

Water recycling

Reusing water for domestic purposes – a discussion document

The WRC has published a discussion document for the water sector on implementation plans for the direct and indirect water-reuse for domestic purposes.

Background

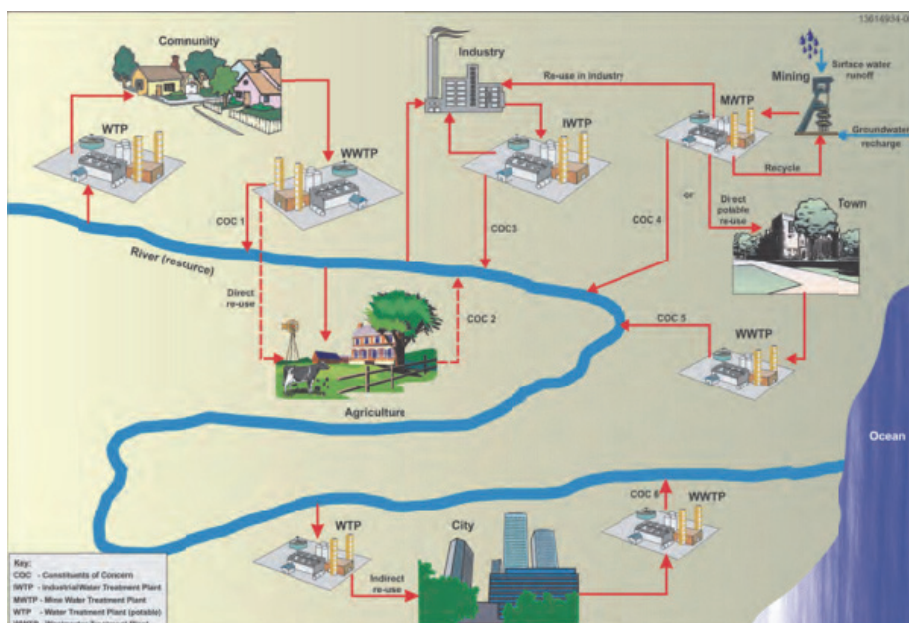
The Department of Water and Sanitation (DWS) published the second version of the National Water Resources Strategy in 2013. This strategy adopts a holistic approach towards water management, its availability and use.

More importantly, it defines water resources in a much broader context. It recognises that the potential for development of additional conventional surface water resources is limited and that other reconciliation options need to be implemented, such as water conservation and water demand management, among others.

The DWS developed a National Strategy for Water Reuse, which provides a considered approach to the implementation of water reuse projects.

Drivers for water security

The drivers for the reuse of treated wastewater are mostly determined by water security, which is threatened by limited available water resources, population growth, access to water and climatic conditions. In South Africa, the main driver is water security. South Africa has a limited supply of water with an uneven geographic distribution thereof, in regions which range from semi-desert to tropical.



Typical catchment water use and reuse.

The rainfall is also highly variable, with frequent severe water shortages. Intensive industrial, mining and urban development aggravates this problem, creating a vital need for water reuse in the country.

It is estimated that the population growth is 2.4% a year. This means that the water demand is likely to exceed available water resources in selected water management areas in the short to medium term. Water reuse and recycling is thus an undeniably necessary supplement to freshwater use.

Objectives of the WRC project

The WRC commissioned a short-term research project focused specifically on the direct and indirect reuse of water for domestic/potable purposes as a proactive step to generate a sector discussion document for the progressive implementation of the Water Reuse Strategy.

The aim of this project was to develop a plan to bridge the gap between the strategy and implementation of water reuse for domestic/potable water use.

Among others, a consultation workshop was held involving various stakeholders to review international best practices and to discuss a way forward in terms of water reuse for potable purposes in South Africa.

The final document attempts to assist decision-makers and key roleplayers in water reuse implementation to set water reuse in motion and to generate an enabling environment (political, regulatory, social and economical) which encourages reuse.

Key elements towards sustainable water reuse

Promoting sound decision-making

There are several important factors that can enable and support good decision-making:

- A sound and clear policy and legislative framework, implying the project implementers and water users know rights and obligations, and what they can and cannot do.
- Water reuse benefits and challenges are clearly understood, and prices and costs accurately reflect the relative benefits among alternatives so that incentives are not distorted; and
- Decision-makers have access to relevant information and support to make informed decisions to implement water reuse projects.

One of the key outcomes from the workshop was that water resource alternatives need to be considered when evaluating a direct domestic reuse scheme, especially the direct reuse of treated wastewater. Water conservation/water demand management and the reduction of non-revenue water must be implemented before considering water reuse by a local industry which, in turn, reduces the fresh/potable water requirements.

It was agreed that the following key steps are needed to take water reuse projects forward:

- Assess the best technical scheme for domestic/potable water supply (in a specific catchment or region), taking factors such as input water quality, technology, health and safety, cost effectiveness, impacts on downstream users etc. into account and
- Incorporate the plan into the next water reconciliation plan (for that particular catchment or region), cost and budget for it.

Fundamentally, a water resource decision needs to be taken based on a comparison of alternative potential water resources. Seawater desalination may prove to be the most viable option for water supply at coastal cities; however, pumping this water to inland cities may be too costly. Reuse of domestic wastewater may therefore be an attractive water-supply option for inland cities.

Recommendation: Develop clear regulatory guidance and incentives to support water reuse projects where appropriate. Develop, document and disseminate decision-making methodologies in cases where water reuse is one of several water resources development/water-supply project options.

Creating a clear policy and legislative environment

Water reuse projects typically involve a range of activities that are subject to regulatory authorisation and control. The fact that these regulatory controls exist in so many different acts, and that regulatory mandates and approaches may differ between the acts, makes it difficult to implement water reuse projects confidently, speedily and cost-effectively. This makes water reuse projects less favourable compared to other alternatives even where it is practical and cost-effective to reuse wastewater.

Successful implementation of water reuse across the country will not be possible without a competent lead agency to promote reuse. A lead agency should thus be identified and

a mandate should be given to this agency to drive implementation, to unblock bottlenecks and to instil trust in the regulatory support for such projects.

This agency will be actively involved in public education and awareness programmes. However, public awareness alone is not enough to encourage water reuse. The lead agency must have a minimum threshold of capacity and competency, being able to prove that it has sufficient technical expertise, planning ability, project management capability, financial strength and rating. It must demonstrate its capability in supporting and promoting water reuse projects.

Recommendation: Document the current regulatory compliance map for different types of water reuse schemes and identify gaps as well as aspects that hinder implementation of water reuse. Facilitate discussions between the relevant departments to develop an enabling legislative framework.

Review water quality standards

Water quality standards for discharges into water resource and water quality standards and regulations for different types of water use play a large role in influencing water reuse decisions. It is important that these standards are realistic and achievable while not compromising public safety and the environment.

The following standards exist:

- South African Water Quality Guidelines for a number of different water use sectors
- Drinking water quality standards (SANS 241)
- General and Special Standards pertaining to the discharge of treated wastewater to the water resource

These standards and guidelines were not specifically developed to address the issues associated with water reuse. Worldwide research into water reuse is producing new information, which needs to be considered in guiding and regulating water reuse projects.

Water reuse projects may be implemented for a large spectrum of potential water users. The different categories/types of water reuse will require quantitative standards to define and manage the fitness for use. The standards must be developed to address the following aspects:

- Water quality variables of concern in a specific water reuse application
- Quantification of risk and acceptable risk levels

- Monitoring requirements in terms of water quality variables, frequency and location of sampling/analysis

WRC project nr. K5/2208 is investigating the social, institutional and economic implications of wastewater reuse for potable/household purposes. This project focuses on water quality aspects and public perception, looking at examples of other projects in the world in terms of institutional set-up, reviewing existing monitoring data, etc.

Clear incentives

Water reuse projects are much more likely to be implemented where it is more cost-effective compared to other water resource development and supply alternatives. Households and business have limited budgets and will generally choose least cost options to meet their water use needs.

Similarly, municipalities are resource constrained and typically opt for least cost choices related to securing water supplies for their residents, businesses, and industries in order to limit water price and municipal rate increases.

Sound water reuse outcomes will arise where the relative costs and benefits of alternatives are not distorted. Where freshwater supplies are subsidised, water users are less likely to choose water reuse options even if these options are cost-competitive with the cost of securing additional freshwater supplies. Conversely, subsidising the reuse of water is unlikely to lead to least-cost outcomes and the efficient allocation of resources.

Recommendation: DWS to consider the importance of price signals and incentives in water reuse decisions when reviewing the water pricing strategy.

Information and capacity to support sound decision-making

DWS recognises the important role that good information plays in supporting sound decisions. There are three aspects of information to consider:

- Educating users with respect to the benefits and acceptance of water reuse
- Sound methodology in the evaluation of water resource options to balance water requirements and supply and
- Providing people who are considering water reuse with clear guidelines on how to implement water reuse projects.

Public education and awareness

The concept and implementation of domestic/potable water reuse will require a focused and sustained public education programme to develop and entrench awareness of the different facets of water use and, specifically, water reuse.

Multiple awareness creation and information campaigns related to a spectrum of water-related matters are launched by DWS, public institutions and private companies each year. It is important to develop and incorporate communication material related to water reuse into these campaigns.

Public perceptions and opinion vary on the topic of water reuse, specifically as it relates to indirect or direct water reuse for domestic/potable applications. A structured communication strategy must be developed and implemented based on:

- An understanding of the diversity of perceptions and opinions
- Appropriate material to inform the public and stakeholders
- Active communication and debate on the topic
- Targeted media coverage

The overall objective of public awareness creation and information dissemination programmes is to enhance the understanding and promote informed decision-making related to water reuse.

The current public perceptions and awareness of the poor operation, maintenance and performance of municipal wastewater treatment plants pose a specific challenge. It will be difficult to gather support for water reuse within the current situation.

The national efforts to address the poor performance of municipal wastewater and effluent treatment plants may have to show results on a consistent basis, before placing water reuse onto the national water agenda.

Recommendation: Development and implement a structure communication strategy based on an understanding of the diversity of perceptions and opinions; appropriate material to inform the public and stakeholders; active communication and debate on the topic; and targeted media coverage.

Technology innovation and development

A range of water reuse projects have been implemented in South Africa. The country therefore has the potential to be

a leading innovator in water reuse technology, particularly in the area of the treatment and reclamation of acid mine drainage.

It is recommended that water reuse technology should be made a key focus area, and the development of centres of excellence in this field should be encouraged.

Capacity to implement

Water reuse projects have many sophisticated technical, engineering, financial, operational and maintenance aspects. A key consideration to any such project is the fact that the water typically has to be treated to improve/upgrade its quality, before it is fit for reuse by a downstream user. The downstream user must be guaranteed an appropriate quality of water to protect designated use of the water. Reuse projects therefore require a high level of confidence in the implementation and operating agencies.

In addition, water reuse projects will typically incorporate more sophisticated treatment technology and systems compared to conventional freshwater and groundwater treatment. Such projects will fail unless trained, knowledgeable and motivated operations and maintenance staff is available.

It is strategically important to implement the following actions:

- Prepare an assessment of the current and future skilled and trained people needed to operate water reclamation, water recycling and water reuse projects
- Encourage water services authorities and water services providers to consider and plan for the staffing and training needs to support water reuse projects
- Alert training and educational institutions in the water sector of growing needs for trained and skilled operations and maintenance staff

The planning and implementation of water reuse projects must also include a comprehensive assessment of operations and maintenance aspects, including staffing, resources, and system requirements.

Financing water reuse projects

Water reuse projects may be financed through the municipal infrastructure grant, regional bulk infrastructure grant, loans from development and commercial banks, project financing linked to public-private partnerships and through bonds issued by agencies such as the TCTA. The waste discharge charge can also provide a source of funding for water reuse projects.

This may specifically apply to indirect water reuse projects, where an upstream wastewater discharge containing residual water is reused by a downstream water user. The downstream user may have to implement relatively sophisticated and expensive water treatment technology and systems to produce water fit for use. The income generated by the water discharge charge system may be applied to offset the incremental treatment cost associated with a reuse project.

Financing considerations are similar to those for other water resource development projects, except that the risk profile of the project may be different.

Enforcement

The performance of existing wastewater treatment plants in terms of meeting discharge standards and reliability is critical to the successful application of water reuse in South Africa. These facilities discharge water that impacts on the safety, economy and fitness for use by downstream users.

Strict enforcement of discharge standards, and addressing the management and performance failures of municipal wastewater treatment plans, is therefore critical to the future of water reuse in South Africa.

Further reading:

To order the report, *Implementation plan for direct and indirect water re-use for domestic purposes – Sector discussion document (Report No. KV 320/13)* contact Publications at Tel: (012) 330-0340, Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.