IWRM Action Hub

IWRM TOOL - C3

Efficiency in Water Management

Summary

Efficiency in water management aims to increase the productivity of the available water by reducing its misuse and wastage. Efficiency in water management aims to align water demand and water supply through a multi-pronged approach at different levels considering social, economic, technical, institutional, and environmental factors. Tools in this sub-section give indications on how to improve water efficiency from the supply and demand perspectives as well as discusses the potential for water reuse and recycling.

What is Water Efficiency?

Water is wasted during conveyance or inefficiently used by many users. Simultaneously, water demand is steadily increasing, creating competition between different users and ecological requirements. At the same time the availability of water itself is dramatically changing. An obvious and necessary method to meet increasing demand is to make the best use out of the available water and utilise non-conventional sources of water or technologies to make more water available within the constraints of existing resources.

Water scarcity occurs when water demands grow beyond the limit of the supply potential (Mishra, 2020). Water efficiency aims to reduce the quantity and/or quality of water required to complete a specific task (Brooks, 2006) or reduce waste of water resources to increase water productivity. As such, the goal of water efficiency is to match water supply with water demand to secure access to water. Traditionally, this is done by increasing water supply capacity. However, this approach has a physical limit dependent of the available amount of water resources. Hence, the importance of alternative methods is increasingly

being realised. Efficiency in water management tackles water insecurity by adjusting both demand and supply, which is further complemented by methods to increase availability of water and preservation of ecosystem services.

Efficiently managing water resources requires an integrated and holistic service delivery approach which encompasses water supply management (e.g. protection, maintenance and expansion of water sources and distribution systems), demand management (e.g., water pricing and public education programs on water conservation), wastewater management, storm water management, research and development, and, where applicable, Public Private Partnerships. It must also include an effective legal, regulatory, and institutional frameworks (ADB, 2010). Every basin is different, and therefore the mix of these different solutions will vary according to hydrological, economic, social, and political viability (Gleick, 2011).

An IWRM Approach to Water Efficiency

Efficiency in water management is an important strategy in IWRM implementation. IWRM requires that the needs of all water users be balanced and that water resources not be compromised for the future by over-extraction (Jønch-Clausen, 2004). Hence, efficiency supports equitable allocation of water between users and for the environment by making the most out of the available water resources. In many developing regions, water supply is insufficient or intermittent, therefore a combination of different interventions will likely be required to achieve water security through efficiency approaches.

Efficiency in water management can be applied across sectors to different levels such as at a river basin level, community level, utility level, industrial level, and household level. At a household level this may include changing water use pattern or installing water saving appliances while at an industrial level water can be conserved by reusing water multiple times for different functions that require successively lower water quality.

In order to effectively implement water efficiency properly, monitoring and awareness raising is required on how, when, and where water is consumed. The analysis and evaluation of water efficiency is dependent on scale (FAO, 2003). An example is measurement of efficiency at a farm scale is comparing water use against amount of yield. Considering the same water at a basin scale, the water not contributing to yield is not lost but returned to the hydrological cycle through evapotranspiration and groundwater recharge. Furthermore, efficiency in water management should also be accounted in terms of economic, social, and ecological terms while also considering reliability and accessibility. Hence, implementing and analysing efficiency in water management must be evaluated at multiple scales to have a holistic and system-wide understanding. Efficiency strategies can be explicitly built into Planning for IWRM (Tools A3). Different components of efficiency strategies are presented below:

- **Social:** While some initiatives for efficiency are more geared towards water users through social and behavioural changes (Tool C5.02). This is particularly important for demand management but also relevant for water reuse and supply efficiency in order to make efficient practices more acceptable for smoother implementation.
- **Institutional and Policy:** Some initiatives for water efficiency are directly associated with water services (Tools B2) such as the operation and maintenance of infrastructures. Maintaining efficiency also requires capacity building (Tools B4).

Furthermore, the push for water efficiency should be supported in the overall policy framework (Tools A1).

- **Technological:** Efficiency includes many that increase the efficiency of appliances and industrial processes, to water conservation. Different technical measures such as water saving appliances can be applied by water users. At the same time water collection, treatment and distribution infrastructures can be improved for conveyance efficiency. Monitoring is the first step required to evaluate efficiency which can be supported through metering systems.

Economic: Efficiency in water management encourages better use of water before plans are made to invest in new infrastructures facilitating major financial and infrastructural. Improving water efficiency allows to gain greater benefits per unit of water. When efficiency gains are ensured, investments in new infrastructure will lead to more effective and efficient water services. Economic Instruments (Tools C4) such as tariff systems can incentivise efficient use and de-incentivise water wastage.

Section Overview

Here is an overview of the Tools contained in this sub-section:

- **Demand Efficiency (Tool C3.01):** This looks at changing water use at the consumer end through water saving devices/appliances or the way people use water. Hence, it requires a combination of technical and social interventions. Demand management has successfully been implemented in locations such as Singapore (Hoo, 2019).
- **Supply Efficiency (Tool C3.02):** This ensures that there are no losses during water abstraction, treatment, or distribution. This involves the maintenance or construction of physical infrastructure to capture, store and distribute more water. Supply efficiency also tackles non-revenue water to ensure economic sustainability of water services and includes universal metering, irrigation canal lining and pressure/leakage reduction.
- **Water Recycling and Reuse (Tool C3.03):** This ensures that used water can be reused for other purposes that require lesser quality of water or treat water for reuse. It is most relevant in water scarce scenarios and can supplement both demand and supply management processes by increasing water availability. This requires technical interventions such as decentralised wastewater treatment or rainwater harvesting complemented by social change to acceptance of water recycling and reuse.
- **Nature-Based Solutions (Tool C3.04):** They are grounded in the sustainable management, use and natural infrastructure for purposes that have been traditionally answered though infrastructural engineering solutions. It can range from green infrastructure investments in the form of artificial wetlands to improved management practices of river basins. Nature-based solutions are environmentally sound and can enhance water availability and storage.

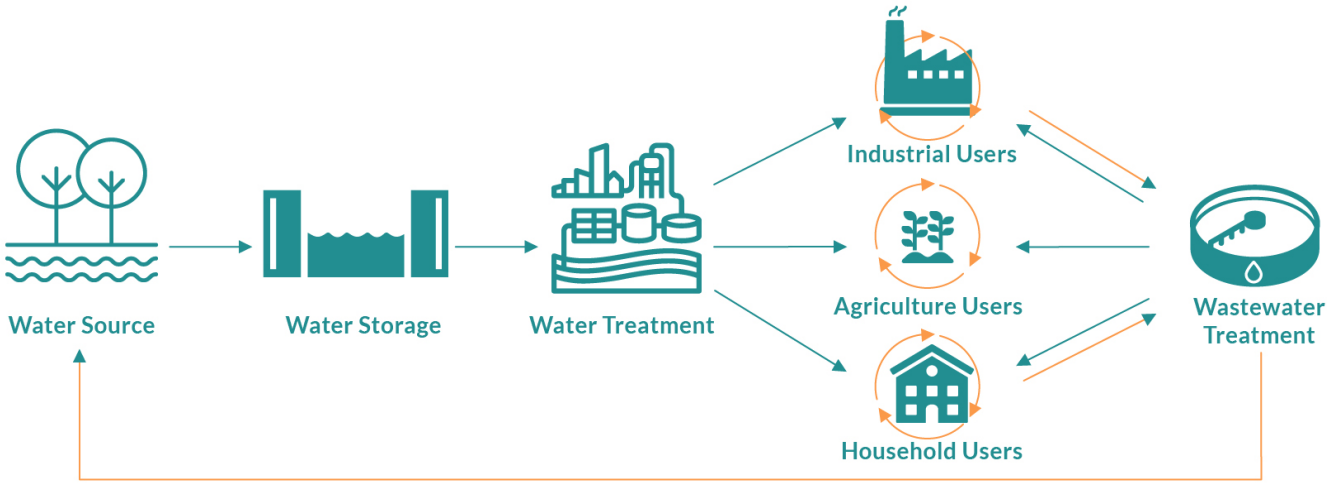

Figure 1. Water Efficiency throughout the water supply cycle (Adapted from Raunak, 2021)

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