AI Can Make Cities Water Secure

By Gayathri Muraleedharan

Climate change is the buzzword currently. The change in climate is intensifying the global water cycle and exposing the world's population to water-related hazards, expected to increase in severity in the coming decades — erratic rainfall patterns, more frequent and severe floods and droughts, and rising sea levels. These changes threaten the ecosystem and livelihoods of people, and at the same time, impede economic and social development. Water is thus a climate connector, and therefore, integrated approaches to water management are essential for climate-resilient development. The theme for World Cities Day 2021 is *Adapting Cities for Climate Resilience*. This echoes the fact that climate change has — and will continue to have — a huge impact on cities. Artificial Intelligence (AI) has the potential to provide the much-needed fillip to our middling efforts in this direction.

AMRUT 2.0, launched by the Indian Prime Minister on 1 October 2021, focuses on making all urban centres in the country water secure. Promoting a circular economy through a 'City Water Balance Plan', focusing on recycling and reuse of treated sewage, rejuvenation of water bodies, and water conservation are some of the key goals of this mission. Leveraging the latest global technologies concerning water is another focus area. While the scheme is expected to renew interest in using digital technologies in the water domain, it is of extreme importance to look at urban water holistically and integrate climate change-induced risks in proposed city water plans.

How can we make our cities water secure?

Cognisance of the complex interrelations not just between various forms of water (such as surface water, groundwater, rainfall), but also its various uses (domestic, industrial, ecosystem services) is key to ensuring urban water security. While the Integrated Urban Water Management (IUWM) approach has been mentioned in many of India's water-related policies and programmes, effective implementation of the same remains a pipe dream. IUWM stresses on interventions over the entire urban water cycle, reconsideration of the way water is used and reused, and application of nature-based solutions for water and waste-water treatment. These could include a host of interventions such as rainwater harvesting, conserving natural lake systems, bio-swales instead of concrete-lined drains, etc. IUWM solutions are particularly advantageous for cities facing climate change-induced water risks.

The 'sponge city' concept, introduced in China in 2014, is an example of using the IUWM approach. Sponge cities can passively absorb, harvest, store, purify rainwater and release it gradually when required, much like a sponge. However, the complexities of water resource management in a single frame pose challenges in actualising IUWM. This is where AI can come in!

How can AI help?

AI has the ability to understand complex interrelations and can build dynamic and evolving city water models. Possibilities of trade-offs between water allocation (for city use) and environmental flows (for maintaining habitats, groundwater replenishment, etc.), predicting climate change-induced disaster risks, and suggesting potential nature-based solutions could be possible outcomes of such models. Big data sets on weather patterns, water usage across sectors, water and wastewater networks, reservoir levels, groundwater availability, existing and proposed land use plans, traffic data, etc., could be fed into AI models to identify patterns, inform decision making, and even suggest possible solutions. This could lead to the development of a dynamic and evolving City Water Balance Plan. For example, the AI-based plan could inform potential consumers (like industries, commercial, or residential complexes) of different qualities and quantities of wastewater generated. This can lead to more reuse, and in turn, lesser freshwater extraction. These AI features could make city water plans interactive and impactful for all stakeholders and facilitate stakeholder interactions in areas earlier unrecognised.

A plethora of global and Indian case studies present examples where AI intervention has yielded results, albeit in distinct phases of the water cycle. For example, AI-based flood management systems have proven successful in pilot installations in Portugal and France. AI technologies have been used to detect patterns and leaks in city water systems, thus reducing non-revenue water (NRW) — like in a county in South Korea that reduced water leakage by about 20%. Indian start-ups are also developing AI-based real-time monitoring systems for management of treatment plants, rainwater harvesting, etc., though mostly at building and neighbourhood scales. On a city scale, Chandigarh and Pune have started shifting to a smart meter-based system for water distribution.

India has witnessed tremendous losses in recent years due to climate change impacts. Targeted missions such as AMRUT are opportune in bringing much-needed attention to our climate change-induced water conundrums. It provides an opportunity to spot early on the synergies between climate change, development, and water-related outcomes so as to maximise cross-sectoral coordination and stakeholder inclusivity. This necessitates better water-related data and observation systems to guide climate resilience and water resources management planning. AI has the potential to understand and respond to the inherent complexities in water cycles and the exacerbated impacts that climate change has on the same. While piece-meal AI and technology interventions may garner specific results, an integrated and holistic intervention alone can ensure city-level impacts and make cities water secure.

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