



## The Global Water System Project A project of the Earth System Science Partnership



### The Global Water System

Water is essential to life on earth, plays a key role in the development and functioning of society and is recognised as a high priority resource for sustainable development. Over the past few decades, environmental science has produced insights into various human, physical, biological and biogeochemical facets of the water cycle that makes up the global water system. The global water system is being transformed by major syndromes including climate change, erosion, pollution and salinisation (see Fig. 1). Although human-induced changes to the water system are now global in extent, we lack an adequate understanding of how the system works and responds to disturbances, and how society can best adapt to rapidly-evolving new system states.



- 1 Hydrological cycle accelerated
- 2 Mountain snow/ice lost
- 3 Trees removal increases runoff, reduces transpiration, affects water table and landscape salinity
- 4 Wetlands dried up or drained
- 5,6 Ground- and surface water used for irrigated agriculture
- 7,8 Dams alter flow and reservoirs increase evaporation
- 9 Industrial water coolers release water vapour
- 10 Transfers between basins
- 11 Urban, mining and construction areas alter water flows and quality
- 12 Coastal salt water intrudes inland
- 13 Impoundments reduce flows
- 14 Siltation, erosion and nutrient flows change coast-lines and affect water quality
- 15 Levees and locks modify flows and channels
- 16 Settlements alter floodplain landscapes
- 17 Grazing affects runoff and water quality
- 18 Industry causes acid rain
- 19 Coastal waters polluted and species lost

**Figure 1:** Examples of major human-induced perturbations to the global water system (numbers refer to the list given on the right-hand side). Source: Vörösmarty et al., 2004. Humans Transforming the Global Water System. *Eos, Transactions, American Geophysical Union*, 85:48 (30 November 2004).

### The Global Water System Project

The Earth System Science Partnership has created a new research project to address these problems (see box). The *overarching question* of the Global Water System Project (GWSP) is how human actions are changing the global water system and what are the environmental and socio-economic feedbacks arising from the anthropogenic changes in the global water system. *Three core questions* follow from this overarching question, and these questions make up the three major research themes of the GWSP.

The first question is ‘*What are the magnitudes of anthropogenic and environmental changes in the global water system and what are the key mechanisms by which they are induced?*’ The activities related to this theme aim at the documentation and attribution of the global water system and will include examinations of the relationships between the global water system and water governance, land cover changes, climate change, water diversions, and nutrient and sediment transport.

The second question is ‘*What are the main linkages and feedbacks within the Earth system, arising from changes in the global water system?*’ Related activities include studies of the linkages at different spatial

scales in the global water system, arising for example through the international trade in virtual water, and studies of the legacy of human and natural interactions in the global water system. The goal of this theme is to gain a holistic understanding of the global water system.

The third question is *‘How resilient and adaptable is the global water system to change, and what are sustainable management strategies?’* Related studies will deal with water requirements for nature and humans, the nature of the adaptive capacity of the global water system and approaches to enhance the capacity and the provision of ecosystem goods and services by the global water system. The aim of this theme is to understand implications for the future and to inform policy and decision makers.

### **Fast-Track Activities**

At the first meeting of the GWSP Scientific Steering Committee in February 2005, a list of so-called ‘Fast-Track Activities’ has been defined. The list includes the development of a world-water atlas (including the development of indicators and an improved estimation of the world water balance); the development of a Global Water System Lexicon; the organisation of a workshop on key issues of the global governance of water; the development of water and agriculture scenarios of the Brahmaputra-Ganges region; the organisation of an advanced (educational) institute for regional and global water researchers; a baseline study on environmental flows; case study implementations in cooperation with other initiatives.

### **Further Information**

Detailed information about the GWSP can be found in the report ‘GWSP Science Framework and Implementation Activities’, which is available on the GWSP website ([www.gwsp.org](http://www.gwsp.org)). The website also provides the project’s newsletter ‘Global Water News’, selected publications, a list of all members of the scientific steering committee, and other information, for example on GWSP related meetings.

### **Get in Contact**

If you want to get more information, or if you want to contribute to the activities of the project described in the GWSP Framework Document, or the fast-track activities, you are welcome to get in touch with the International Project Office (see contact information).

#### **Contact Information**

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### **GWSP Governance and Focus**

The Global Water System Project (GWSP) is a joint project of the Earth System Science Partnership (ESSP) consisting of four Global Environmental Change Programmes: the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme (IHDP), the World Climate Research Programme (WCRP) and DIVERSITAS, an international programme of biodiversity science. In the Scientific Steering Committee of the GWSP, which consists of eminent scientists from Africa, Asia, Europe, Australia, South America, and the USA, various scientific disciplines are represented. The project implementation is co-ordinated by the GWSP International Project Office, hosted at the Center for Development Research, University of Bonn, Germany.

The GWSP is a science-driven project taking a global and broad temporal perspective on the world’s freshwater, while being scientifically integrative, addressing gaps and collating results.