Southern China International MUN

United Nations Commission on Science and Technology for Development: On measures to adopt sustainable technology practices to enhance water sanitation and accessibility
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1. Description of the Issue

1.1 History of the Issue

The challenge of ensuring **clean water and sanitation** has existed since the birth of civilization, but the incorporation of sustainable technology to solve this issue is now a current necessity due to the increasing scarcity and increasing awareness about the environment. Traditionally, the design of any human settlement utilized gravity-fed aqueducts and simple filtration systems using materials such as sand and charcoal, as observed among the Roman and Indus Valley civilizations. [1] During the 19th and 20th centuries, engineering designed and developed larger-scale and more energy-intensive methods of providing this access to clean water and sanitation: centralized chlorination stations, vast networks of pipes designed to withstand freezing temperatures, and advanced wastewater treatment systems. [5] This **"gray infrastructure"** paradigm successfully decreased the rate of diseases driven by water sanitation among the population of the industrialized world but has proven too cost-heavy to be scaled globally. [5]

The concept of **sustainability** in water technology emerged from several crises faced by the world in the latter part of the 20th century. [5] The UN Conference on the Human Environment in 1972, the release of the Brundtland Report on sustainable development in 1987, and the subsequent World Summit, or Earth Summit, in 1992 highlighted the collective awareness about water not being an infinite supply. [10] The goals from 2000 to 2015 and their successors in post-2015 **Sustainable Development Goal 6**, "Clean Water and Sanitation for All," specifically addressed water accessibility and technological innovations and sustainability in water technology. [10] The two most important antecedent historical events that triggered the shift towards innovations and sustainability in water technologies are the rapid pace of urbanization, which exceeded the traditional means of creating water infrastructure, and water pollution from industry that negatively affected freshwater, as well as the growing awareness about the impacts of climate change on droughts and floods. [11]

1.2 Recent Developments

The past few years have been characterized by a paradigm shift that considers harnessing cutting-edge, but sustainable, science and technology for water management. **Digitalization and Artificial Intelligence**: smart sensors, based on IoT, give real-time information on water quality, leaks, consumption, thus facilitating predictive maintenance and minimizing non-revenue water. [9] Artificial Intelligence models optimize the functioning of water treatment plants, as well as Water Scarcity predictions. [3] **Materials Science** has transformed water filtration systems, as new generations of filtration membranes composed of graphene oxide or aquaporin proteins have

increased efficiency using less energy, or nanotechnology filters capable of extracting micro-pollutants, heavy metals, respectively. [2]

Nature-Based Solutions (NBS) have seen immense adoption as sustainable technology interventions. [7] Designed wetlands for wastewater treatment, rainwater harvesting systems with intelligent management systems, and watershed rehabilitation with satellite monitoring are examples of the art of merging nature and technology. [7] To add to this, the recent **circular economy model** of the water sector is being fueled by emerging technologies such as energy-efficient anaerobic digestion systems to convert sewage sludge to biogas and advanced electrochemical technologies to enable the reuse of high-quality water.[6] What can be noticed is the increasing reliance upon low costs and decentralized technology such as solar-powered UV purification systems, Atmospheric Water Harvesters to supply rainwater to arid environments, and innovative mobile apps to alert cities about sanitation. [6]

However, challenges remain. According to a report published by **UN-Water** in 2023, although some progress has been made, "In 2024, 2.2 billion people still lacked safely managed drinking water; 3.4 billion people lacked safely managed sanitation; and 1.7 billion lacked basic hygiene services at home." [11] The digital gap hampers the use of smart water technologies in developing countries. [4] There is also a growing concern regarding **"green washing"** within the water technologies industry. [4]

Key Terms

Sustainable Technology Practices (in Water). The use of scientific know-how and technology application in water resource management that does not harm the environment, uses resource efficiency (energy, water), is economically sustainable in the long run, and is socially acceptable and adaptable.
Water Sanitation: This involves excreta collection, transportation, treatment, and ultimate disposal or reuse, together with hygiene promotion, for health protection and for preservation of the environment.
Water Accessibility (SDG 6.1): The availability of sufficient quantities of water that meets accepted safety standards and can be accessed by everyone at all times on reasonable conditions.
Nature-Based Solutions (NBS): Measures for protecting, conserving, and maintaining or restoring natural or modified ecosystems that can respond to the challenges of water (e.g., purification, storage, and flood control), and at the same time, support the needs of humans and biodiversity. (riparian buffer zone, and green roofs).
Circular Water Economy: A circular water economy is an economic mechanism for minimum water loss and pollution by maintaining the continued use of water, value extraction, recovering, and regenerating products and materials at the end of a service life. Examples include reuse of wastewater and recovery of nutrients.
Decentralized Water Systems: Smaller-scale water and sanitation infrastructure that can be installed at the community, household, or building level and may be independent of large central grids. These can include, for example, bio-digester toilets and community-scale filtration.

2. Emphasis of the Discourse

2.1 Right Wing Approach

A Right-wing strategy for water tech focuses on market-led development and PPP as the best practice of water resource delivery, believing that applying efficiency principles will maximize

returns on investments in the sector. It strongly recommends **intellectual property rights** that will stimulate innovations and R&D, supporting smart water networks that utilize AI, high-end desalination plants, and modular water treatment plants developed by companies that want to protect their intellectual properties against imitators. The regulatory role of government is mainly seen as providing competition policies that will promote efficiency, not specifying any TD strategy or direction on how it should be developed. Even though this strategy may promote or fast-track the adoption of highly efficient models of water delivery in profitable sectors or regions, it tends to overlook or neglect unserved village areas and slum districts where returns on investments are nominal or low.

2.2 Left Wing Approach

A left-wing strategy envisions water as a basic human right and common resource that is vulnerable to being turned into a commodity. This view promotes robust **public ownership** and regulation of water resources and technologies. This particular approach also supports broader access through means of subsidized domestic water treatment units, community-managed rainwater harvesting initiatives, and public-owned and operated sanitation schemes that focus on affordability and community control. This approach is highly critical of the prospect of corporate control of water infrastructure. The appropriate technologies that are often encouraged in this approach include manual pumps, constructed wetlands, or ceramic filters that can provide employment in the community and enhance community resilience. The main issues in this particular approach would be its scaling up and having the technology meet high standards of sustainability.

2.3 Stance of Intergovernmental Organizations

Intergovernmental organizations influence the world water technologies sector because of their unique mandates. The **World Health Organization (WHO)** establishes the scientific basis through the setting of the global guidelines for drinking water quality and the promotion of household water treatment as a key interim option for communities without access to piped water. [13] The **United Nations Environment Programme (UNEP)** encourages ecological responses through the promotion of **Nature-Based Solutions** and pollution prevention technologies as a sustainable complementary option for conventional infrastructure. [6] With regard to financing, the **World Bank** is a significant player; it emphasizes the economic sustainability of technological investments through the support of cost-recovery and public private partnerships approaches in water technologies. [12] The **UN-Water** is the body within the United Nations framework that coordinates UN agencies; the key role of the UN-Water is the emphasis of the science and technology nexus in the achievement of Sustainable Development Goal number six. The **Commission on Science and Technology for Development (CSTD)** is specific in its focus on capacity; the body assesses the developing world's capacity for adoption and adaptation as well as innovations in the field of sustainable water technologies; the key is the use of the "technologies for development framework." [11]

2.4 Stance of developed countries

The developed countries tend to adopt an approach that revolves around the modernization and optimization of mature water infrastructure. Their priorities lie in the "green transformation" of their infrastructure: less energy use in water treatment plants, the use of artificial intelligence in managing water infrastructure, the removal of "emerging contaminants" such as pharmaceuticals and PFAS, and finally, the development of "industrial water reuse and **circular economy** in industry." The economic aspect of developed countries often finds them at the forefront of global

exports in the high-end water technology industry. As such, their approach in the **CSTD** would naturally revolve around the protection of intellectual property rights in driving innovation and pushing the pivotal role that the private sector should play in providing sustainable solutions. Their development assistance activities are often designed to provide their local technology companies with opportunities.

2.5 Stance of developing countries

A paradox faces developing countries: providing basic access for the unconnected in the short term while trying to target more sustainable and climate-resililant water services. Their central need is for suitable technology that can be operated or maintained at the local level. A central need in international talks is obtaining technology transfers on equitable terms and having concrete **capacity-building plans** for local manufacturing or adaptation and maintenance. These countries also push for external support for technology 'sovereignty,' including regulation that would limit dependence on more expensive and often more complex technologies in developed countries. They often advance the concept of common but differentiated responsibilities, suggesting that developed countries have more responsibilities in this regard in connection with water technology access, given their overall historical role in causing the world's most significant shared transnational issues and the intellectual property system that is now in place.

3 Possible Solutions

3.1 In Favor of Developed Countries

The developed nations, with their strong technological and financial foundations, would most probably advocate and support the implementation of solutions that would lay down structured innovation and investment tracks. One such feasible solution would be the launch of a fund specified for international water-tech verification and scaling, which would be funded by the developed nations as well as private sources. This fund would not only be involved in the joint funding of research and development in the next generation of water-related sustainable innovations like low-energy desalination or bio-inspired filtration technologies, but would also establish a globally recognized verification body to evaluate and verify the performance, sustainability, and robustness of emerging water technologies in the global arena. In fact, the developed nations would be in favor of attempts at developing standards and open data platforms associated with the concept of "smart water" and would be instrumental in the global aggregation of water data management to support the development of **AI-powered solutions** through such efforts.

3.2 In Favor of Developing Countries

Developing nations would call for solutions that would primarily focus on capacity development, adaptation, and the equitable availability of technology. One of the major solutions that would be adopted would be the creation of a **global network** of regional centers of sustainable water technology. This would be done through the budget allocations for international development and would include the development of the region's technology, workforce, and entrepreneurs in the water technology sector. The other major solution would be the development and use of a UN-backed tiered technology assessment framework. This would enable developing nations to test and focus not just on the technological efficiency of the water and sanitation technology but would also include parameters that would be exclusively necessary for the development of the Global South. This would include the factors of affordability, adaptability in changing climatic

conditions, maintenance, and local materials. This would help reduce the reliance and overdependence upon the unnecessary and excessively costly technology that would be imported. The other would be developing ways and means through which licensing for the essential water sanitation technology would be done in a collective manner that would help cut prices.

4 Keep in Mind the Following

In your own country, during your research on its policies on this issue, you should start by examining the nexus of your country's water needs, its innovation capabilities, and its development targets. You should explore how your country's policies reconcile innovation and equity and how your country's economic and political ties inform your country's role at the international level. You should broaden your inquiry to understand your country's role in the existing international regimes on technology transfer, capacity building, and setting standards. Some of your questions during this inquiry may include the following:

1. What water and sanitation problems exist with high priority in your country (e.g., water scarcity, pollution, rural water access, water infrastructure datage), and the solutions through the use of new water and sanitation technologies?
2. How does the policy framework in your country support or obstruct the adoption of sustainable water technology practices, especially in small-scale water provision and in informal settlements?
3. What is your country's policy regarding intellectual property protection as opposed to technology transfer with regards to the achievement of SD Goal 6 in international bodies such as CSTD/WTO?
4. Does your country mainly receive or provide international assistance and technical cooperation with respect to the water sector? What types of cooperation (such as grants, concessionary loans, personnel exchange) are in greatest demand or supply?
5. How does your country incorporate the concepts of a Circular Economy and Nature-Based Solutions within its National Water Resource Management & Technologies?
6. What is your country's capacity to support the whole lifecycle of sustainable water technologies: innovation, adaptation, and maintenance through your domestic scientific, engineering, and vocational education facilities?

5. Evaluation

The positive integration of sustainable practices of water and sanitation technologies is indeed one of the defining challenges of global will on innovation and equality at once. The task at hand is very difficult, and it consists of crossing an intricate gap that ranges from speedy innovations on one side and the difficult labor of universal access on the other; from efficiency that only works well in well-funded sectors on one side and tough, low-budget innovations on the other. The debates will show how there is an inherent conflict of ownership and control of innovations that sustain a human right on one side and those that reap its economic returns on the other side of this divide. Achieving success in this committee will mean transcending determinism through policies that define innovation trajectories and seek an equal share of knowhow that will be essential in building new capacities required for sustainable innovations on the side of science and technology working well for development and leaving no one behind on water access. Good luck delegates!

5 Bibliography

1. “Aqueducts: Research Starters: EBSCO Research.” EBSCO, EBSCO, www.ebsco.com/research-starters/environmental-sciences/aqueducts. Accessed 21 Dec. 2025.
2. Guo, Youhong, and Guihua Yu. Materials Innovation for Global Water Sustainability | ACS Materials Letters, pubs.acs.org/doi/10.1021/acsmaterialslett.2c00187. Accessed 21 Dec. 2025.
3. Hanoon, Sadeq Khaleefah, et al. “A Novel Approach Based on Machine Learning and Public Engagement to Predict Water-Scarcity Risk in Urban Areas.” MDPI, publisher, 4 Dec. 2022, www.mdpi.com/2220-9964/11/12/606. Accessed 20 Dec. 2025.
4. “How Digitalisation in Water Can Help Ensure Safe Water and Sanitation for All.” UN Trade and Development (UNCTAD), 17 Mar. 2023, unctad.org/news/cstd-dialogue-enrique-cabrera. Accessed 20 Dec. 2025.
5. “Learning from History: Sanitation for Prosperity.” World Health Organization, World Health Organization, www.who.int/news/item/19-11-2020-learning-from-history-sanitation-for-prosperity. Accessed 21 Dec. 2025.
6. Nature-Based Solutions for Water Management A Primer, www.unepdhi.org/wp-content/uploads/sites/2/2020/05/WEB_UNEP-DHI_NBS-PRIMER-2018-2.pdf. Accessed 21 Dec. 2025.
7. “Nature-Based Solutions for Water.” UNDP, www.undp.org/publications/nature-based-solutions-water. Accessed 21 Dec. 2025.
8. Nti, Emmanuel Kwame, et al. “Water Pollution Control and Revitalization Using Advanced Technologies: Uncovering Artificial Intelligence Options towards Environmental Health Protection, Sustainability and Water Security - Sciencedirect.” ScienceDirect, www.sciencedirect.com/science/article/pii/S2405844023053781. Accessed 21 Dec. 2025.
9. Pepper, Shannon. “Ai in Water Management: Six Ways Artificial Intelligence Can Help Solve Problems across the Water Sector - Environmental Finance Center Network.” Environmental Finance Center Network - Working Together to Solve Funding Challenges for Environmental Programs and Promote a Sustainable Environment., 1 Nov. 2023, efcnetwork.org/ai-in-water-management-six-ways-artificial-intelligence-can-help-solve-problems-across-the-water-sector/. Accessed 20 Dec. 2025.
10. “Goal 6: Water and Sanitation - United Nations Sustainable Development.” United Nations, United Nations, www.un.org/sustainabledevelopment/water-and-sanitation/. Accessed 21 Dec. 2025.
11. “Water and Urbanization: UN-Water.” UN, UN, www.unwater.org/water-facts/water-and-urbanization. Accessed 21 Dec. 2025.
12. “Water for People.” World Bank, www.worldbank.org/en/topic/water-for-people. Accessed 21 Dec. 2025.
13. “Water, Sanitation and Hygiene (WASH).” World Health Organization, World Health Organization, www.who.int/health-topics/water-sanitation-and-hygiene-wash. Accessed 21 Dec. 2025.