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Water reuse: suitable to combat water stress?

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Water stress as an obstacle to development

Global trends such as population growth, urbanisation and climate change are increasing the world-wide demand for water. Private households only account for 12% of this demand. Water consumption by the agricultural (69%) and industrial sectors (19%) is much higher. If the availability of freshwater decreases at the same time, **water stress** occurs.

More than 2 billion people, nearly a quarter of the world's population, already live in regions with high water stress and without access to a reliable potable water supply. This negatively impacts health, food security, ecosystems as well as economic development and can lead to conflicts over scarce freshwater resources. In order to increase the availability of freshwater resources and water security as a result, water reuse is an important component and, at the same time, a goal of the Development Agenda 2030 (6.3).

Water reuse: in agriculture, industry and as potable water

In many industrialised countries (e.g. USA, Australia, Israel and Spain), reuse of wastewater has been practiced for many centuries especially in agriculture to irrigate fields. Furthermore, trade and industry are recycling more and more of their process water – especially in the context of high water rates and costs for the discharge of untreated wastewater. In addition, treated wastewater with potable water quality can be used to supplement water resources which are already in use (e.g. groundwater, surface water) (“indirect potable water use”). “Direct potable water use” (fed into the water network), on the other hand, is rare worldwide, e.g. in Singapore and Namibia.

In the context of development cooperation, however, there is a considerable need for appropriate solutions for water reuse, especially in regions affected by water crises – and the trend is rising. Key advantages of reuse are:

- **Substitution:** in agriculture, treated wastewater replaces the extensive use of freshwater, which in return is increasingly available as potable water.
- **Diversification of water resources:** the use of treated wastewater reduces dependency on surface water. This not only covers peaks in demand but also reduces the impact of seasonal droughts and weather variability.
- **Cost and energy efficiency:** compared to developing and mobilising additional resources in water crisis regions (such as pipelines from remote areas and desalination), reuse is usually much more cost-effective and climate-friendly: the low amount of energy consumed for processing reduces greenhouse gases.
- **Electricity production:** in case of suitable geographic conditions, treated wastewater can be used to generate electricity before it is used for agricultural irrigation.
- **Potential for nutrient use:** the nutrients contained in treated wastewater (especially phosphorus and nitrogen) can be used as fertilisers in agriculture through irrigation.

Beyond technology: institutional, operational and social challenges

Reuse depends on several factors: water quality and scarcity, purpose of reuse, location, cost and availability of alternative water sources. When planning and implementing water reuse projects, many project-specific non-technical aspects have to be taken into account in addition to the technical challenges (cleaning requirements and systems engineering). Challenges include, for example:

- Inadequate **institutional and regulatory framework conditions** need to be adapted to local requirements (clarification on responsibilities of a usually high number of actors, regulatory requirements, legislation and monitoring).
- The necessary **know-how** must be transferred. Adequate quality assurance systems need to be installed and the necessary personnel capacities must be developed.
- Through **user group involvement and communication strategies** (partially cultural or religious), prejudices and a lack of acceptance towards the use of treated water can be overcome.

Conclusion: contribution to the sustainable use of water resources

Water reuse is an economically, environmentally and socially sustainable way of meeting the water needs of regions suffering from water stress and thus protecting scarce fresh water resources. It can therefore make a significant contribution to achieving the sustainable development and climate goals.■

Note: This paper reflects the opinion of the authors and does not necessarily represent the position of KfW.