Guidelines on Water Reuse

Providing reliable water and sanitation services is one of the top priorities for Azerbaijan's development policy, and the experience provides opportunities for peer-to-peer learning in which service providers from project targeted areas share their experiences with their peers across the country. The World Bank's Water Global Practice envisions continued engagement with the sector to support further improvements in the efficiency and quality of water supply and sanitation services in Azerbaijan and beyond.

Population growth, rapid urbanisation, more water intense consumption patterns and climate change are intensifying the pressure on freshwater resources. The increasing scarcity of water, combined with other factors such as energy and fertilizers, is driving millions of farmers and other entrepreneurs to make use of wastewater. Wastewater reuse is an excellent example that naturally explains the importance of integrated management of water, soil and waste.

The guidelines note that water can be reused for a variety of purposes (landscape, environmental, , etc.) and the document outlines the range of potential economic and environmental benefits. In all cases the quality of the water (and hence the treatment necessary) would need to be appropriate to the specific end use as well as ensure wider health and environmental protection. Risks to all aspects of health and environment need to be considered, including potential hazardous substances and exposure routes and taking the precautionary principle into account.

Economic Benefits of Reuse of Treated Wastewater

It is important to recognise that treated wastewater is a resource, that resource has a value and this value will reflect the price placed upon the resource. Therefore, capturing that resource (i.e. avoiding its loss and adding value by the correct treatment) can deliver economic benefits. As an economic good, appropriately treated wastewater has value to those producing it and to those consuming it. Appreciating this could help in delivering an economically sound management of wastewater collection and treatment services, with consequent advantages in terms of effectiveness and profitability of the whole value chain
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There is a range of potential economic benefits from water reuse .Economic sectors that are highly dependent on water supply (availability and quality), such as agriculture, food industry and tourism and recreational industry could increase their water supply security with water reuse (depending on the hydrological demands in a basin), decreasing their vulnerability to water scarcity and droughts as well as their vulnerability to longer-term climatic change. This could deliver economic benefits to the businesses concerned. The supply to users of treated wastewater is limited, but is predictable. It, therefore, enables users to plan their business activitie While there are economic benefits from water reuse, the precise economic context needs to be considered in each case where water reuse projects are considered. Key economic issues to take into account include:

Cost of treated wastewater and cost of reuse solutions: water reuse schemes remain relatively underdeveloped in the EU owing to a lack of economic attractiveness and perceived

low returns on investment. Decisions to invest in such schemes also reflect costs comparisons with other water sources (including costs of abstraction from natural water bodies). Many existing schemes have benefited from direct or indirect subsidy to support both supply and demand, but this may be at odds with the need for cost recovery and financial sustainability in the water sector, although it has to be noted that the cost of conventional water resources is often subsidised or kept low (e.g. for irrigation). Costs of the schemes include ensuring the necessary treatment (for both the user and any subsequent impact on the environment) and the delivery of the treated water to the user. Adequate pricing of fresh water that takes into account, for example, the ecological cost of over-abstraction is an important factor in establishing price equality between fresh and treated wastewater.

Financing of reuse projects: where there are funds available to support treatment works, water distribution systems and some uses, such as irrigation systems, these need to be considered in the economic case for reuse in each individual situation.

Marginal cost pricing systems can reduce excessive water use and pollution as well as ensure the sustainability of wastewater treatment programmes. Adequate pricing schemes create incentives to reduce water demand and encourage water reuse schemes.

The capital and operational costs of switching from a freshwater water source to a treated wastewater source of water need to be understood and local opportunities to minimise costs and/or boost benefits should be explored and maximized.

Water Reuse in Azerbaijan

Azerbaijan is based on the principles of innovative management and this trend is the basis of transition to a sustainable green economy. In this regard, sustainable water management become one of the most important factors to build an inclusive society and to achieve sustainable management in state. National Program for Sustainable Socio-Economic Development in Azerbaijan covers the periods of 2003-2010, 2015-2025. One of the sections of the Program is fully devoted to water policy issues. At the present stage, for the sustainable development of the region, it is necessary to ensure the country's water safety by improving the efficiency of water management and consumption. In this paper my objective is to analyze the water management in Azerbaijan. In particular, the degree of efficiency of the institutions and the tariff structure to give recommendations for future development.

With financing and knowledge support from the World Bank, Azerbaijan rehabilitated and reconstructed water and sanitation facilities across the country’s eight rural districts. By the end of the project in 2019, the project has provided over 324,000 Azerbaijanis with water and sanitation services and a reliable supply of treated water. 98 percent of the population in the selected districts gained access to water for 24 hours a day, as compared to about 3 hours prior to the implementation of the project. Improved water supply and sanitation services contributes to poverty reduction, bringing significant benefit to people’s wellbeing and reduced environmental pollution.

Complete reconstruction of water supply and sewer systems of 43 cities and towns of Azerbaijan and construction of relevant plants and networks is planned within the framework of I and II projects of National Water Supply and Sanitation Project financed by World Bank.

Suggested standards are Water Supply and Sanitation: British Standards (BS), British Water Industry Standards (BWIS), DIN Standards, ISO Standards, AWWA (American Water Works Association) Standards, European Norms (EN); Construction and electromechanical equipment: British Standards (BS), DIN Standards, ISO Standards, AWWA (American Water Works Association) Standards, European Norms (EN); Working projects on Waste Water Treatment Plants: ATV 301 Standards

There is an action plan “Ministry of Ecology and Natural Resources” together with Azersu OJSC and Azerbaijan Land Reclamation and Water Management OJSC from 2019 to 2030. On the project on regulatory requirements for wastewater treatment; sewage treatment and discharge into natural water basins. Goals and measures to achieve these goals are:

1.Continuous activities on a regular basis to minimize the risks of pollution of small rivers.
2.Construction and reconstruction of the collector drainage network for drainage of irrigated areas.
3.Conducting trainings and seminars on the disposal of treated wastewater.

For wastewater treatment, the study of the dynamics of the natural stabilization of sludge; the study of organic, inorganic and bacteriological indicators of solid waste generated from sludge are promising
At this stage, due to the lack of relevant regulations, the country does not provide for sanitary and preventive measures to remove and reuse sludge from centralized systems and other sanitation facilities. To achieve this goal, it is necessary to conduct appropriate research, create a regulatory framework and train special personnel for the application of technologies in this area.
In addition, the main economic factors of water management include water purification and its secondary use. In a number of oil countries, deepening of oil and gas processing and the emergence of petrochemical plants at a number of plants lead not only to an increase in the quantity of wastewater, but also to a complication of their composition, which increases the demand for their treatment.

Challenge

Azerbaijan inherited an extensive water supply system built during the Soviet era. However, the condition of the water system gradually deteriorated due to a lack of investment and deferred maintenance, resulting in a substantial decrease in the quality and reliability of the water supply service. In many small towns, prior to the implementation of the project, water treatment facilities were largely dysfunctional or nonexistent - to the extent that the residents in these towns did not have access to a safe water supply. Furthermore, most rayons (districts) did not have functioning sewerage collection services, the few available facilities were in disrepair, and utilities were technically and financially unsustainable. This was a serious threat to public health and the environment.

Khazar University Water Reuse Policy

Water reuse is one of the top five priorities of Khazar University sustainable development. Water aims at removing barriers to innovation, connecting supply and demand for water-related innovations, creating dissemination strategies for proven solutions and supporting market acceleration of innovations. Khazar university Action Groups to develop and test the following solutions:

- Fit for Purpose/Symbiotic approaches based on technical, economic, social and environmental criteria, where cost-effective treatment meets intended use and quality.
- Innovative solutions and/or treatment options, producing and testing recycled/reclaimed water for residential, urban, industrial and agricultural uses, with consideration of ecosystems and involving multiple stakeholders.
- Systems capable of determining the quality of recycled and reclaimed water to improve management and public acceptance according to health requirements.
- Innovative separation- and extraction technology pilot projects in industrial zones to harvest resources from waste- and re-used water

Social benefits associated with the use of water reuse include:

- Increased quality of life, wellbeing and health as reuse allows the maintenance of attractive landscapes in parks and sports facilities and improvement of urban environment (e.g. urban parks and fountains).
- Supporting the sustainability of rural communities (both with reference to their long-term maintenance and their environmental impact) by providing relatively secure water sources for rural businesses.
- Being a cohesion tool that encourages the drinking water, wastewater and environment agencies and other stakeholders to work closely together using an integrated approach, thereby helping all to recognise the benefits and risks of treated wastewater reuse.
- Helping to achieve Sustainable Development Goals (SDGs) through increased water availability and sanitation, protection of the environment through the use of appropriate technology solutions.

For an integrated solution, a number of issues related to the water problem are designed to solve the following main tasks:

- research and accounting of water resources and regulation of their flow;

- the use of water energy of rivers and lakes in hydroelectric power plants, the implementation of water-land reclamation, ensuring optimal soil moisture by creating engineering irrigation and drainage systems;

- protection of the population and land from unregulated water regime; creation of necessary conditions for sanitary and technical use of water, i.e. to meet the water of sanitary, drinking and household needs of the population and the needs of agriculture, industry, transport, etc.

- regulation of natural and waste water quality and struggle against their pollution;

- ensuring the proper conditions for the effective organization of fish farming in floodplains of rivers, natural and artificial reservoirs;

- use of local runoff of small rivers for the mass arrangement of water bodies and the provision of water measures aimed at combating drought. This also includes monitoring the work of large hydraulic structures, developing rational methods for their operation.

The Risks to Health and the Environment Related to the Quality of Reused Water

Occupational health risks

Different types of workers may be exposed to water during water reuse and to the possible microbiological and chemical contaminants mentioned above: farmers, workers in the water industry, workers in industries where reused water is used, workers involved in urban and recreational applications of water reuse, etc. While workers may be exposed to potential contaminants during longer periods than the public, the risks would not be necessarily higher due to better awareness and the implementation of preventive measures (e.g. protective equipment) by appropriate businesses. The literature does not report cases of occupational diseases caused by exposure to reused water. However, it is important that where treated wastewater is produced/used any potential risks to workers are identified and managed through preventive measures appropriate to the particular situation. Where water is treated to a high standard, risks should not normally be expected.

Risk to soil quality

The composition of treated effluent (e.g. heavy metals, boron, and other toxic constituents) can affect soil productivity . Water reuse schemes may require further treatment to remove substances identified as posing a risk to the protection of soils. The effect of the use of other products, such as chemical fertilizers and pesticides, should also be taken into account in the risk assessment regarding soil quality.

Water quantity

Treated wastewater for reuse (diverted from wastewater treatment plant discharge (if it does not replace current direct uptake from the river), and where reused flow is significant compared to the river flow, may have an impact on river flow levels, which could affect both the ecology and water availability for downstream abstraction. In some particular hydrological conditions, such as a very dry season, treatment plants have to discharge in streams with a very limited flow rate. In this case, discharge can contribute to maintaining an ecological flow. Under these conditions, water managers should take into account this aspect when they evaluate the water balances and distribution, including water reuse.

Risks from treatment choices

There might be risks posed by the treatment process (e.g., formation of sub products, deficits in the removal of pollutants). In rare cases, an advanced treatment could pose a higher risk than the use of treated wastewater with a lower treatment (e.g., discharge of disinfection by-products such as trihalomethanes). Such risks should be assessed in the planning processes where risks are analysed and the decisions made on the treatment required. The choice of appropriate treatment should in any case be based on the best available technology, standards, legislation and sound knowledge.

Schemes for the reuse of treated wastewater development

The development of may have very different characteristics depending on the sources of the water, its intended use, the quality standards established for each use and the appropriate levels of treatment to achieve these quality standards on the most cost efficient and effective way.

arising include the quality of water directly introduced to a receiving water body (e.g. in aquifer recharge), indirectly introduced (e.g. run-off in irrigation), impacts on flow regimes, etc. Each of these interactions with the environment may be regulated under EU law, including controls on specific types of activities or binding objectives for environmental quality.

It is, therefore, important that any scheme for the reuse of treated wastewater considers the objectives arising from the EU water law set out in this chapter (as well as any other relevant EU law) to ensure that such schemes are fully compliant. This requires co-ordination between those seeking to develop such schemes and water managers who understand the implications of EU water law, as transposed into national laws. It is also important to note that compliance with these EU directives does not mean that the available water from a WWTP for reuse is necessarily safe for a specific use – this needs to be determined on a case by case basis. The objective of soil conservation and emerging pollutants, in particular, may require further attention.

Water reuse schemes may require significant investment for treatment and distribution of water and commitments by associated businesses. Ensuring such investments are compliant with the law is a critical part of the business decision.