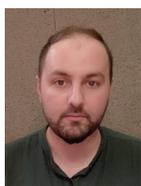


Urban Water Management and Quality-Based Water Use

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Abstract: *Urban waters are classified according to their use in domestic, industrial, municipal, and agricultural needs. It is important to manage them properly in order to efficiently use and distribute water, considering physical, chemical, and biological aspects. In this article we provide an overview for the efficient use of urban water and consider aspects of management for quality-based distribution. A brief discussion about urban water management design strategy, Xeriscape, is also provided.*

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Urban water management and quality-based water use

Societal demands for wealth and high living standards have increased with developing technology and networking. Therefore, development of sustainable growth strategies of the governments is essential to provide the necessary wealth, not just for the present, but for the future as well.¹

One critical issue that urbanization forces us to deal with is water management. Demand for water has increased rapidly as a result of growing urbanization combined with the severe effects of climate change and agricultural requirements.² According to the World Bank, these factors will have a severe impact on economies,³ so its significance regarding water resources and water environment should not be ignored.

The report of the World Bank states that some cities may confront a two-thirds drop in water availability by 2050. This will lead to further problems, even in basic necessities like food and health. However, efficient use of water could make a difference for this serious situation. Good policies would increase the GDP of central Asian countries by more than 11 percent and reduce undesirable water shortages in the Middle East.³ “Good” policies for urban water management include the efficient use and recycling of urban waters (surface water, groundwater, potable water, sewage and other types of waste waters), flood prevention, development and regulation of water efficient-sensitive management and design techniques, and protection of natural wetlands, waterways, and estuaries.⁴ Effective urban water management will lead to the creation of more resilient, sustainable, and wealthier cities.

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Effective management of urban waters relies on efficient water use and recycling policies. Water recycling requires the treatment of wastewater/water by removing any solids, particles, and living small organisms. This is not just a process that provides potable water; it also has biological, chemical, and physical aspects for urban life. In this regard, health effects should be considered as biological aspects, while environmental effects are important for physical and chemical aspects.⁵ Efficient use and recycling of urban waters can be analyzed according to domestic, industrial, agricultural, and municipal use.

Each person uses between 30 and 300 liters of water per day for domestic use.⁶ Approximately 3 liters of this is consumed for the needs of the human body, which is difficult and unhealthy to reduce. However, for the remaining domestic consumption, it is important to use water efficient utilities and machines, through means such as preventing leakage of household appliances.

For industry cases, water is required for heat transfer, power generation, and processing. During these applications, recirculation, reduction, and reuse of water by measuring and monitoring the water quality carries great importance since the mismanagement of industrial wastewater not only creates high water consumption, but is also very harmful for the environment, with a significant footprint.^{5, 7}

Water efficiency at the municipal level requires effective monitoring and management of distribution. Leak detection and repair, metering, rate systems, and regulations are the main concerns facing municipalities.⁵

Agricultural use of water creates the water–energy–food nexus and therefore is the most important factor in the efficient use of water. Agriculture accounts for 70 percent of the total water use of the world, although this figure is only 40 percent in many OECD countries.⁸ However, this ratio has been changing in favor of domestic and industrial use in recent decades. Demand for water for domestic and industrial uses has been rising in parallel to economic development, increasing populations, and resulting urbanization. According to the United Nations' Food and Agricultural Organization (FAO), water withdrawal for household and industri-

al use quadrupled from 1950 to 1995.⁷ This created a danger for agricultural water demand because of polluted urban supplies, which lead to high health risks such as epidemics. To prevent this, it is also important to develop efficient design and management strategies.

Urban Xeriscape is an efficient method to distribute water. Xeriscape involves creating landscape designs that can contribute to minimum water use by preserving the environment.⁹⁻¹⁰ Enhancement of environmental quality and degraded environmental conditions for architectural applications have been the main objectives. However, those objectives have started to have transition towards efficient use of water and design and applications due to global warming and climate change concerns. Xeriscape has seven basic principles: appropriate planning and design, preparation and improvement of soil, preference of drought-tolerant plants, reducing the rate of lawn, efficient irrigation, use of mulch, and proper maintenance.¹¹⁻¹³ These principles provide effective water use by providing urban sustainability through distributing water according to its quality without wasting high-quality or potable water when it is not required.

Domestic, industrial, municipal, and agricultural uses of water are interconnected. Therefore, in order to keep same water wealth for our future, it is important to manage the efficiency of water through well-management methods, which includes recycling and quality-based water use.

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