WATER TREATMENT AND CONSERVATION

Water is essential to wildlife, the environment, and to residential, agricultural, and industrial activities. Shifts in population density and climate have led to the inequitable distribution of water throughout the United States, and when coupled with the additional pressures of agricultural and industrial needs, water shortages become more prevalent. In the U.S., thermoelectric power generation uses 45% of all withdrawn water, agriculture uses 37%, and the remaining 18% is used for residential and industrial applications. Importantly, water and energy are intertwined: as water is needed to generate energy, so is energy needed to purify and distribute water. In fact, between 4 and 13 percent of generated electricity is used to treat and distribute water. Additionally, water usually undergoes some form of pre-treatment before residential or industrial use. While current water treatment technologies can remove many organic pollutants, salts, and pathogens from water and wastewater, new treatment technologies and conservation measures will be needed to meet the growing demand for dwindling supplies of water caused by environmental contamination, drought, climate-driven changes to regional water distribution patterns, and ground-water removal at unsustainable rates.

Historically, the U.S. government provided robust support for fundamental and applied research on the development of municipal and industrial water treatment technologies, but that is no longer the case. For example, the funding for developing advanced desalination technologies has decreased from a peak of over $150 million (inflation adjusted) per year in the mid-1960s to a low of $10 million in 2015. Recently, the U.S. Department of Energy and Department of the Interior have begun making larger investments in desalination, but the overall percentage of U.S. government spending remains lower than it has been historically. This low level of support has led to stagnation in the development of innovative technologies critical to a future in which more brackish water and seawater may need to be desalinated and wastewater recycled for irrigation, industrial uses, and drinking water.

The public water infrastructure is not uniformly robust across the United States, with some cities and states experiencing critical failures in supplying clean drinking water. The EPA's sixth national assessment of public water infrastructure needs shows that $472.6 billion is needed to maintain and upgrade this infrastructure through 2034. Completing this work is a critical requirement for addressing inequities in accessing clean drinking water.

Warming climate is shifting water-distribution patterns on the regional and continental scales. Warmer air can hold more water, exacerbating drought conditions, especially in the Western U.S. Furthermore, increasing intensity of rainfall events in the Northeast and Midwest regions stress water infrastructure, including sewer and water treatment systems. Climate-driven changes to the availability of water will continue to have an impact on energy production, agriculture, industry, infrastructure, human health, and ecosystems.

To address these issues of water availability and treatment, the American Chemical Society recommends that the United States

- Support the maintenance, upgrades, or construction of public water infrastructure to provide consistent and equitable access to clean and safe drinking water.
- Encourage innovations to decrease demands for water in energy production.

- Support technologies, management practices and infrastructure in the agricultural sector that reduce water use, increase water recycling, and minimize the environmental pollution.
- Encourage innovations within industrial plants:
  - to reduce or eliminate the amount of water used in their processes,
  - to create a closed water cycle by recycling and reusing as much water on site as possible,
  - and to develop processes to reduce or eliminate the discharge of toxic substances into ground and surface waters, including municipal/regional water supplies.
- Foster research and processes that expand the water resources to include reclaimed water, brackish water, and seawater.
- Increase research and planning for climate-driven changes in the availability of water.