IWRM TOOL - C3.01

Demand Efficiency

Demand Efficiency is the optimisation of water use to gain more productivity per drop of water resource. Water Demand Efficiency allows to reduce user-end loss and misuse of water in order to ease pressures resources and limit unsustainable exploitation of water. This Tool introduces water demand efficiency, the need for integrated approaches, and pathways to enhance demand efficiency via social, technological and institutional mechanisms.

What is Demand Efficiency?

Demand efficiency actions can be taken independently from water availability. However, it is often driven by water scarcity. Demand efficiency aims to encourage better use of water before plans are made to increase supply capacity facilitating major financial and infrastructural savings for countries, cities and companies before additional capital is investment for new supply and conveyance facilities. It focuses on reducing loss and misuse during consumption in various water sectors (intra-sector efficiency). This requires reflection and re-evaluation on current water uses.

Using demand efficiency, countries, cities or companies can get most of the available water. A reduction in water use within each sector to optimum levels allows reasonable allocation between various users (cross-sectoral efficiency). In cases of water scarcity, this leads to more equitable distribution of water to vulnerable and marginalised users. Furthermore, it also leads to more water conservation. The process involves limited ecological consequences, allowing more water to be conserved or allocated towards maintaining environmental flows, ecosystem services and the development of in-situ users of water through recreational activities, aquaculture, fisheries and energy (Figure 1).

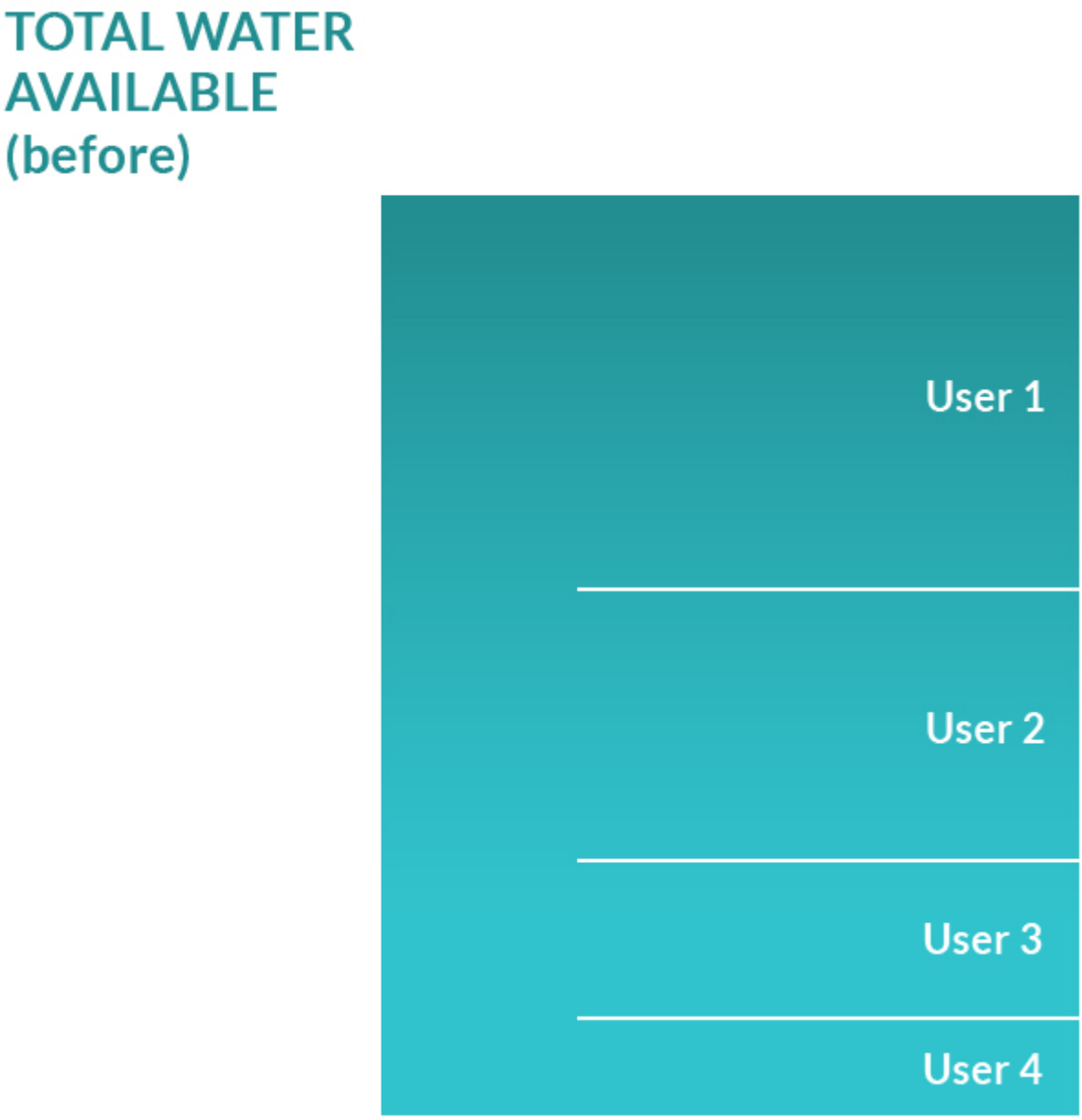

Figure 1. Water allocation before and after demand efficiency

An IWRM Approach Towards Demand Efficiency

There are three major entry points for enhancing demand efficiency, that is, through (1) social, (2) technological, or (3) institutional change. Such demand efficiency actions can be approached through both bottom-up approaches, e.g., households implementing water saving devices by themselves, or top-down approaches, e.g., economic incentives and regulations. However these approaches function in tandem requiring governments, communities and private companies to collaborate to meet water-related needs. Improved efficiency of use is achievable in almost all situations, but the specific tools vary widely, according to circumstances. A multipronged approach to water use efficiency planning is more likely to optimize results by considering all options likely to influence efficiency, including system and behavioural changes (Government of Western Australia, 2020).

Social Change Towards Demand Efficiency

Since water demand arises from multiple users, demand efficiency is a responsibility to all water users in doing their part to conserve water for resource protection. It must be realised that the function of water is not only to fulfil consumptive demand but also for other ecological and cultural purposes. This requires a fundamental shift on the human relationship with water including changing attitudes and behaviour towards value of water (Tool C5.04).

Mechanisms towards such changes include education and communication through programs for users at school, community and institutional level (Tools C5). Education and communication campaigns should be directed towards main users (e.g. women or farmers' groups or industrialists – according to specific social and cultural conditions). Behavioural change stems from awareness towards efficient use and can also lead to curtailment of water use for specific purposes, opening pathways for alternatives such as less water intensive industries, practices or technologies.

Indicators such as product labelling, lifecycle analysis, water accounting, Water Footprint, Virtual Water (Tool C5.03) can help raise awareness among consumers (Tool C5.02) regarding water that is used in the production of goods. It enables them to make informed choices on what they buy. Providing access to technical support information, transparency, and the performance of water-saving policies is also important to give people a sense of ownership and responsibility towards water use efficiency. A useful technique is the water audit (Kubade, 2017), which, by using simple procedures, can easily identify gross inefficiencies in water use in, for example, an industrial plant.

Technological Change Towards Demand Efficiency

Technologies for reducing consumption vary by application and context. One commonly cited example is to use drip irrigation technologies to replace flood irrigation techniques. Another commonly referred to technological fix for demand efficiency would be retrofit water saving devices or procuring water efficient appliances. Decentralized water and sanitations technologies involve less leakage and are traditionally better in terms of water conservation.

Appropriate technology must be selected based on the applicable social, environmental and economic context. In an urban setting, appropriate selection of drought tolerant vegetation for parks, and other areas can save a substantial amount of water. Demand efficiency can also lead to “co-benefits” which include improved water quality, reductions in water-related energy costs, improved instream ecological health, and improved crop quality (Gleick, 2011). For example, in urban contexts, the improvement in demand efficiency leads to energy savings often far exceeded water savings, in economic terms (Gleick, 2011). Assessments of such investments are required to determine savings in terms of economics, water and environment. The use and application of such technologies can be promoted, incentivised or mandated through social, institutional and policy changes.

Institutional and Policy Change Towards Demand Efficiency

Regulations and by-laws (Tools A2) set standards for water consumption, which may explicitly aim to prevent waste, misuse, or undue consumption in public water supply. Improved demand efficiency should be embedded in legal and technical regulations. However, efficiency in use may be undermined by laws or policies in other sectors (e.g. energy subsidies for the pumping of ground water that is used for irrigation). Hence, supporting demand efficiency also requires coherence in policies which can be facilitated by institutions. Water regulations are more effective if widely publicised for social changes and firmly enforced by institutions.

Another way that by-laws and regulations can help improve water efficiency is by setting standards for the use of water-saving appliances and fixtures. Such regulations stimulate the introduction and further development of lower water consumption technologies. However, the strategies chosen must be appropriate to local circumstances.

Other mechanisms are economic incentives, such as volumetric tariffs and charges for water use (domestic, industrial, agricultural), and subsidies or rebates for more efficient water use (Tools C4). Pricing is often effective and is being increasingly used in irrigation as management reforms open the possibility of volumetric charging. These can be operationalized through different water services (Tools B2).

Water Use Efficiency in Agriculture

Demand efficiency is often referred to as Water Use Efficiency (WUE) in the agriculture sector, the most water-demanding economic sector, thus where water-use efficiency can be greatly enhanced (FAO and UN, 2021). WUE is defined as the amount of carbon assimilated as biomass or grain produced per unit of water used by the crop (Hatfield, 2019) . As such, the objective of demand efficiency in the agricultural sectors is to gain more crop per drop.

Water demand efficiency can be enhanced in a number of ways in the agricultural sector. For instance, crop selection and crops patterns can be modified to reduce water use. One practical example is the substitution of water-intense crops for crops that need less water or switching production to higher value crops. This can be further supported by efficient irrigation technology such as drip irrigation, reduced fertilizer use and crop scheduling. If management of irrigation water at field level is shifted to farmer groups (governments retaining bulk supply responsibility), more efficient use as well as volumetric charging can be possible.

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Water services

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