



## THE BONN DECLARATION ON GLOBAL WATER SECURITY

In the short span of one or two generations, the majority of the 9 billion people on Earth will be living under the handicap of severe pressure on fresh water, an absolutely essential natural resource for which there is no substitute. This handicap will be self-inflicted and is, we believe, entirely avoidable.

After years of observations and a decade of integrative research convened under the Earth System Science Partnership (ESSP) and other initiatives, water scientists are more than ever convinced that fresh water systems across the planet are in a precarious state. Mismanagement, overuse and climate change pose long-term threats to human well-being, and evaluating and responding to those threats constitutes a major challenge to water researchers and managers alike. Countless millions of individual local human actions add up and reverberate into larger regional, continental and global changes that have drastically changed water flows and storage, impaired water quality, and damaged aquatic ecosystems.

Human activity thus plays a central role in the behavior of the global water system.

Since 2004, the Global Water System Project (GWSP) has spearheaded a broad research agenda and new ways of thinking about water as a complex global system, emphasizing the links that bind its natural and human components. Research carried out by GWSP and its partners has produced several important results that inform a better global understanding of fresh water today.

- Humans are a key feature of the global water system, influencing prodigious quantities of water: stored in reservoirs, taken from rivers and groundwater and lost in various ways. Additional deterioration through pollution, now detectable on a global scale, further limits an already-stressed resource base, and negatively affects the health of aquatic life forms and human beings.
- At a time of impending water challenges, it remains a struggle to secure the basic environmental and social observations needed to obtain an accurate picture of the state of the resource. We need to know about the availability, condition and use of water as part of a global system through sustained environmental surveillance. History teaches us that failure to obtain this basic information will be costly and dangerous.
- Humans typically achieve water security through short-term and often costly engineering solutions, which can create long-lived impacts on social-ecological systems. Faced with a choice of water for short-term economic gain or for the more general health of aquatic ecosystems, society overwhelmingly chooses development, often with deleterious consequences on the very water systems that provide the resource.
- Traditional approaches to development are counterproductive, destroying the services that healthy water systems provide, such as flood protection, habitat for fisheries and pollution control. Loss of these services will adversely affect current and future generations.
- Sustainable development requires both technological and institutional innovation. At present, the formulation of effective institutions for the management of water lags behind engineering technologies in many regions.
- Research from the GWSP and elsewhere confirms that current increases in the use of water and impairment of the water system are on an unsustainable trajectory. However, current scientific know-

ledge cannot predict exactly how or precisely when a planetary-scale boundary will be breached. Such a tipping point could trigger irreversible change with potentially catastrophic consequences.

The existing focus on water supply, sanitation and hygiene has delivered undoubted benefits to people around the world, but equally, we need to consider wider Sustainable Development Goals in the context of the global water system. Ecosystem-based sustainable water management, a pressing need that was reaffirmed at the Rio+20 Earth Summit, requires that solving water problems must be a joint obligation of environmental scientists, social scientists, engineers, policy-makers, and a wide range of stakeholders.

These realities motivate the water community assembled in Bonn for the Global Water System Project Conference “Water in the Anthropocene” to make a set of core recommendations to institutions and individuals focused on science, governance, management and decision-making relevant to water resources on earth. Given the development imperatives associated with all natural resources at the dawn of the 21st century, we urge a united front to form a strategic partnership of scientists, public stakeholders, decision-makers and the private sector. This partnership should develop a broad, community-consensus blueprint for a reality-based, multi-perspective, and multi-scale knowledge-to-action water agenda, based on these recommendations:

1) Make a renewed commitment to adopt a multi-scale and interdisciplinary approach to water science in order to understand the complex and interlinked nature of the global water system and how it may change now and in future.

2) Execute state-of-the-art synthesis studies of knowledge about fresh water that can inform risk assessments and be used to develop strategies to better promote the protection of water systems.

3) Train the next generation of water scientists and practitioners in global change research and management, making use of cross-scale analysis and integrated system design.

4) Expand monitoring, through traditional land-based environmental observation networks and state-of-the-art earth-observation satellite systems, to provide detailed observations of water system state.

5) Consider ecosystem-based alternatives to costly structural solutions for climate proofing, such that the design of the built environment in future includes both traditional and green infrastructure.

6) Stimulate innovation in water institutions, with a balance of technical- and governance-based solutions and taking heed of value systems and equity. A failure to adopt a more inclusive approach will make it impossible to design effective green growth strategies or policies.

The recommendations above, taken collectively, can constitute the centrepiece of a blueprint to promote the adoption of science-based evidence into the formulation of goals for sustainable development. Stewardship requires balancing the needs of humankind and the needs of nature through the protection of ecosystems and the services that they provide. Without such a design framework, we anticipate highly fragmented decision-making and the persistence of maladaptive approaches to water management.

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