Waterfuture Conference

24-27th Sept.,2019
Bengaluru, India

BUDAPEST·2019 WATER SUMMIT
PREVENTING WATER CRISES

15-17th Oct.,2019,
Budapest, Hungary

The Bengaluru - Budapest Science Action Plan Towards Sustainable Water Futures

Context

Humankind is in the midst of an unprecedented global water crisis. Problems related to water scarcity, water pollution, loss of ecosystem integrity, land degradation, failure of essential water infrastructure and extreme climatic events like floods and droughts are occurring at hitherto unseen rates and scales all over the world. The impact is particularly magnified across the Global South, affecting its economy, human health, biodiversity, natural environment and society at large. Many cities face tipping points despite considerable efforts to provide water security. Many regions are facing severe droughts and crop failures – both of which are set to increase in frequency and intensity. We have seen extreme events never observed, with significant loss of life. Millions of people are condemned to leave their homes each year in search of water and alternative livelihoods. The water crisis is inextricably linked to human health, food, and energy. It has the capacity to significantly disrupt the sustainability of the economy, environment and society. In spite of all the enormous mobilization of the world's governments, civil society and business communities, we are already off track in implementing SDG 6 and the other water-related SDG targets. The 2030 Agenda for Sustainable Development will likely not be met by 2030, resulting in large scale environmental and societal impact as we move into mid-century.

Issues

The risks born out of the interaction between natural processes -- hydrological, biogeochemical, and ecological — and anthropogenic systems (such as engineered systems, law, governance, institutional practices, cultural systems and human behaviour) remain difficult to understand, analyse, couple and predict. These complex interactions result in many unknowns that are rapidly evolving. For decades, science and technology, including the social sciences as well as engineering, have played a central role in identifying and understanding systemic water risks. The accelerating pace of changes in water systems and how they interact with other sectors are creating new risks to society. These are difficult to capture with existing observation and analytic infrastructure. More recently, satellite imaging, modelling, artificial intelligence, data integration and assimilation have transformed our view of the water system from a local issue to a global one. However, the advancements made in science and technology have been outpaced by the growth of the complexity in water systems. The accelerating pace of changes in the water system and water delivery services and how they interact with other sectors are creating new risks to society that are difficult to capture with existing observation and analytic infrastructure. This leads to vast information gaps, which in turn, result in poor decision-making.

As a consequence, the global community will continue to struggle to meet its energy, food and water demands, propelling us towards a stage that cannot be reversed and can lead to political crises. Business-as-usual is no option. We need to develop new innovative real-time solutions.

**The International Conference Towards a Sustainable Water Future was held in Bengaluru, India, 24 -27 September, 2019. The Conference was jointly convened by the international Sustainable Water Futures Programme, an associated Programme of ICSU's Future Earth initiative, and the Divecha Center for Climate Change, Indian Institute of Science, Bengaluru, India. More than 700 participants attended the meeting from varios fields of science. This closing Statement was adopted by the participants by consensus at the closing plenary session with a view to contribute to the Budapest Water Summit (BWS) 2019, to be held in Budapest, Hungary, 15-17 October, 2019. The Conference was part of the process that led the to BWS2019*

Towards an evidence informed and value based digital operating framework

Science and technology must make a leap in understanding—and then responding to—the constantly changing water system and close this information gap. To ensure sustainable water futures require partnerships across academia, governments, UN and other intergovernmental, development organizations, civil society and the business sector. The realities described above motivate the international water science and management community assembled in Bengaluru, India, to call for a set of actions given the sustainable development imperatives associated with water and other connected development goals.

We urge a strategic partnership of scientists, public stakeholders, decision-makers, political leaders and the private sector to develop a broad multi-perspective action plan. Specifically, the conference calls for the development of an evidence informed and value based digital operating framework for water across scales that will integrate effects of hydrological, biogeochemical, ecological, human health, cultural, social-economic behaviour, institutions and will help understand feedbacks in near real-time for all stakeholders. This will enable us to identify, predict and adjust responsible production and consumption behaviours under varying risk conditions based on evidence-based science.

The Action Plan

This operating framework must leverage advanced cyber-infrastructure and integrate multiple subsystems in the domain of, but not limited to, hydrological, biogeochemical, and ecological and anthropogenic processes. It can be developed by embedding existing scientific models with big data analytics, cloud computing, augmented intelligence, deep-learning techniques and distributed ledger systems like blockchain technologies to verify information flows. The system can be powered by the growing arsenal of free, publicly available digital information streams and in near real-time enable us to operationalize predictive science and technological inventions for water-related decision-making across numerous scales.

Such a new digital operating framework is essential to help society understand the potential tipping points of the water crisis in order to mitigate the impact. This framework would allow us to pinpoint opportunities, such as investment, allocation, and engineered interventions, with respect to time and space and shape our strategic thinking on sustainable water futures. This framework will be connected and will feed existing platforms for improved performance. It also will allow the water community to address many of the current and expected water governance challenges, and help manage critical water resources by increasing the knowledge distribution on improving operational efficiency, reducing waste, extending the life of existing assets, and protecting the very aquatic biodiversity and ecosystem services upon which reliable water systems depend.

What we propose here is a paradigm shift. We propose a new innovative approach on how information is to be collected, processed, and used in decision making at different scales. The framework should be value-based and incorporate safeguards against the ever-evolving challenges related to data privacy, cybersecurity and ethics. Such a paradigm shift is to improve human and environmental health and well-being, increase innovation opportunities, create jobs and ultimately have a positive societal impact.

The Bengaluru Water Future Conference submits the following recommendations for general consideration, with a view to the proceedings of the Budapest Water Summit 2019 in particular:

Creating a digital environment

1. Through appropriate capacity development activities facilitate the work of an interdisciplinary team of scientists, humanists, policy specialists and digital technologists to develop the architecture for the integrated digital water management framework across scales.

2. Develop partnerships with non-water actors who pioneered integrating disruptive technologies and adopt appropriate good practices.

3. Enable the fast and effective transfer of modern data science, modelling and other relevant new water management tools for the benefit of developing countries, particularly in Africa and South and Southeast Asia.

4. Facilitate the inclusion of citizen scientists to amplify data capture and provide verification of these important new information streams.

5. Capitalize on the most recent advances in space technology for the benefit of sustainable water resources management, seamlessly enabling up and downscaling.

Creating an integrated architecture

1. Use new design tools based on deep learning, advanced neural networks, artificial intelligence, machine learning to map out static (e.g., engineered infrastructure) and time-varying (e.g., watershed state and natural capital) elements of and linked to water systems and develop meaningful and traceable indicators for policy planning.

2. Implement greater access, openness and transparency in data heritage and governance.

3 Design ethics-based cyber information systems which take into account the notion of equity, fairness, social justice, conflict avoidance and water-sharing support system.

4 Integrate into this framework the current water resources assessment capabilities. Refine modelling of coupled social and environmental processes, including detection of potential water-related in-country and transboundary conflicts and migration.

5 Develop machine learning tools that appropriately consider the accelerating hydrological cycle under climate change and invokes non-stationarity for an improved estimation of relevant design values. The impacts of non-stationarity will result in higher occurrence probabilities of extremes, such as floods and droughts, for which the research, technology and policy community will need to develop adequate responses, including social ones.

Developing capacity to deliver digital transformation in the water sector

1 Gender-sensitive capacity building approaches targeting emerging digital technologies should initiate, from the outset, an in-depth context-specific assessment of the utility for digital technology and big data, and value the differing perceptions and perspectives on the value of digital technologies and digital transformation.

2 The emerging digital future requires a fundamental effort to advance data literacy of all stakeholders engaged in water security, in order to have a more effective and visible voice in global discourses and to guard against a growing digital divide that would exacerbate inequalities in socially differentiated groups as well as within and between regions. Apply such frameworks to support sustainability by influencing water culture in general, including consumer behaviour, policy planning, environmental protection, business intelligence, pedagogy, public and private finance and investment-related activities as well as water-related politics.

3 Stimulate and foster innovations in water institutions, governance through innovative, cyber based applications.

The water science community that convened in Bengaluru is committed to working with all stakeholders to realize the action plan