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SUMMARY OF WATER RELATED CHALLENGES IN SOUTH AFRICA

2018

INTRODUCTION

This summary was compiled by the Federation for a Sustainable Environment (FSE) grounded upon its involvement as member of the various organs of state's project steering committees, study steering committees, expert steering committees, advisory committees, task teams, forums, etc. since and prior to its inauguration in 2007.

PREFATORY

South Africa shares the following four river passing with its neighbours: The Limpopo, Inkomati, Pongola/Maputo and Orange Rivers.

Providing for the ecological water requirements is a legal priority. Implementation of the Ecological Reserve is expected to result in serious deficits in some of the main river catchments.

EXTRACTS FROM THE DRAFT (WORK IN PROGRESS) NATIONAL WATER AND SANITATION MASTER PLAN (8 DECEMBER 2017):

- The impact of this plan will be delivered through action, and through the recognition that "*you cannot drink paper plans*".
- Water Resources and Water Supply:
    - Water security is a critical challenge confronting South Africa.
    - Water security presents a profound challenge to South Africa's social wellbeing and economic growth.
    - South Africa's water scarcity could get rapidly worse as supply contracts and demands escalates due to growth, urbanization, unsustainable use, degradation of wetlands, water losses and a decrease in rainfall due to climate change.

- Based on current demand projections, the water deficit confronting the country could be between 2. 7 and 3.8 billion cubic meters, a gap of approximately 17% by 2030.
- The South African water sector must take bold steps to adopt a 'new normal' to head off the projected water gap.
- 56% of the over 1 150 Waste Water Treatment Works are in poor and critical state, and must be rehabilitated urgently and properly maintained thereafter.
- 44% of 962 domestic Local Government Water Treatment Works are in a poor condition and must be urgently rehabilitated.
- South African must restore raw water quality: deteriorating water quality is a major constraint to economic and social developments.
- A lack of data and information resulting from weak monitoring systems poses high risks to decision making and planning and must be urgently addressed by repairing and maintaining measuring infrastructure, adopting new monitoring technologies, and improving data management and distribution.
- Ensure that competent staff are in charge of the Waste Water Treatment Works, that monitoring is done diligently and that where there is a problem encountered, it is addressed immediately and suitably.
- **The National Development Plan and the Reconciliation Strategies for the Orange and Vaal Rivers envisioned the completion of the Lesotho Highland Water Project Phase by 2020 to address the growing deficit within the Vaal River System. It has been delayed to 2025.**
- **The Reconciliation Strategy for the Integrated Vaal River System envisioned the desalination of Acid Mine Drainage (AMD) by 2014/2015 to address the growing deficit within the Vaal River System. It has been delayed to 2022.**
- The key objectives of the National Water and Sanitation Master Plan are:
  - Resilient and fit for use water supply
  - Universal water and sanitation provision
  - Equitable sharing and allocation of resources
  - Effective infrastructure management operation and maintenance
  - Reduction in water demand projections.
- Approval of mine closure should ensure financial provision of mine water management and therefore comprehensive and bankable mine water management plans.
- The current water supply reliability is only at 65%. In the 27 priority district municipalities, the water reliability is only 42% with the worst 10 Water Services Authorities below 30% reliability.

- Sanitation and Wastewater Treatment
  - The Green Drop assessments have not been undertaken since 2014.
  - Public water authorities are unable to attract adequate numbers of specialised technical staff required to effectively operate and maintain water schemes. The situation is exacerbated by an under-recovery of revenue which further prevents operational plans from being effectively implemented.
  - Deterioration of water resource quality is often because of failing sewer collector mains and pump- sets, and dysfunctional wastewater treatment works. Most of these failures are due to wastewater treatment facilities being operated beyond design capacity or being operated by process controllers who lack the necessary expertise.
- Water Demand Management
  - The development of new mines in water scarce areas requires forward planning to make arrangements for the transfer of water and development of new sources.
- Water Quality Management:

    - Approximately 83% of the country's national monitoring sites reflect some form of water quality challenges.
    - Deteriorating water quality has the potential to significantly limit the economic growth potential of the country. The deterioration of water quality in rivers, streams, dams, wetlands, estuaries and aquifers impacts on the economy, on human health and on the healthy functioning of aquatic ecosystems.
    - Deteriorating water quality reduces the amount of water available for use as more water must be retained to maintain the dilution capacity in our river systems. It increases the costs of doing business as many enterprises are forced to treat water before using it in their industrial processes.
    - Most of the country's water resources are negatively impacted by:
        - Salinity
        - Radioactivity
        - Metals from mining and waste disposal
        - Excessive sediments
        - Agricultural chemicals
        - Acid atmospheric chemicals
        - Groundwater contamination
        - Urban/industrial effluent
    - Water quality management is a government wide task, to be implemented under strong leadership of the DWS with both the private sector and civil society playing a role.
    - Several mega trends have been identified, which can be expected to unfold in South Africa during the next few decades and which could lead to new or accelerated water quality challenges. These include:
        - Climate change
        - Hydraulic fracturing
        - Rural-urban migration and growth of inadequately serviced densely populated settlements
        - The adopting of new manufacturing and industrial processes
        - Water Re-use
- Water Ecological Systems
    - The protection of the ecological infrastructure of our natural aquatic ecosystems is crucial for economic development, water and food security and the assurance of healthy and functional water resources that will support future sustainable development
    - Fifty-seven percent or river ecosystem types are threatened. 65% of main rivers are threatened including 46% critically endangered.
    - High water yield areas constitute only 4% of South Africa's surface area and are the water factories of the country. Currently only 18% of them have any form of formal protection.
    - 65% of wetland ecosystem types are threatened making wetlands the most threatened of all ecosystems. 71% of them are not being protected at all. Wetlands are exceptionally high value ecosystems that make up only a small fraction of the surface area of the country.
- Policies, Legislation and Strategies
    - Grey areas in responsibility and accountability
    - Institutional arrangements are fragmented among a large number of water boards, catchment management agencies and municipalities.
    - Poor alignment of policies and strategies between various government departments and spheres of government

    - Lack of policy and legislative integration between DWS, DAFF and the Department of Mineral Resources
    - Inadequate maintenance and control of effluent from waste water treatment by Municipalities.
- Regulation and authorisation
    - The existing regulatory framework is highly complex in that multiple stakeholders/role-players are involved and different regulatory authorities
    - The current regulatory capacity in the water sector is insufficient both in terms of the number of skilled staff to implement regulatory requirements and in the appropriate tools for regulation in the context of limited staff and financial resources.
    - The capacity to collect and collate information and report on an ongoing basis and the capacity of the regulatory authorities to interpret and respond appropriately and timeously to the information is a major challenge
- Governance and Institutional Arrangements
    - The performance of DWS with respect to the management of national and regional water resource infrastructure has been poor
    - Poor collection of water use charges means that maintenance of water resources infrastructure is under-funded.
    - The requirement of off-take agreements prior to the construction of large infrastructure projects has led to delays in implementation that have increased water vulnerability, particularly in Cape Town, Durban and Gauteng.
    - The establishment of Catchment Management Agencies has been slow. Only two were established and are functional
- Human Resources, Skills development and Capacity
    - Three key challenges – number of vacancies in critical areas especially engineering; development of new skills for a hanging environment; and development of functional skills for incumbents in water sector institutions
    - Significant skills gaps in all water sector institutions
    - 800 vacancies
    - Experienced professionals are leaving pubic institutions to work in the private sector due partly to the inability of public sector institutions to attract and retain such staff
    - Mentoring of new entrants into the water sector has become a major challenge due to the s
    - Shortage of experienced personnel in the public sector
    - Impact assessments are hardly ever conducted
    - The ongoing retirement of a large cohort of older, experienced workers is leaving significant gaps in skills and experience in the sector
    - Resource constraints
    - New capability requirements to meet the emerging demands of climate change, environmental management, new technologies
- International water cooperation
- Research, Development and Innovation.

<u>IN TERMS OF THE MINE WATER MANAGEMENT POLICY (2017):</u>

In the current legislation(s): NEMA, MPRDA and NWA mine water management is not formally defined and this may continue to hinder process of dealing with mine water management decisively. These policy principles may require legislative review or policy alignment. The existing frameworks place the government in the position of having to be reactive rather than proactive as far as mine water management is concerned.

- Integrated Approaches to Mine Closure
  The delegation of powers between different government departments at the national, provincial and municipal levels is unclear. Institutional roles and responsibilities are fragmented, overlapping or vaguely defined. There is a need to rationalise and align national legislation, even our own NWA to remove ambiguity and address mine water directly.
- Apportionment of Liabilities
  The MPRDA may play a leading role in the mining sector, but persons/companies/institutions still have to comply with other statutory duties under the NEMA and the NWA. Liability thus is based on a consistent and comprehensive application of the abovementioned (not limited to) legislations. This suggests that any person/company/institution that can be proven to fall within the ambit of Section 19 NWA, and/ or Section 28 NEMA, and/ or Section 45 MPRDA, can be held legally liable for damages and/ or negative impacts caused by mine water. The legislation needs to be strengthened, to give the DWS a strong legislative basis to impose sanctions and apportion of liabilities. The best funding models to deal with historic pollution should be identified. Abandoned mines need to be rehabilitated by DWS in cases where water security is at risk. Within the context of mine water, and given the magnitude of this challenge, it remains prudent that possible apportionment of liabilities be considered within the existing legislative frameworks. This will provide a legal basis for holding parties potentially liable for negative effects and damages of mine water related pollution and/or any other negative impacts that can be related to mine water.

- Optimum use of Appropriate and Cost Effective Technology
  The DWS recently completed a Feasibility Study to identify the best plan of action for a long term solution that uses a proven acid mine water treatment technology and produces useable water. Options for passive, biological, chemical and physical treatment were assessed. The only technologies which are proven for treatment of the expected volumes to the required standard, and which constitute the Reference Project are:
  - High Density Sludge (HDS) for neutralisation and metal removal (Chemical Treatment), as per the Short Term Intervention (STI), currently being implemented in the Witwatersrand.
  - Reverse Osmosis (RO) for desalination (Physical Treatment); and
  - Ion Exchange (IX) for uranium removal (Physical-Chemical Treatment) if required

- Classification and Differentiation of Mines
  The current legal and policy context does not draw a clear distinction between the handling and regulation of (1) new, (2) active and (3) historic mines (including abandoned mines). The current legal and policy context does not impose special and/ or stricter measures in the case of mines with a significant adverse impact potential. Specific conditions should be imposed on mines that have an acid generation potential.

- Promotion of Sustainable Mine Development
  There is a perception that mining is often authorised, irrespective of whether the long-term "sustainability" outweighs the long-term "cost of impact", including the costs for managing mine water. More investigation is required on the possibility to use the green approach in mining. This will involve investigations on green technologies, sustainable mining methods, etc. and the evaluation of socio-economic sustainability.

- User Commitment to Sustainable Water Resource Protection
  Apportioning liability remains problematic. The NWA has gaps with regards to "retrospective liability". The application of retrospective liability is currently provided for under the NEMA. The impacts caused by mine water drainages e.g. AMD is often externalised by the mining sector,

whether during active mining or subsequent to mine closure. Financial provision predominantly applies to surface rehabilitation.

- Environmental Vigilance and Continuous Improvement

  From a mine water management perspective, there often appears to be a mismatch between environmental planning and the actual interventions earmarked for implementation. Access to information by the general public also appears to be a major challenge limiting the overall public from participating. The DMR mandate, i.e. to promote minerals development, appears to be incompatible with DWS's mandate, i.e. to protect and use water resources sustainably. Mining authorisations often appear to be granted for mines that are to mine in water sensitive areas. From a mining sector perspective – significant impacts due to AMD are often attended to on a case-by-case basis. From a regulatory perspective – an "Integrated Master Plan" is currently required for the regulation of future mining developments. Mining authorisations appear to be granted on an ad hoc basis without the necessary consultations amongst the relevant Government Departments (DMR, DWS and DEA). It is hoped that the recently-adopted one environmental permitting system will address this gap.

- Institutional Arrangements on Infrastructure Management/Transfer after Mine Closure

  The Mining Charter provides that mines are expected to design and plan all operations so that adequate resources are available to meet the closure requirements of all operations. Section 28(2)(c) of the MPRDA contemplates that mines should report on their compliance to the Mining Charter on annual basis. However in instances where a mine is declared insolvent and subsequently closes, the responsibility is inherited by the State who then has to ensure the continuous rehabilitation of derelict and ownerless mines. Technically, the mine escapes liability and the rehabilitation fund provided prior by the mine is often not sufficient for continuous infrastructure management and rehabilitation. As a result, mine water is left unmanaged if transfer has not taken place which then typically becomes a State liability.

- Reuse of treated mine water, including AMD

  Evidence depicts that supplying South Africa's growing population with clean, safe drinking water is a significant challenge. Not only is the country's water infrastructure in need of refurbishment in some places and entirely absent in many others, but access to sufficiently large quantities of potable water is increasingly becoming a challenge. Acid mine water often contains toxic heavy metals and radioactive particles, or is acidic and can be extremely harmful to the health of humans, animals and plants. Situated in the Witbank Coalfields in the Mpumalanga Province of South Africa, the EMalahleni Waste Water Reclamation Plant uses reverse osmosis to desalinate underground water, and provides potable water that is used to benefit local needs. It should be noted that whilst reverse osmosis is the front runner for most treatments, there is a plethora of other treatments and technologies that can be used. This is done through partnership between Anglo American, EMalahleni Local Municipality and BHP Billiton Energy Coal South Africa (BECSA). While this is encouraging and should be supported and the responsibility is clear when mine is still in operation, however the challenge is when the mine has reached its life span (mining activities ceased), there is no appropriate mechanism to continue to take operational responsibilities to sustain AMD Management Operations.

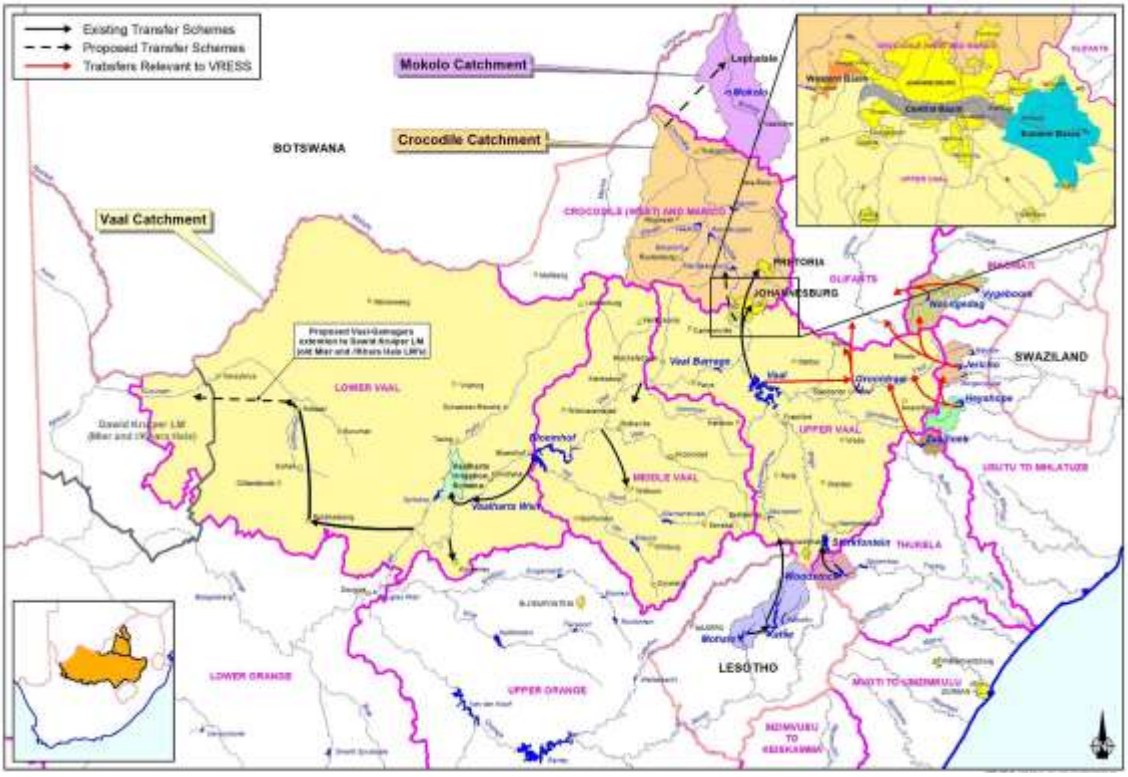
IN TERMS OF THE DEPARTMENT OF WATER AND SANITATION'S WATER QUALITY STRATEGY AND POLICY:

Problem Statements

- Currently effective Integrated Water Quality Management (IWQM) is hampered by poor co-ordination, siloed planning and conflicting approaches between the various government departments and spheres of government
- Municipalities are a major source of waste water containing pollution
- Non-Government support for water quality management – far too many enterprises continue to contravene legislation and pollute water resources
- Water pollution arises from a number of sources in a catchment, whether direct discharge or diffuse pollution arising from run-off from land based activities. Water pollution affects both surface and ground water resources. Pollution is mobile moving along the length of a water resource with the potential for increased cumulative impacts from multiple sources. It therefore requires integrated and adaptive water quality management. Adding to the complexity of managing water quality is the fact that catchments are complex social ecological systems, subject to continual change arising from external influences and internal system changes. **Weak cooperative governance between critical government departments is compounded by the limited resources (particularly human and financial) that are available for addressing these challenges.**
- The water resource quality within South Africa is declining with assessments reflecting that some 83% of water resources having some form of implication for the fitness of use for one or other user groups. This deterioration of water quality will be one of the major threats to the country's ability to provide sufficient water of suitable quality that can support development needs, whilst at the same time ensuring the environmental sustainability of the water use. The most significant issue in this regard is the ability to control sources of pollution and to manage pollution when it is necessary. Key drives are the growing population, the need to develop the social economy to support ongoing development objectives, increasing urbanisation, the introduction of new contaminants and climate change.
- The financial resources currently available for managing water quality are insufficient for the task, and do not recognise the level of investment that is required to counteract the economic harm done by declining water quality.
- Water quality challenges have historically been viewed as "technical", with the result that the funding required for Integrated Water Quality Management has often been insufficient. **The funding related challenges are:**
    - **Inadequate funding raised through the administrative and regulatory mechanisms available to the DWS due for instance to delayed implementation of the Waste Discharge Charge System and the inadequate cost of a water Use Licence Administration fee;**
    - **Continued culture of non-payment;**
    - **Lack of political will to hold major polluters accountable;**
    - **The lack of sustainable financial models for local government, leading to inadequate funds to maintain Waste Water Treatment Works, such as ring fencing of funds to appropriate solution;**
    - **Inadequate implementation of environmental provisions related to mine rehabilitation:**
    - **Poor co-ordination and planning across the sector, and**
    - **Economic Policy uncertainties and anomalies as well as the generally uncertain political climate, which have resulted in inadequate investment by private sector companies.**

    - **In relation to mining activities, ensuring sufficient funding for Integrated Water Quality Management after mine closure remains a significant challenges.**
    - **In order for the Waste Discharge Levy to be introduced, an amendment to the NWA is required to give the Minister permission to promulgate a Money Bill.**
- The burden of funding water quality management has broadly fallen to the state supported by revenue generated by water use charges or funds claimed for the rehabilitation of pollution incidents.
- South African water quality monitoring programmes are constrained by limited financial resources, inadequate number of suitably skilled staff, uneven availability of access to accredited laboratories for testing samples and the complexity of monitoring the number and variety of pollutants entering water resources, including new and emerging pollutants.
- Key strategic issues requiring attention related to research and development are:
    - Lack of alignment of water research objectives, thrusts and programmes with the broader national policies and strategies relating to water resources management and water use;
    - Limited participation of sector-wide stakeholders in the setting and execution of the water-related research and innovation agenda for the country;
    - Availability of skills and expertise in water research; and
    - Insufficient allocation of financial resources for water sector research and innovation.
- Capacity Building and Training:
    - Historically, the DWS ran regular training programmes for water quality officials, resulting in a highly trained cadre of officials. However, over the past decade, these training programmes have fallen away leaving a shortfall in the opportunities for staff to develop their understanding of Integrated Water Quality Management (IWQM). This has resulted in ineffective implementation of IWQM programmes and inadequate regulation of water use.
    - There is a shortfall in capacity across and between Government Departments.
    - There are concern that the competencies of staff within some key technical positions do not have the necessary training and qualifications to perform the functions required of them. This is particularly of concern regarding the technical skills required of municipal staff operating the Waste Water Treatment Works.

Figure 1: The study area for the Reconciliation Strategy for the Integrated Vaal River System – Phase 2



The document provides background information, explains the rationale for the study and requesting participation from stakeholders to assist the DWS to ensure sufficient water resource availability for the study area until 2040.

The Department of Water and Sanitation has commissioned a three-year study (2018 – 2020) for the continuation of the Integrated Vaal River System Reconciliation Strategy Study – Phase 2. The initial strategy for the Vaal River System was developed in 2009 with the main objective to reconcile the current and future water requirements with the available water by implementing appropriate interventions to increase the available water, conserve water through conservation and demand management measures as well as improve the water quality in the river systems.

The strategy developed in 2009 has been implemented, monitored and updated over the 2010-2015 period to ensure that it remains relevant under prevailing conditions. This study is part of an on-going process to ensure the relevance of management of the Integrated Vaal River System to confirm sufficient water availability. The DWS works closely with the Strategy Steering

Committee (SSC) to implement the strategy, maintain its relevance and to continue to ensure efficient planning.

Study Area

The study area comprises the water resources of the Vaal River System which includes the catchments of the Upper, Middle and the Lower Vaal Water Management Areas (WMAs) – from Kuruman in the west to Ermelo in the east and Johannesburg in the north to the Lesotho border in the south. Other sub-systems that also form part of Integrated Vaal River System or are linked to the Vaal River System are indicated on the map – see page 6.

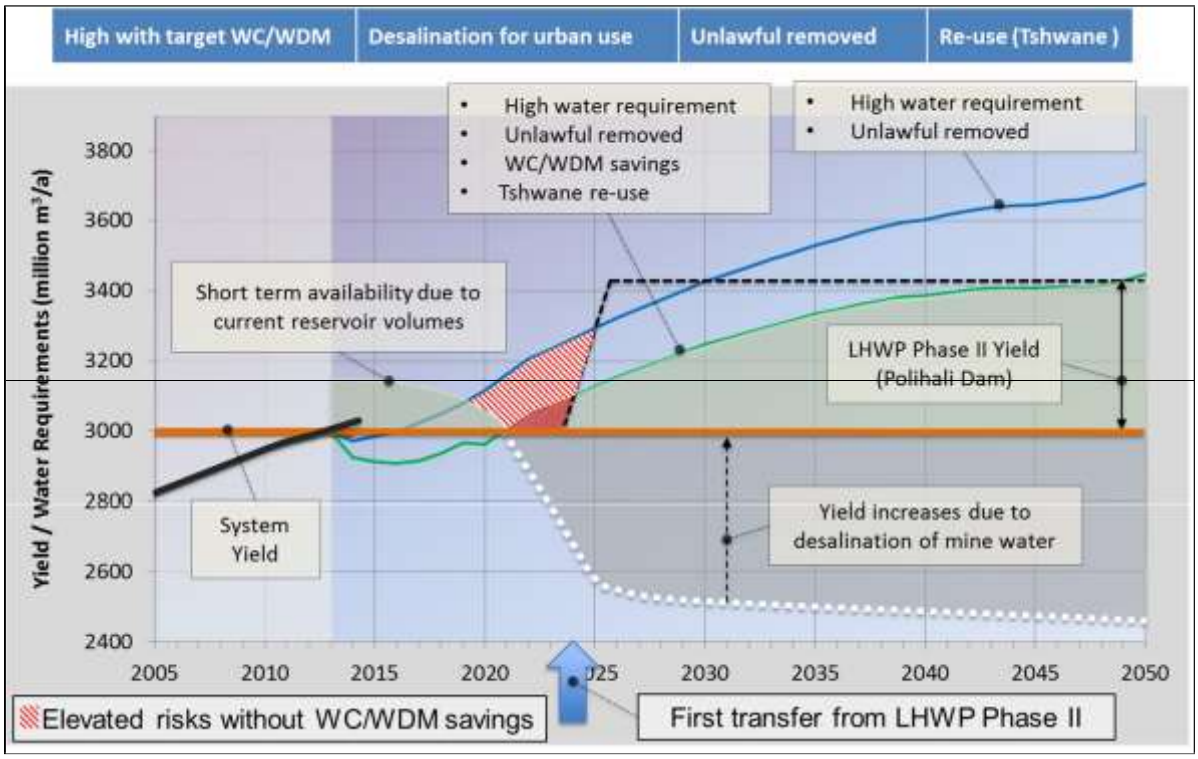
Considerable variations in climatic conditions occur over the three WMAs. The Mean Annual Precipitation (MAP) decreases from 800 mm in the Upper Vaal to 500 mm in the Middle Vaal and 100 mm in the Lower Vaal WMA. This tendency is reversed when considering potential annual evapotranspiration, which increases from 1300 mm in the Upper Vaal to 2800 mm in the Lower Vaal WMA. The land use in the Upper Vaal WMA is characterised by the sprawling urban and industrial areas in the northern and western parts of the WMA. There is also extensive coal and gold mining activities located in the Upper Vaal WMA. These activities are generating substantial return flow volumes in the form of treated effluent from the urban areas and mine dewatering that are discharged into the river system. These discharges are having significant impacts on the water quality in the main stem of the Vaal River, throughout all three the WMAs.

System Balance for Target Reconciliation Scenario (June 2015)

The Upper Vaal WMA is economically important, contributing nearly 20% of the Gross Domestic Product of South Africa, which is the second largest contribution to the national wealth amongst all of the WMAs in the country. The potential for future economic growth in this WMA remains strong. Growth will largely be attracted to the already strong urban and industrial areas in the Johannesburg-Vereeniging-Vanderbijlpark complex.

The system balance for the target reconciliation scenario form the Continuation of the Integrated Vaal River System Reconciliation Strategy Study (PHASE 1) is presented in **Figure: 1**.

Figure 2: System balance for target reconciliation scenario (June 2015)



Based on the presented results, the previous phase of the study concluded that Water Conservation and Water Demand Management (WC/WDM) (Project 15%), eradication of unlawful water use in the irrigation sector, desalination of mine water and the re-use of water (Tshwane Project) are essential interventions to limit the risk of drought restrictions until the Lesotho Highland Water Project (LHWP) Phase 2 can be implemented in the year 2024.

The risk of needing to implement drought restrictions in the Vaal River System will increase until Phase 2 of the LWHP can deliver water into Vaal Dam. Appropriate preparedness plans need to be put in place in all sectors and at all levels of the water supply chain to ensure consumption can be reduce when droughts occur as a measure to prevent complete failure in supply and before dams are depleted and empty.

Compiled by Mariette Liefferink, on behalf of the Federation for a Sustainable Environment.

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