lost,
- Effects negatively on South Africa's economic sectors, impacting on crop yields affecting our built and ecological infrastructure, increasing the cost to supply water and affecting ecosystem services and
- Impacts on rural livelihoods as much of South Africa's rural population rely on good quality water to ensure they have healthy crops and livestock, upon which they depend for their daily food and subsistence.

Some of the impacts of water quality deterioration are immediately visible, such as in the case of major fish kills, while others are more deceptive and long term. When added together, these challenges are having a significantly negative impact on socio- economic development issue, but also an economic and developmental issue.

2. Water re-use

The re-use of waste water effluents and other return flows, both treated and untreated currently accounts for approximately 14% of total water use in South Africa and form a significant part of water available for use in some of our important river systems (DWA 2011). As future water demands continue to increase in response to population growth and economic development, availability of natural surface water and groundwater will be under increasing pressure. It follows that re –use of wastewater after treatment, would need to be increasingly utilised as an indispensable additional water resource, given the inevitable future shortfalls in water availability from other sources.

The following terms are commonly used in the re-use domain (DWA,2011; city of Cape town, 2015):

- Direct re-use: Re-use of treated or untreated wastewater by directly transferring it from the site where it is produced to a different/separate facility for further use.
- Indirect re-use: Re-use of treated or untreated wastewater after it has been discharged into a natural surface water or groundwater body, from which water is taken for further use.
- Direct potable re-use: Treating the used water to a level which is fit for direct use by a second water user.
- Indirect potable re-use: Treating the used water and discharging the treated water to a natural or man-made stream, dam, aquifer, etc. before abstraction and use by a second downstream water user.
- Recycling: utilisation of treated or untreated wastewater for the same process that generated it; i.e. it does not involve a change of user, for instance, recycling the effluents in a pulp and paper mill.
- Reclaimed water: Wastewater that has been treated to a level that is suitable for sustainable and safe re-use.
- Return flows: treated and/or untreated wastewater that is discharged to a natural surface water or groundwater body after use.

3. Challenges

- Applying the right technology at the right application,
- Changing perceptions on the re-use of waste water and
- Achieving sustainable financial models for the different technologies.
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5 TECHNOLOGY GAPS WITH IMPACTED WATER TREATMENT

5.1. Acid Mine Drainage (AMD)/ mine water; sewage return flow/ seawater desalination)

- **High-Density Sludge (HSDS)**

HDS is a proven (CSIR-developed process) technology for the treatment of mine water with low pH and high metal loads. It is a rapid and relatively-easy process that generates an effluent with a suitable pH and significant improvement in metal concentrations. HDS treatment generates a waste sludge which is amenable for disposal onto a mine waste facility. HDS is thus used in bulk pre-treatment of raw mine water, before the effluent may be further treated for re-use.

Limitations:

- Large volumes of alkali material (calcium carbonate and/ or calcium hydroxide); transport and storage costs

- Mechanical infrastructure needed for agitation and aeration (to improve HDS reactions), and sludge handling and disposal (pumps with high power demand)
- Acquisition of sites for sludge disposal in line with waste management legislation may be problematic
- Sulphate recovery limited to approximately 50%

Reverse Osmosis (RO)

RO desalination of post-HDS mine water is the industrial standard for generating potable water after disinfection. It has been proven on bulk scale at e.g. the Emalahleni and Optimum Coal Mine Water Reclamation Plants. Water produced is of potable quality as per SANS 241: 2015. A similar approach is contemplated for the Wits AMD Project.

Limitations:

- Expensive and non-recyclable membranes needed
- Energy intensive
- Membranes readily fouled by organic material and hydrocarbons
- Requires brine storage disposal facility in line with waste management legislation

6. Challenges

- Identify and develop more suitable passive treatment systems with less maintenance
- Identify and develop financial sustainable solutions for the treatment of mine effluent
- Identify newer generation membranes that are more efficient and capable of being chemically re-generated.
- Evaluate brine reprocessing to ensure brine storage or disposal is negated
- Evaluate use of HDS sludge as aggregate in mine backfill, road construction, aggregate additive, soil conditioner