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EDITORIAL

Thank you to all who welcomed me personally when I began working as the Executive Officer of the GWSP in December 2006. It has been an exciting year with lots of changes. At its 5th Session in Brisbane, Australia, in August 2007, the Scientific Steering Committee (SSC) approved a new implementation strategy. This consists of three Global Initiatives as Integrative Study Areas for which new expert groups will formulate cutting-edge research plans. More information is given in this Newsletter. Recognising that full integration of social sciences, economics, biodiversity research, and geosciences requires well-developed methods and a powerful knowledge base, the SSC also confirmed that extra efforts are needed for research on global water governance, and for integrative modeling in the GWSP context. The two lead articles are reflecting these issues. The biggest remaining challenge for GWSP is the expansion of capacity building with regard to multi-disciplinary work; this is a matter of funding infrastructure as much as the willingness to tackle complex issues. An example from Africa is the Advanced Institute which we organise in collaboration with START and others. My wish for the year 2008 would be to see GWSP researchers motivate senior and young scientists from all continents to address the important issues we are facing in the future. We hope that we will be able to provide opportunities for all of you to participate in this process and look forward to having you join us.

Lydia Dümenil Gates
Executive Officer, International Project Office (IPO)

GOVERNANCE AND THE GLOBAL WATER SYSTEM: THE NEED TO ADOPT A GLOBAL PERSPECTIVE ON WATER ISSUES

Understanding and managing the earth's resources is a key focus in the natural sciences, but there are increasing calls for earth system governance theories (Biermann 2007) in the social science world. Global water governance and policy have only very recently entered the focus of researchers and social scientists (e.g. Conca 2006; Hoekstra 2006; Varady & Iles-Shih forthcoming). In this article we argue for a stronger focus on global water governance in research and policy, provide a brief overview on ongoing processes and point at potential future developments before arguing for certain key issues to be addressed by the scientific and policy communities.

Multiple forms of global governance: Protesters claiming a human right to water during the World Water Forum in Mexico in March 2006

Although water governance can be traced back more than 5000 years, it was only in 1982 and 1997 respectively that the UN Convention on the Law of the Sea and the UN Convention on the Law of the Non-Navigational Uses of International Watercourses were adopted; and only in the last few decades has water hit the global political and scientific agendas. Different views exist on what is the appropriate scale to govern water. Many argue that since water problems occur locally, water governance is a *local level* issue and one needs to understand local rights, needs and stakeholders to address governance issues effectively. Those advocating a *basin level* approach emphasise that water related problems are best dealt with within the natural system boundaries in order to manage the basin efficiently, including up- and down-stream relations. Those supporting a *global* perspective argue that water related problems and conflicts elude appropriate solutions at local or basin level.

Indeed, one could argue that water is also a global, multi-level issue since:

1. The hydrological system is global and exchange processes occur at global level.
2. Global environmental change and socio-economic globalisation phenomena create driving forces behind water problems that lie outside

the reach of local, national or basin oriented governance regimes.

3. Many locally occurring phenomena such as water scarcity or biodiversity loss may imply alarming global trends requiring global action.
4. The direct and indirect impacts of relatively reduced quantities and qualities of water are global (e.g. distribution of food production).
5. Lessons learnt in one part of the world could be relevant for other parts of the world and comparative learning justifies a global approach.

Such arguments have led to a variety of governance initiatives at global level:

- Established in 1996, the **World Water Council**, a multi-stakeholder platform, addresses global water issues through the **World Water Forum** and associated ministerial conference. The conference adopts a political declaration of action points.
- The **UN** with their conventions, agencies and programmes are a dominant actor in the global water arena. Parts of these activities are under the umbrella of the UN Water mechanism which was established to coordinate UN activities on the follow-up of the WSSD in 2002, and the **Millennium Development Goals** (MDGs). However, such goals cannot be achieved without global leadership.
- **Emerging Global Industrial Players** such as multinational water corporations are participating in domestic water supply and wastewater treatment in a growing number of urban centres of the world.
- **Global scientific and professional communities** increasingly shape the international debate. In addition to long established organisations and programmes such as UNESCO's International Hydrological Programme (IHP), the global arena is populated by further organisations and projects like the Global Water Partnership, the International Water Association, the International Network of Basin Organisations or the Global Water System Project.
- The **global diffusion of institutions** (formal and informal rules) can be perceived as self-organised governance structures in an increasingly globalised world, or as a process managed by influential actors to promote some values at the cost of others. One example is the introduction of the IWRM concept.

The heterogeneous actor landscape and complex, diffuse networks of interactions reflect that global water governance is fragmented, which after Rosenau's (2002) typology can be described as mobius-web governance. Postulating that future developments are characterised by the trends towards globalisation versus regionalisation and centralisation versus decentralisation one can envisage four scenarios:


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- **Global multi-level initiative(s):** In recent years, several initiatives emerged such as the World Water Forums and the UN organisations and external partners under the UN Water mechanism. Such initiatives could compete (with synergetic, duplicative or contradictory results) or collaborate (with synergetic results), but collaboration without leadership is unlikely.
- **Regional, multi-level initiatives:** In a multi-speed world, where some regions are more developed than others, successful initiatives may be regionally anchored. These include the EU's Water Framework Directive, and initiatives such as the Mekong River Commission and the Southern African Development Community.
- **Global treaty based regimes:** For the past fifty years, there have been efforts to codify common principles of water law that apply in different regions, leading to the influential 1966 Helsinki rules of the International Law Association and its more recent update in 2004. Such initiatives develop common management norms but face competition from the globalisation process.
- **State centred, unilateral, centralised initiatives:** With the rise of terrorism and the return to unilateralism by the United States, one sees a growing trend towards state centred management of water, focusing on national interests and protecting the politically sensitive resource of water.

Each of the outlined scenarios has its own advantages and disadvantages. A centralised, state centred approach appears to be outdated, but since water is a politically sensitive resource, many governments will avoid giving up control to fluvial or global regimes. A multilateral regime assures state sovereignty while promoting common norms

for dealing with water. Where multilateral agreement is not possible, solutions may be sought effectively at regional level. A pluralist, multi-actor approach may work well for developed countries where institutional processes exist to ensure accountability of the key actors, but there are major doubts about whether such processes will function well for the developing countries.

It is unclear how global water governance will develop but we argue that the scientific and policy communities need to focus on the following key issues and questions:

a. What are the most likely developments in water governance and will they meet the emerging challenges in the sustainable management of water resources at global scale?
b. How does one design and promote global multi-level governance in a world with multiple levels of economic development, multiple institutional structures, multiple cultural and historical traditions?
c. How can legitimacy, legality, accountability, equity, transparency, effectiveness and efficiency be ensured in such a fragmented governance framework?
d. Under what circumstances will global governance networks work in favour of the poor and underprivileged and lead to an empowerment of those whose voice is not yet heard to guarantee the key issues of access to water and sanitation?
e. Under what conditions will such polycentric governance frameworks provide a basis for adaptive, multi-level governance that can respond flexibly to emerging challenges and changes in structural context at different scales?
f. Studies on water governance must develop a multi-level approach and analytical framework which includes the global level and its cross-level interactions to do justice to the complexity of current governance processes and governance challenges.

The lack of strong motivation within UN agencies and states to push water management further has been compensated by the rise of pluralistic bodies trying to deal with these issues. In a world of decreasing solidarity and increasing globalisation, can global governance frameworks provide the legal, legitimate, accountable systems that can lead to sustainable water management for the humans and ecosystems that depend on them?

Acknowledgements

The authors would like to thank all participants of the workshop on "Governance and the Global Water System", 20–23 June 2006, Bonn, Germany, for their comments on the issues addressed in this paper and very stimulating discussions. Joyeeta Gupta wishes to acknowledge that her contribution was undertaken in the context of the "Inter-governmental and private environmental regimes and compatibility with good governance, rule of law and sustainable development" project, financially supported by NWO, Netherlands Organisation for Scientific Research.

The ideas presented in this article are discussed further and in more detail in a paper which is currently under review for a special issue of Global Governance on global water governance.

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GREEN WATER IN THE GLOBAL WATER SYSTEM

Green Water, i.e. soil water originating from rainfall, which sustains agricultural and other vegetation through transpiration or evaporates directly from land surfaces, comprises the largest component of the terrestrial hydrological cycle. On average, green water fluxes are twice as large as blue water (surface and ground water) fluxes. In semi-arid and sub-humid regions green water may constitute more than 90% of all water fluxes (Falkenmark 2005).

However, green water is largely ignored in water management, even when referring to integrated water resources management (IWRM). Global water assessments have not yet taken into account green water – see for example World Water Vision (2000), World Water Development Report (2003, 2006) or the Human Development Report on water (2006), and green water is missing also from all indicators of water scarcity. At best, green water is considered as the residual in the water balance, when calculating blue water stores and fluxes. Water management is synonymous with blue water management. Ecosystem water demands are only quantified for aquatic ecosystems (e.g. Smakhtin et al. 2004). The potential role of land management in mitigating water scarcity is largely ignored.

The Millennium Ecosystem Assessment (2005) emphasised the importance of all ecosystems and the services they provide to sustain human well-being, in particular in poor, often semi-arid and sub-humid regions. It failed, however, to quantify the amounts of (green) water required to support terrestrial ecosystems for providing these services, and it also looked at tradeoffs between different ecosystem services from the blue water perspective only.

The recent Comprehensive Assessment of Water Management in Agriculture (2007) begins to address the importance of green water, by pointing out that rainfed agriculture holds the greatest potential for increasing yields in view of closing the food gap over the coming decades and also to reduce poverty. The 4th Assessment Report of the Intergovernmental Panel on Climate Change (2007) and other assessments highlight the importance of biofuels and carbon sequestration in mitigating climate change, but a comprehensive account of the (green) water resources upon which these measures depend, and potential tradeoffs with water demands for other ecosystem services, is still lacking.

At the same time, integrated management of blue and green water and land, holds an enormous potential to mitigate increasing water scarcity in semi-arid and sub-humid regions. Particularly, this is the case in so called closed basins where all available blue water is already committed, and any new water allocations compromise some current water use (Rockström et al 2007).

A new initiative on global green water fluxes was launched at a recent joint TIAS-GWSP workshop on "Global Assessments: Bridging Scales and Linking to Policy" (Van Bers et al. 2007). A number of modeling groups agreed on a coordinated assessment of green and blue water fluxes and productivities at continental to global scale. An initial workshop of the new global green water initiative will be held in January 2008 at the Stockholm Environment Institute.

This new initiative was kicked off at the TIAS-GWSP workshop with a set of presentations, with results from

Figure 1. *Proportion of green water in total agricultural water fluxes per 0.5 degree grid cell (Rost & Gerten submitted)*

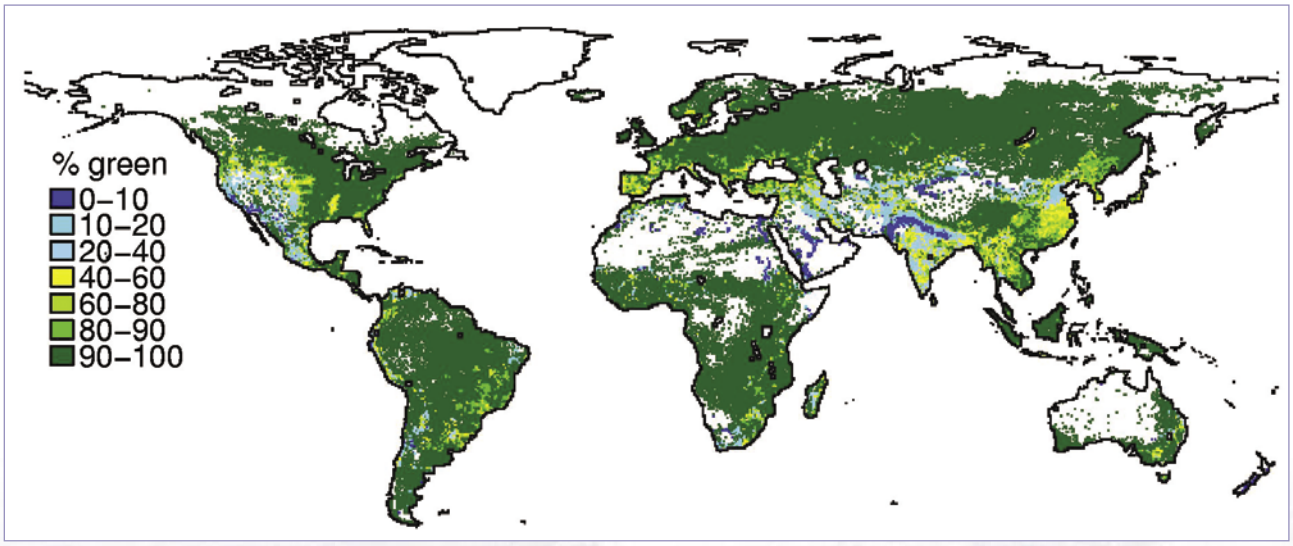


Figure 2. *Ratio of green and blue water in virtual water exports, calculated by the GEPIC model (Yang et al. 2006)*

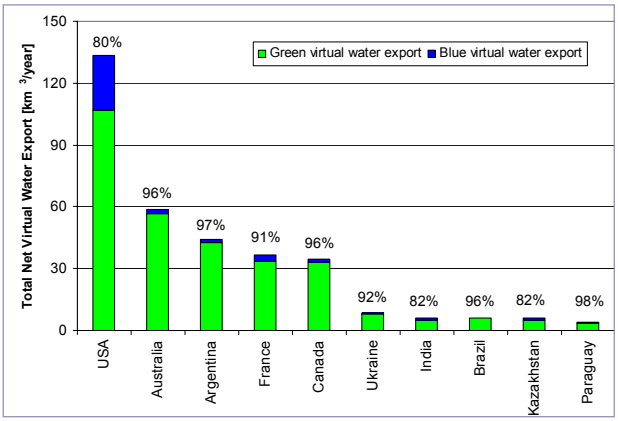
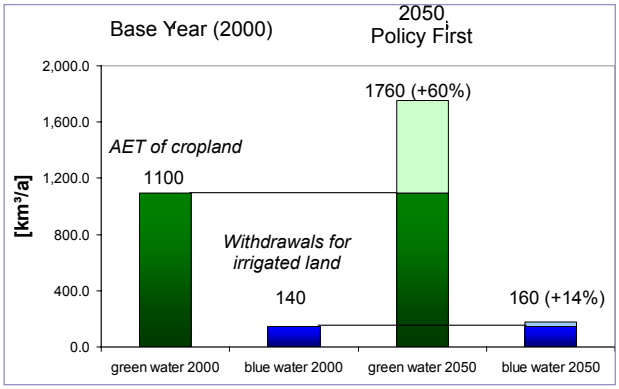


Figure 3. *Current and future green and blue water fluxes in agriculture and other economic sectors in Africa (Alcamo et al. 2007, using LandShift and WaterGAP models)*



different large-scale hydrological, vegetation and crop models, which impressively demonstrated the importance of productive green water fluxes in supporting food production and other ecosystem services and human livelihoods. An example was provided by the LPJmL model, which demonstrates to what degree global rainfed and also irrigated agriculture depend on green water (the remainder being blue water) – see figure 1.

This dominance of green water in producing the world's food is also reflected in trade with agricultural commodities. All major food exporting countries derive most of their virtual water, embedded in agricultural export products, from green water (>80%) – see figure 2.

An analysis of water fluxes in Africa indicates even stronger dependence on green water. With less than 5% of agricultural area in Africa being irrigated (FAO Aquastat, WRI Earthtrends), low industrial water demand, and limited water infrastructure development, any water-scarcity indicator that ignores the role of green water in supporting livelihoods, is rather meaningless. In Africa, the dependence on green water in agriculture is likely to increase further. This is shown in figure 3 on the basis of the 4th Global Environment Outlook (2007) policy first scenario under which crop land in Africa increases at the expense of natural vegetation.

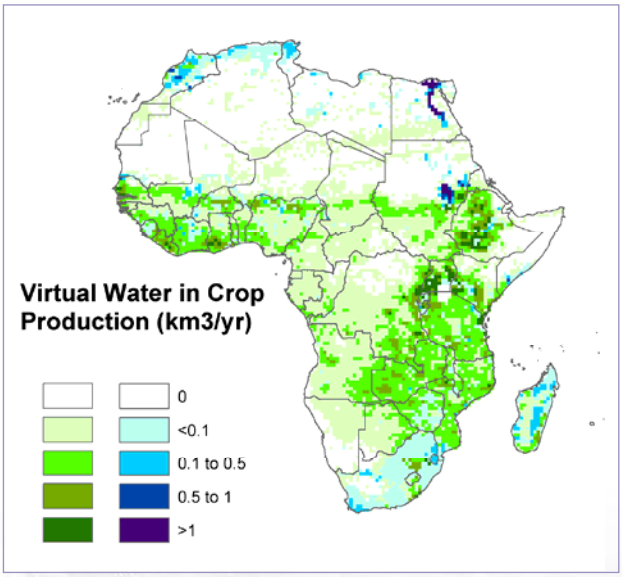
To put these numbers into perspective: the estimated total annual renewable blue water resources (river flow and groundwater recharge) in Africa amount to about 4000 km³ (Odada 2006).

Also for Africa, an initial attempt was made to calculate the blue and green water ratio in the virtual water content of crops, deriving green water fluxes (evapotranspiration) as the residual of precipitation and blue water fluxes (runoff and groundwater recharge) – see figure 4.

The new global green water initiative that was launched at the TIAS-GWSP workshop will be the first coordinated quantification, geographically explicit and through process-based modeling, of green water fluxes at continental to global scale, as a function of land use and vegetation cover.

This new initiative will start from initial parallel simulations of the participating global hydrology, vegetation and crop models, and progress to innovative model intercomparisons, based on best available (and harmonised) input data and standardised scenarios of e.g. climate and land use change. From this expertise improvements are expected across models, that would also allow for best available parameterizations e.g. of crops, natural vegetation, irrigation and river routing.

Figure 4. *Amount of green water (left column) and blue water (right column) per grid cell in the virtual water content of crops in Africa (Vörösmarty et al. 2005, using the WBM model)*



Box 1. *Model Descriptions*

LPJmL, a dynamic global vegetation and hydrology model (Gerten et al. 2004, Rost & Gerten, submitted; see http://www.pik-potsdam.de/lpj) calculates green and blue water fluxes and productivities geographically explicit at 0.5 degree resolution, based upon biogeochemical, hydrological and plant physiological processes, for about a dozen natural plant functional types and a dozen rainfed and irrigated crop functional types.

The **GEPIC** model integrates the EPIC crop growth model with a GIS, to calculate green and blue water fluxes in agriculture and virtual water content of crops (Liu et al. in press).

LandShift (**Land S**imulation to **H**armonize and **I**ntegrate **F**reshwater Availability and the **T**errestrial Environment) is an integrated model system to simulate land use change processes on the global and continental level.

WaterGAP (Water – a Global Assessment and Prognosis) is a global hydrological model, that simulates water availability and demand, at continental to global scale.

WBM, the Water Balance and Transport Model calculates runoff and other hydrological parameters at continental to global scale.

With that, the new initiative will produce best estimates of green water fluxes and productivities for current and scenario conditions, e.g. at country and basin level.

Such a product will add an important (green water) dimension to the earlier UN Comprehensive Freshwater Assessment (1997).

Eventually the new initiative will quantify and compare water fluxes sustaining different ecosystem services across sectors (e.g. food and biofuel production, carbon sequestration etc). Also a new water scarcity index that includes productive green water fluxes will be derived. In order to be relevant for water management and governance, a transfer of information across scales has to be achieved, e.g. upscaling of the hydrological effects of certain interventions and land use changes (e.g. afforestations, rainwater harvesting, conservation agriculture etc) to basin level.

Application of results of the new initiative will be facilitated through stakeholder dialogues, as part of the GWSP Global Catchment Initiative.

The products of this new initiative will contribute to the GWSP Digital Water Atlas, which describes and maps key indicators of the state of the Global Water System.

The new global green water initiative, for which some important building blocks were presented at the GWSP-TIAS workshop, will open an exciting new way of integrating land and water management for sustainable development.

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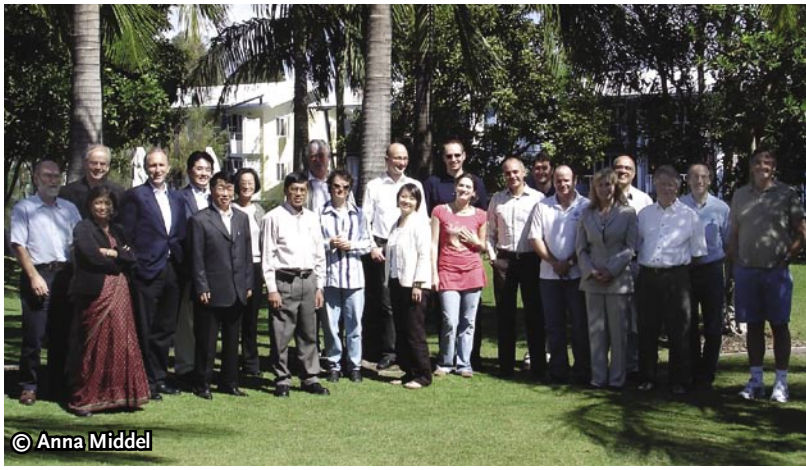
GWSP GOVERNANCE

GWSP SSC and EC meetings in Beijing, Amsterdam, and Brisbane

The 4th meeting of the Scientific Steering Committee of the GWSP was held on 7–8 November 2006 in Beijing, back-to-back with the ESSP Open Science Conference and the Annual Workshop of GWSP's Chinese National Committee.

The SSC evaluated the GWSP's programme definition and initiation phase (2005–2006). The project's Fast-Track Activities were regarded as being successful in launching the project. At the same time, the SSC called for a more structured, cohesive approach for the programme implementation and product delivery phase (2007–2010) and commissioned GWSP's Executive Committee to develop a strategy and work plan for phase II of the project.

At its meeting in Amsterdam on 19–20 February 2007 the Executive Committee developed the concept of three Global Initiatives as Integrative Study Areas (see report in this Newsletter). This concept for GWSP's second phase was approved by the SSC at its 5th meeting at Couran Cove on Southbroke Island, Brisbane on 25 – 27 August 2007. The SSC meeting was hold prior to the Third International Symposium on Riverine Landscapes which was co-sponsored by GWSP.



Participants of the GWSP SSC meeting on Southbroke Island near Brisbane, Australia, August 2007

Both SSC meetings were attended by liaisons from the Earth System Science Partnership (ESSP), the four global environmental change research programmes (DIVERSITAS, IGBP, IHDP, WCRP), the International Water Association (IWA), the International Water Management Institute (IWMI), and UNESCO-IHP.

Global Initiatives as Integrative Study Areas

In order to ensure product delivery during Phase 2 of the Project (2007–2010) and to involve the broader natural and social science community interested in global change issues, GWSP defined three Global Initiatives as Integrative Study Areas (ISA) within which the implementation of the tasks of the Scientific Framework will be coordinated and the delivery of truly integrated and interdisciplinary research results will be secured.

The Initiatives are targeted towards the production of scientifically outstanding and highly policy-relevant results. To achieve these results an integration of activities across themes and sub-themes of the Scientific Framework as well as across disciplines is essential. This way, the Initiatives are a strategic tool for the overall integration and synthesis of project results.

The three Global Initiatives are:

- Global Scale Initiative: Ranking of Changes to the Global Water System
- Global Catchment Initiative: Bringing the Global Perspective to River Basin Research and Management

- Global Water Needs Initiative: Balancing Human and Nature Water Requirements

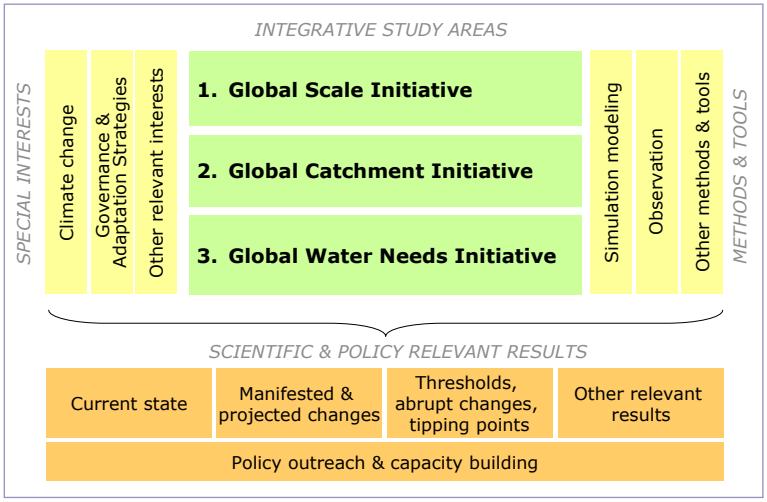
For each Initiative a GWSP Expert Group will be established in order to guide the implementation of related activities and the achievement of the overall goals and objectives. Membership in GWSP Expert Groups will be open to the broader scientific community related to global water system research.

Expert Group 1 – Global Scale Initiative: Ranking of Changes to the Global Water System

Goals and Objectives:

a. Create a coherent geography – a set of electronic maps – on the State of the Global Water System and world water resources with a focus on contemporary and future time horizons.
b. Demonstrate the use of sufficiently mature "off-the-shelf", operational data bases that can assess the state of and variability in the global water system.
c. Develop models, data sets, and other necessary tools to identify hot spots of change with respect to the physical, biological, biogeochemical, and human dimension aspects of the global water system.
d. Translate the global-scale outputs into research, education, and policy priorities.

Figure 5. *Conceptual Framework of GWSP Activities in Phase II (2007–2010)*



Expert Group 2 – Global Catchment Initiative: Bringing the Global Perspective to River Basin Research and Management

Goals and Objectives:

a. Advance the state of scientific understanding of the global water system through a worldwide study of catchments.
b. Encourage researchers working on a catchment level to address questions associated with the global water system not normally addressed in catchment studies.
c. Identify regional feedbacks between the hydrologic system, the terrestrial environment, the climate system, and governance regimes.
d. Develop new ideas for adapting to undesirable global changes on the river basin scale, and to communicate these ideas to policymakers and other stakeholders.

The first meeting of the Expert Group of the Global Catchment Initiative will be held on February 7/8, 2008 in Bonn. Participants are representatives from UNESCO's HELP and FRIEND initiatives, the CGIAR Challenge Programme on Water and Food, the GLOWA programme, and further distinguished scholars from natural and social science disciplines.

Expert Group 3 – Global Water Needs Initiative: Balancing Human and Nature Water Requirements

Goals and Objectives:

a. Develop a global consensus on approaches for the assessment of environmental flow needs.
b. Consolidate the state of knowledge about human water consumption patterns and quantify the implications of future human water allocations on the sustainability of river ecosystems.
c. Valuate freshwater ecosystem goods and services.
d. Devise strategies for harmonising human and nature water requirements.

The three Initiatives were launched at the GWSP Scientific Steering Committee meeting in August 2007. The Expert Groups are currently under formation and the work programme for the three Initiatives is being discussed.

Contact:
For further information on the new initiatives and on how to get involved, please contact the GWSP IPO (gwsp.ipo@uni-bonn.de).

GWSP Chinese National Committee and Asia Network

With respect to risks of floods and droughts and issues such as water shortage, water conflict, and degradation of aquatic ecosystems, China has adopted the global water system approach to managing water resources by coping with increasing water related stresses from rapid population growth and economic development. The establishment of the Chinese National Committee of IGBP-BAHC in 1995 took the first step in the Chinese water community to cooperate with the international community to strengthen research on the global water system. Furthermore, the Chinese National Committee of the Global Water System Project (GWSP-CNC)

and the Asia Network Science Office of Global Water System Project (GWSP-ANSO) were established in 2003 and 2006 respectively, to promote the involvement of the Chinese water community in global water system research. The GWSP-CNC and the GWSP-ANSO office in Beijing are hosted by the Institute of Geographical Sciences & Natural Resources Research, at the Chinese Academy of Sciences. GWSP-CNC is chaired by Prof. LIU Changming, academician of the Chinese Academy of Sciences (CAS). Prof. XIA Jun is the Executive Vice-Chairman of CNC-GWSP and he is also responsible for the operation of GWSP-ANSO. Recently, Dr. LIU Wenhua joined the GWSP Beijing office to take care of daily administration work, liaise with the IPO of GWSP in Bonn, and network with scientists worldwide.

Research Projects

GWSP-CNC and GWSP-ANSO have been active in developing research programmes on China's current situation and needs to address typical water issues and problems.

- *Cross-basin Water Diversion Projects and Their Impacts on the Hydrological System and Water Security*
  This 4-year project (2007–2009) is supported by CAS. The research aims to understand interactions among atmospheric water, surface water and groundwater at cross-basin water system level and impacts of climate change and human activities on the hydrological cycle. A model will be developed to support the assessment not only of climate change and human activities, but also of the impacts of cross-basin water diversion projects on water security.
- *Impacts of Dams and Flood Gates on Water Flow and Ecosystem Restoration in the Huai River Basin*
  This collaborative research project is being implemented by research teams from China and Japan at the period of time from 2007–2009.
- Modeling Water Cycle for Cross-basins and Quantifying Uncertainties of the Changing Environment
  The Chinese National Science Foundation will fund this project during the fiscal years 2008–2011.
- *China's Water Modeling System*
  The proposal for this project has been developed by the Key Lab of Water Cycle & Related Surface Processes, Chinese Academy of Sciences (CAS) and will receive funding soon.

Science-Policy Dialogue on Water Issues

The research activities of CNC-GWSP and ANSO-GWSP not only contribute to a better understanding of the dynamics of the global water system, but also promote science-policy interface. In May 2007, the consultant report of *Countermeasures and Suggestions on Resolving Water Problems in China,* drafted by scientists from the Center for Water Resources Research, CWRR-CAS, GWSP-ANSO and GWSP-CNC, was presented to the Chinese Government at a meeting held by the National Scientific Advisory Committee. Mr. HUI Liangyu, the Vice Premier of China highly commended the report in helping the Chinese government to make sound decisions for future development. In October 2005, GWSP-CNC and the Key Lab of Water Cycle & Related Surface Processes of CAS submitted a proposal on China's Water Cycle Observation Plan (CWCOP) to the Ministry of Sciences & Technology (MOST). The proposal suggested the establishment of a global observation network for large river basins in China. This proposal has become an important component of the National Integrated Earth Observation System Plan 2005–2015 to guide the next decade's scientific activities in investigating the changes of the global water system.

Workshops and Conferences

Recently, GWSP-CNC and GWSP-ANSO organised a series of successful water conferences, workshops and symposia to showcase the latest research results on the global water system. In November 2006, a joint workshop of GWSP-CNC and GWSP chaired by Prof. LIU Changming was held in Beijing to bring together scientists from across the world to discuss future research priorities. In June 2006, the International Symposium of Hydrological Sciences for Managing Water Resources was organised in China chaired by Prof. XIA. As an important section of the symposium, the 2nd GWSP Asia Network Workshop on *Global Water System Hotspots in the Asian Region: Mega Cities and Dams* was convened by GWSP-CNC, GWSP-ANSO and GWSP Asia Network Data and Information Center (GWSP-ANDIC). A GWSP workshop was held during the 2007's International Yellow River Forum, October 16–19, at Yingkou City, Shandong Province, China. The workshop was co-organised by GWSP-ANSO, GWSP-CNC, GWSP IPO, CWRR-CAS, the Key Lab of Water Cycle & Re-

Participants in the joint workshop of GWSP's Chinese National Committee and GWSP's SSC in Beijing, November 2006

lated Surface Processes, and the Institute of Geographical Sciences & Natural Resources Research, CAS. The main topics were global climate change and water resources management, risk management of floods and droughts associated with extreme climate events, and integrated water resources management for sustainability. More than 20 scientists from across the world, including Claudia Pahl-Wostl and Hong Yang from the GWSP SSC and Lydia Dümenil Gates, GWSP IPO, participated in this workshop.

Through research activities coordinated by GWSP-CNC and GWSP-ANSO in Beijing, we hope the office will play a key role in building a link between research communities in Asia to stimulate international cooperation on global water system research. We also expect that GWSP-CNC and GWSP-ANSO will provide a platform for the global water research community to exchange information and to extend its network from the North to the South.

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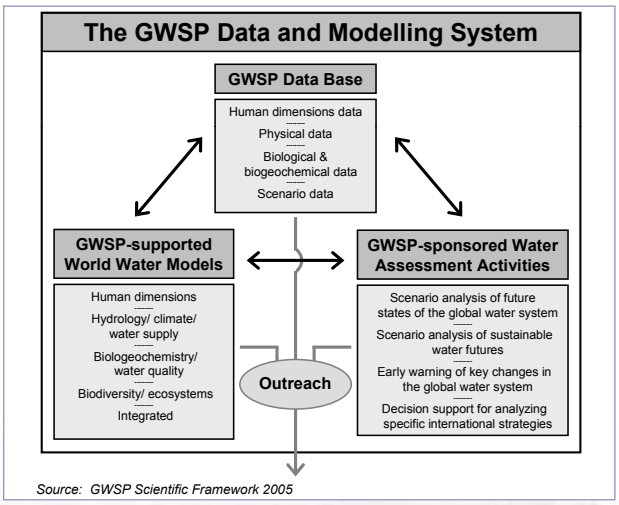
GWSP WORKSHOPS

A Community Approach to Assessing the World Water Balance. *First International Workshop on Computing the World Water Balance, University of Kassel, Germany, 25–26 April, 2007*

Since the mid-1990s a small set of global hydrology and water resource models have been developed that are capable of computing the basic dimensions of the world water balance. These models have been used to address a wide range of global-scale questions including the impact of climate change on global water resources, the location of future areas of critical change in the global water system, and the magnitude of changes in ecosystem services provided by the global freshwater system. (See, for example, GWSP Newsletter Number 1, "A New Assessment of World Water Resources and their Ecosystem Services".)

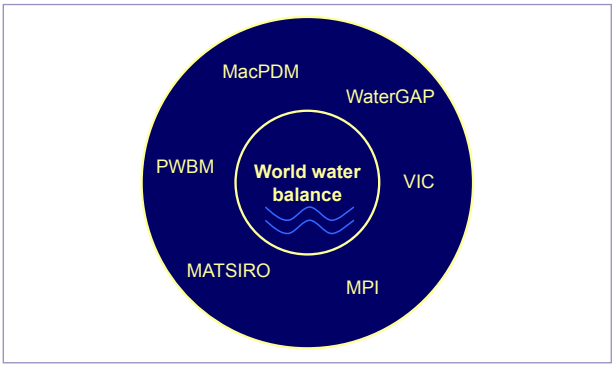
Figure 6. *The World Water Balance Activity in the Context of the GWSP Scientific Framework*



While these models have led to the publishing of numerous results, their estimates about the global water system have never been systematically compared. Such a comparison, however, would be very useful scientifically because it would indicate the magnitude of uncertainty in estimating the world water balance. Indeed, it would be invaluable to have harmonised estimates from several models concerning total annual water availability under current and future climate, the global partitioning of surface freshwater, the long-term average freshwater inflows to the world's oceans, and other key parameters of the global water system.

To initiate the first intercomparison of estimates from global water models, the Global Water System Project organised a workshop in Kassel, Germany in April 2007 at which representatives from six global modeling groups came together for the first time to exchange information and plan common activities. After presenting their respective modeling approaches and comparing some preliminary results from model experiments, the researchers discussed and adopted a protocol for a rigorous model intercomparison (the protocol especially covers the standardisation of hydro-meteorological and socio-economic input data). Six global modeling groups are now using the standardised inputs agreed upon to compute various aspects of the world water balance, including grid-cell runoff (gross water availability), river discharge, soil water content, evapotranspiration, average snow water equivalent, and volume of snow melt. These components are being computed for current climate conditions and for the 2080s

Figure 7. *Participating global modeling research groups*



under the A1b and B1 IPCC scenarios. Both continental totals, as well as totals for selected major river basins on each continent are being estimated. The results will be analysed and compared within the next few months and collective publications are in the planning stage. In the next phase of the model intercomparison, the climate community will be requested to join the exercise with their land surface models.

Summed up, the Kassel workshop represents an important step in building a vital global water modeling community for dealing with key questions about the world water balance.

The workshop was sponsored by GWSP and the Center for Environmental Systems Research, University of Kassel, with participants from the EU-Watch Project.

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Formation of an International Freshwater Biodiversity Consortium

The results from the scoping workshop on "collaborative strategies for international initiatives on freshwater biodiversity" held in Elewijt, Belgium, in December 2006 emphasised the need for an integrated tool: a synthetic or virtual knowledge platform which would provide access to already existing but often scattered freshwater biodiversity data in order to address key scientific and conservation questions. Further discussion was required to define the added value, structure and strategy of this collaboration. In this context a strategy document was developed as the basis for discussion during the second workshop held in Elewijt, Belgium, on April 26–27 2007. This workshop was organised by the Belgian Biodiversity Platform and the Royal Belgian Institute of Natural Sciences and sponsored by the Belgian Science Policy Office (Belspo) and the Global Water System Project (GWSP).

The objectives of this second workshop were to finalise a common view for the current consortium and to define a strategy to build a synthetic knowledge platform/web-portal on Freshwater Biodiversity. Participants agreed on having a formal consortium: the "Freshwater Biodiversity Consortium" (FBC or FBiC) and formulated the mission statement and the objectives of this consortium. The group also discussed its interaction with the current and upcoming international initiatives that will carry out work on biodiversity data: Encyclopedia of life, Speciesbase, species2000+, and GBIF.

The workshop participants emphasised that all these initiatives are weak on freshwater biodiversity and that the consortium could play a key role as unique provider of Freshwater biodiversity data through its web-portal. The consortium will contact representatives of these projects and explore possible collaboration.

Participants also discussed the possible scientific and conservation questions that could be addressed using the web-portal and the consortium expertise. In terms of fund raising activities, the current main funding opportunity is the second call of the EC Work Programme 7 that is published in December 2007. The next phase of the process will be a proposal to be submitted to this call in 2008.

Box 2. *Current Consortium Partners*

Department of Conservation and Land Management (CALM- Australia)
DIVERSITAS FreshwaterBIODIVERSITY Cross-Cutting Network
UNESCO-IHP Ecohydrology programme
FISHBASE
Freshwater Animal Diversity Assessment (FADA) – Belgian Biodiversity Platform (Belgian Science Policy Office)
Global Biodiversity Information Facility (GBIF)
Global Water System Project (GWSP)
Institut de Recherche pour le Développement (IRD)
IUCN – Freshwater Biodiversity Assessment Programme
Past Global Changes (PAGES)
SPECIES 2000
The Nature Conservancy (TNC)
World Wildlife Fund for Nature (WWF)
Wetlands Ecology, IWMI

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Global Environmental Assessments – Bridging Scales and Linking to Policies

On May 10th and 11th 2007, a joint TIAS-GWSP workshop was held in Adelphi, Maryland to share and consolidate new research ideas and foster future co-operations in the area of global environmental assessments. Participants came from leading research groups in this field, as well as from UN organisations and programmes, governmental and non-governmental organisations, foundations, and industry.

A major goal of the meeting was to strengthen the interconnections between the social and natural sciences and between science and policy. The theme of global assessments encompasses a broad range of analyses. Hence, the topics presented and discussed addressed current progress in global environmental assessments, not only in general, but also with respect to climate change and adaptation, water resources, land use, agriculture and food security and the links between these. However, crosscutting themes that dominated the presentations and ensuing discussions were

- the preparation of policy-relevant assessments,
- the representation of phenomena across scales, with the regional-global connection being a particularly important issue, and
- the methodological improvements especially of tools for policy and decision making.

The discussion of methodologies and tools included the use of scenario techniques, the consideration of uncertainty in modeling as well as the transfer of skills for end users.

The workshop report with extended abstracts of the contributions has now been published as *Issues in Global Water System Research No. 2*. Copies are available from the GWSP IPO and may be downloaded from the GWSP website. All workshop presentations can be downloaded from the TIAS website: http://www.tias.uos.de/wash2007sec/.

UNEP and IISD formally launched the Global Environment Outlook Resource Book at a side-event during the workshop. The book is a synthesis of the work of leading assessment and capacity building practitioners from around the world to help organisations design and run effective integrated environmental assessment programs at ecosystem, regional and national levels. The document may be downloaded from the UNEP and IISD websites (ww.unep.org and www.iisd.org).

The event was held back-to-back with the International Water Association's WATERMATEX 2007: the 7th International Symposium on Systems Analysis and Integrated Assessment in Water Management. At a joint workshop day with WATERMATEX uncertainty and models in water policy processes were discussed.

The event was co-hosted by The Integrated Assessment Society (TIAS), the Global Water System Project (GWSP) with support from the United Nations Environment Programme, the European projects "Harmoni-CA" and "NeWater".

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Third GWSP Workshop on Global Dams and Reservoirs: Information Needs on a Global Scale

University of New Hampshire, 16–17 May 2007

An ongoing global assessment of the impacts of dams and reservoirs (has taken) has been taking place across multiple entities (e.g., academic researchers, dam operators) over the last 10–15 years. The impacts encompass elements of hydrology, constituent transport, biodiversity, ecology, fisheries management, biogeochemistry, greenhouse gas emission, social science, transboundary diplomacy, energy security, and economics. A consensus has thus emerged that impacts of dams and reservoirs constitute a global-scale phenomenon, the full dimensionality of which has yet to be articulated. Starting in April 2006, a series of three workshops was initiated through GWSP to address the growing challenges surrounding collection and management of dam and reservoir related data at the global scale. The first workshop of this series was held in Washington, D.C. in April 2006 and began harmonisation of the multiple geospatial data sets that depict the world's dams and reservoir systems. From the start, this has been a community-based effort in order to bring unity to these data sets, to establish quality control, to identify and acquire new data holdings and to avoid duplication of effort. The second workshop, held in Montreal, Quebec in October 2006, was limited to the technical

team derived during the first workshop and served to develop and set protocols for the merging, synchronisation and quality improvement of existing datasets. Participants left this second workshop prepared to begin construction of the new master database.

The Third GWSP Workshop on Global Dams and Reservoirs: "Information needs on a global scale" was held at the University of New Hampshire, 16–17 May, 2007. In addition to the technical team, experts from more than 10 countries in Asia, Europe and North and Central America participated, representing academic institutions, governmental and non-governmental agencies and dam operators. The workshop goals were to debut a first version of a global, integrated geospatial database depicting the worldwide population of dams and reservoirs; to establish dialogue between data providers and the application community; and to optimise the database design so that it supports uses as diverse as state-of-the-art Earth system studies, improved environmental management, and the design of policy instruments for sustainable development and conflict reduction.

The technical team led off the workshop by presenting the current state of the global database, which consists of a cleaned version of about 6000 cross-validated dam locations linked to known surface water bodies and the best available global hydrography, the HydroSHEDS river network. About 3500 of these dams are related to reservoirs with storing capacities larger than 0.01 km³. A set of attributes will be provided for all dams/reservoirs with the first release of the dataset. Additional attributes may follow, depending on the availability of data. The first release will represent the most comprehensive geospatial database of dams and reservoirs with linked hydrography available. As such, a dialogue ensued on further optimisation of its design to meet the application community's needs.

The application community presented needs across a wide range of disciplines, including conservation, sedimentation, agriculture in Africa, economics, Asian and European perspectives, and goals of dam operators. Through determining feasibility of meeting each need, the importance of providing a standardised, comprehensive and quality checked database that is accepted by the scientific community was highlighted. By providing the database to the scientific community we would ensure further evaluation through their many applications. Once established, the database could be used as a master database to which science groups can add data rather than duplicating efforts. Preliminary naming of the database is the Global Reservoir and Dam Database (GRanD), and first release is scheduled for mid 2008.

Participants of the Global Dams and Reservoirs Workshop in Durham, New Hampshire, USA, May 2007

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Dynamics and Vulnerability of River Delta Systems: Developing a Research Agenda and Implementation Plan

Joint GWSP-LOICZ-CSDMS Workshop in Boulder, Colorado, USA, September 2007

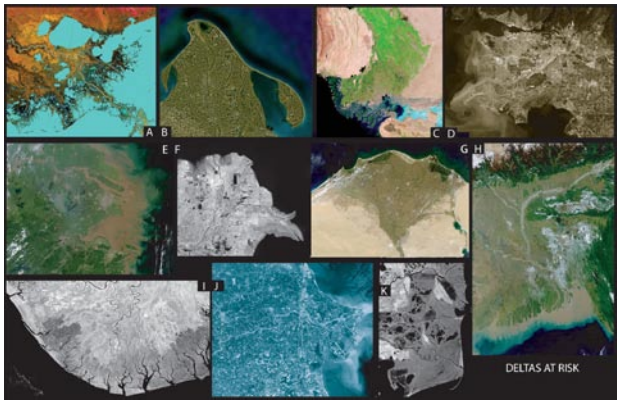
From New Orleans to Bangkok, from the Okavango to the Volga, more than 350 million people worldwide live in deltas. As an interface between bodies of water and land, along with land deltas and dry deltas, deltas often represent the end of rivers yet are a rich mine on which ecosystems and societies have been built.

Deltas are shaped by physical, biological, and social processes. Physical processes include tides, waves, currents, flow rates, and rainfall. Ecosystems affect erosion, create microclimates and contribute nutrients and nutrient cycling. People dredge and dig, direct rivers and build structures, introduce and exterminate biota.

These complexities lead to significant challenges in understanding and managing deltas and their regions of influence. They also highlight the dangers facing deltas, from resource exploitation to sudden environmental changes.

To understand, and to develop solutions for, these threats and vulnerabilities, an international scoping workshop was held in Boulder, Colorado, USA in September 2007 on "Dynamics and Vulnerability of River Delta Systems" which will lead to a White Paper setting the agenda for delta research and research application. Research and application challenges from deltas were explored by twenty-five attendees from four continents. From modelling geomorphological dynamics to overcoming legal challenges

Figure 8. *Deltas at Risk.*



A) Mississippi, USA – subsidence & loss of wetlands; B) Ebro, Spain – scarcity of river water and sediment; C) Indus, Pakistan – scarcity of river water and sediment; D) Fraser, Canada – coastal flooding & loss of infrastructure; E) Yangtze, China – subsidence; F) Huanghe, China – subsidence, scarcity of river sediment & coastal erosion; G) Nile, Egypt – scarcity of river water and sediment & coastal erosion; H) Ganges / Brahmaputra, Bangledesh – river flooding & coastal flooding; I) Niger, Nigeria – human-induced subsidence; J) Po, Italy – subsidence & river channel stabilization; and K) Danube, Romania – transboundary issues, threatened wetlands. Figure courtesy of James Syvitski (CSDMS Integration Office).

in transboundary regions, the pressing research and application questions were detailed along with the data and techniques available for tackling those questions. A coherent, comprehensive, and doable plan will be available not only for adding to delta science but also for ensuring that the science is useful and useable for managing deltas and their vulnerabilities.

The workshop's organisers and sponsors were the Global Water System Project (GWSP), the Land-Ocean Interaction in the Coastal Zone (LOICZ) project and the Community Surface Dynamic Modeling System (CSDMS).

Participants of the workshop on Dynamics and Vulnerability of River Delta Systems, September 2007

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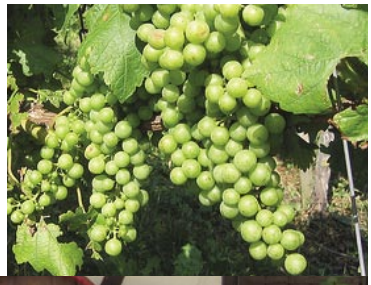
GWSP TRAINING AND CAPACITY BUILDING

Transitions to Adaptive River Basin Management: NeWater-GWSP Summer School 2007

The summer school took place in July near Freiburg and the Black Forest in Germany. Its focus was on making the transition to adaptive management regimes, with topics including, among others, barriers to change, learning processes to facilitate change, transitions management theory and strategies, and the role of the European Water Framework Directive in transitions management.

Emphasis was placed on demonstrating transitions in practice. In addition to the NeWater cases, the Dutch experience was presented by the Dutch Research Institute for Transitions, and the IUCN highlighted their river basin activities in Africa and Asia. The participants, 25 postgraduate students, PhD-students and Post-Docs, were actively involved in the programme through practical exercises in social learning and participatory modelling, simulation and role playing games.



The 2007 summer school was the second in a series which is being organised by

Turning water into wine: transition management in practice at a local winery as a part of the hands-on experience of the summer school

the NeWater project and co-sponsored by GWSP. After a review of more than 40 applications, the GWSP IPO provided grants for 6 participants from Germany, Mexico, Romania, Spain, Thailand, and Uganda. The third and final summer school on adaptive river basin management will be held in Germany in July 2008. Programme information and a call for applications will accessible on the NeWater and GWSP websites in January 2008.

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Advanced Institute on Global Environmental Change and Water in the Context of the Millennium Development Goals

One of the Fast-Track Activities of GWSP to jointly sponsor a capacity building exercise for Sub-Saharan African researchers has been launched successfully. UNESCO-IHE Institute for Water Education and the Institute for Environmental Studies at the Vrije Universiteit, Amsterdam, conducted a three-week Intensive Seminar on Global Environmental Change and Water in the context of Millennium Development Goals at Delft from September 24th to October 12th 2007.

This seminar is part of the Advanced Institute on Global Environmental Change and the Vulnerability of Water Resources in the Context of the Millennium Development Goals, which is supported by the Global Change System for Analysis, Research and Training (START), in a partnership with the Global Water System Project (GWSP), the Global Environmental Change and Human Security Project (GECHS) and with financial support from the Norwegian Agency for Development Cooperation (NORAD), the International Foundation for Science (IFS) and the Cooperative Programme on Water and Climate (CPWC). Many of the partners involved, IFS, IHE and GWSP in particular, also provided considerable in-kind contributions by supervising and mentoring the participants.

The Advanced Institute consists of a three-week Intensive Seminar held at UNESCO-IHE in Delft; research grants for successful Institute Fellows; and a culminating synthesis workshop. This Seminar was the first step in the process.

The intensive seminar discussed physical, biogeochemical and the institutional aspects of global environmental change and the implications for Africa. Tutors included

Advanced Institute Fellows and Organising Committee at UNESCO-IHE Institute for Water Education in Delft, the Netherlands

GWSP scientists Joseph Alcamo, Charles Vorosmarty, Claudia Pahl-Wostl, Ken Conca from GECHS, Eric Odada and Roland Schulze from START, Pavel Kabat from the CPWC, and many other experts resident at UNESCO-IHE and Vrije Universiteit, Amsterdam.

20 Institute Fellows from 9 countries in Africa were selected by an international review panel out of an applicant pool of 80 that responded to the announcement for this event. Every applicant submitted a pre-proposal for research to be conducted post-intensive seminar session. One participant was unable to complete the seminar session due to personal reasons. The remaining 19 participants were from Ethiopia, Kenya, Lesotho, Malawi, Nigeria, Tanzania, Uganda, Zimbabwe.

All 19 participants benefited from proposal-writing sessions conducted by IFS staff and refined their proposals during the intensive seminar session. The topics of their proposals ranged from issues of downscaling results of global/regional climate and hydrologic models to issues of local scales including impacts of water availability, governance and gender. The refined proposals were submitted to the International Foundation for Science and are undergoing review. Successfully reviewed proposals by participants will be funded by IFS. Mentors have been assigned to each participant to assist in research and publication. The follow-up process will be coordinated by the manager of the programme, Ton Bresser, and the academic director, Joyeeta Gupta.

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CONFERENCE REPORTS

Global Environmental Change: Regional Challenges

From 9 to 12 November 2006 the ESSP Open Science Conference on *Global Environmental Change – Regional Challenges* was held in Beijing, China. More than 900 experts discussed the current state of GEC science and the study of the Earth System. GWSP contributed to the success of the OSC in many ways. In his plenary talk Felino Lansigan, member of the GWSP SSC, drew the attention of the conference to GWSP issues: "Beyond conflict: Sharing the global water system for nature, food, and economic development" The presentation is available for download from www.essp.org.

GWSP also co-organised 3 of the parallel sessions:

- Environmental water allocation: Conserving ecological goods and services" (convened by R.J. Naiman and S.E. Bunn, both GWSP SSC; in cooperation with DIVERSITAS),
- "How can earth system and socio-economic information be used to better understand and manage the local and remote effects controls on regional water resources?" (co-convened by C. Vörösmarty, GWSP co-chair; in cooperation with GEWEX),
- "How do coastal and freshwater systems interact under the global water system?" (co-convened by J. Alcamo, GWSP co-chair, F. Lansigan, GWSP and LOICZ SSC, E. Craswell, GWSP IPO; in cooperation with LOICZ).


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GWSP scientists gave presentations in further sessions: Claudia Pahl-Wostl, GWSP SSC, on "Water Governance: Bridging regional and global scales" and Marcel Endejan, GWSP IPO, on "Using object-oriented analysis and the Unified Modelling Language to facilitate interdisciplinarity in earth system science". Furthermore S.E. Bunn, R.J. Naiman and C. Vörösmarty, together with further authors, presented a White Paper on the science of flow-ecology relationships in order to provide clarification on key terms and concepts used in academic as well as political debates. The White Paper is available from the GWSP website.

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GWSP at the World Water Week 2007

Water Governance and Adaptive Capacity – The Need for Multi-Level Approaches

At this seminar on August 16, scientists introduced cutting-edge research on water governance and complex coupled socio-ecological systems. Participatory and learning processes are essential for the effective use of water resources. A paradigm shift toward "good water governance" and resilient systems is often requested but rarely fully implemented. In order to manage the change needed, adaptive capacity has to be created and maintained. Several requirements for that were formulated and discussed, ranging from flexible institutional arrangements to charismatic leadership.

How scientific findings are confronted with evidence from the local, regional and global levels were discussed. Mainstream water governance, both in science and practise, focuses on the local or the regional level. However, the water crisis is increasingly a global one. The concept of scale offers insights into the right level for interventions for specific problems so that proposed solutions can better fit the problem at stake.

The impact of climate change is one of the biggest challenges in future water governance and must be taken into account. Increased learning and adaptive capacity is needed. This requires flexible, coherent and supportive institutional frameworks to, among other things, increase efficiency of water usage.

Conclusions/Recommendations:

- Participatory and learning processes are essential for the effective use of water resources,
- A paradigm shift toward "good water governance" and resilient systems is often requested but hardly fully implemented, and
- Increased learning and adaptive capacity is needed. This requires flexible, coherent and supportive institutional frameworks.
- Enhancing the adaptive capacity of water governance and water resources management to deal with global change is an issue for all governance and management levels from local to global as well as for both the development countries and the developed world.

The seminar was jointly organised by IHDP, GWSP, NeWater, and the Stockholm Environment and co-chaired by Andreas Rechkemmer, IHDP Executive Director, and Claudia Pahl-Wostl, GWSP SSC. Further speakers have been Per Olsson, Stockholm Resilience Centre; Johan Rockström, Director of the Stockholm Environment Institute and the Stockholm Resilience Centre; Reza Ardakanian, Director UN-Water Decade Programme on Capacity Development; and Fritz Holzwarth, Water Director at the German Federal Ministry of the Environment.

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Working with Nature: Improving Integrated Water Resources Management by Sustaining and Restoring Ecosystem Services and Freshwater Biodiversity

Though essential to human well-being and both climate change adaptation and mitigation, biodiversity receives little attention in water resource management programs. Working with nature (freshwater ecosystems and their biodiversity) helps balance multiple objectives for water use.

Today, water managers have a wide range of policy, participatory, economic, and technical tools to effectively incorporate and manage ecosystem services into water management programmes. Emerging scientific tools, such as the Ecological Limits of Hydrological Alteration (ELOHA) framework, offer guidance to determine environmental flow requirements. Processes of social learning and institutional change can overcome misperceptions of trade-offs between ecosystem and direct human water needs. Permanent platforms for stakeholder participation that give voice to biodiversity concerns are increasingly applied in project design and implementation.

Sector-based approaches remain the major obstacle to progress. There needs to be a shift in political, economic and management thinking towards more holistic ecosystem services based approaches. Recognition of our reliance on ecosystem services will enable us to better address the multiple problems and objectives for water use management. A shift in thinking by policy makers towards this more holistic approach and an increase in protection of ecosystem services by water managers is needed.

From GWSP Robert Naiman and Claudia Pahl-Wostl contributed to this seminar on August 14 with presentations on 'Defining the ecological limits of hydrological flow alterations' and 'The role of processes of social learning and institutional change to overcome the seeming trade-off between ecosystem and human water needs' respectively.

Conclusions/Recommendations:

- Water managers have at their disposal a wide range of policy, participatory, economic and technical tools to effectively incorporate ecosystem services into water management,
- Processes of social learning and institutional change may be applied to overcome the seeming trade-off between "ecosystem" and direct human water needs, and
- Sector-based approaches remain the major obstacle to progress. For this to change there needs to be a shift in political, economic and management thinking towards more holistic ecosystem services based approaches.

Convenors: USAID Global Water for Sustainability (GLOWS) Program, Secretariat of the Convention on Biological Diversity (CBD), DIVERSITAS, Global Water System Project (GWSP), The World Conservation Union (IUCN), International Water Management Institute (IWMI), Ramsar Convention Secretariat, UNESCO International Hydrological Programme (UNESCO-IHP), Wetlands International (WI) and World Wide Fund for Nature (WWF).

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CAIWA 2007 – International Conference on Adaptive & Integrated Water Management

Under the patronage of the European Parliament, this GWSP co-sponsored conference was held in Basel, Switzerland, on 12–15 November 2007 and brought together 200 participants from academia, industry, and policy making/government. Participants analysed progress towards adaptive management in the water field, explored new research directions, and highlighted policy implications of scientific findings. It was also an opportunity to share the major scientific insights from the NeWater project, lead by Claudia Pahl-Wostl, GWSP SSC, with the broader scientific and policy-making community.

At the first conference day the NeWater Online Curriculum on Adaptive River Basin Management was presented. The GWSP IPO contributes to this activity by the provision of the online platform and teaching material on challenges from global change (see announcement section of the Newsletter for the launch of the curriculum). On the second conference day, Claudia Pahl-Wostl and Daniel Petry co-chaired a GWSP session on multi-level linkages in water governance which formed a part in GWSP's activities on the analysis of cross-level interactions of global water governance.

At a targeted Science-Policy Day challenges for and experiences with adaptive management from 2 European (Guadiana and Rhine) and 1 African (Orange) river basin were shared. At several roundtables key water management issues were discussed in more detail. The GWSP IPO co-organised the roundtable on 'Adaptation to Water Scarcity', with Hong Yang from the GWSP SSC giving the introduction on food production and water scarcity. Further water management, decision-making experts and researchers identified needs for policy changes and for changes in the research agendas in order to enhance adaptive capacity towards water scarcity issues.

Currently, the CAIWA key messages as well as a policy brief on adaptation to water scarcity are being prepared and will be announced on the GWSP website and the CAIWA homepage (http://www.newater.uos.de/caiwa/).

Daniel Petry
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ANNOUNCEMENTS

IPO News

Farewell to Eric Craswell and Lara Wever

Eric Craswell, GWSP's founding EO, left the IPO in December 2006 to retire in Australia. The GWSP community is extremely grateful for his efforts that guided GWSP during its initial years. We were going to wish him all the best for his 'golfing' years, but as this newsletter is going to print, we hear that he will continue his research at Australian National University. So we wish him all the best for his hobbies and his future scientific pursuits. Lara Wever, the GWSP Administrative and Financial Officer, also left Bonn at the end of 2006 for Australia. She moved to Griffith University in Brisbane where she is currently studying for her degree in environmental management. We all thank her for her dedicated support over the years.

New GWSP Administrative and Finance Officer

Anna Middel joined the GWSP IPO in January 2007 after working several years at the IHDP secretariat. Anna looks after our general administration, our financial matters and – as a specialist in this field – all logistics issues at conferences and workshops.
Contact: anna.middel@uni-bonn.de

Nobel Peace Prize for IPCC
GWSP researchers amongst the authors of the 4th Assessment Report

GWSP congratulates IPCC for receiving this outstanding award and especially the researchers from the GWSP community who are actively involved in the IPCC Working Groups. The following members of the GWSP SSC are key authors of the 4th Assessment Report: Taikan Oki contributed to WG I report, chapter 3 "Surface and Atmospheric Climate Change", and to WG II report, chapter 3 "Freshwater resources and their management". José Marengo co-authored WG I report, chapter 9 "Uncertainty and attributing to climate change", and the regional chapter on Latin America of WG II report. Joseph Alcamo coordinated and co-authored the regional chapter on Europe WG II report and was involved in the Summary for Policymakers and in the Technical Summary of the WG II report. Joyeeta Gupta co-authored the WG III report, chapter 13 "Policies, instruments and co-operative arrangements".

Calendar

GWSP Global Catchment Initiative: 1st Expert Group Meeting, 7–8 February 2008, Bonn, Germany

For further information contact: daniel.petry@uni-bonn.de.

Launch of the NeWater Curriculum on Adaptive River Basin Management

A curriculum in adaptive river basin management will soon be available for teaching at universities at Master's and PhD levels. The teaching materials will be published in January 2008 as downloadable modules on the internet for interested instructors of Environmental and Resources Management, Hydrology, Public Policy, and other fields which may include studies in water resources management.

The curriculum modules are:

- Module 1: Global change and water resources
- Module 2: Introduction to Adaptive Management and IWRM
- Module 3: Adaptive Management Tools and Methods
- Module 4: Managing Transitions to Adaptive Water Management

With funding from the NeWater project and additional resources from GWSP, the curriculum is being implemented by the Institute of Environmental Systems Research, University of Osnabrück (www.usf.uos.de), Alterra at Wageningen University and Research Centre (http://www.alterra.wur.nl/NL/) and the Global Water System Project (www.gwsp.org). *For further information visit www.newater.info, contact Caroline van Bers (cvbers@usf.uos.de) or Daniel Petry (daniel.petry@uni-bonn.de).*

Training for Instructors on Teaching Adaptive Water Management, 1–2 April 2008, Osnabrück, Germany

The objective of the training course is to familiarise university instructors with the material provided in the NeWater Curriculum on Adaptive Water Management (see above) with respect to both the content of the modules, and also the use of the materials in designing new programmes or incorporating these into existing teaching curricula. The training session will, at the same time, provide valuable feedback to the team that has developed the site on the use of the teaching materials. *For further information visit: http://www.newater.info/everyone/3098 or contact the training coordinator Caroline van Bers (cvbers@usf.uos.de).*

Food Security and Environmental Change 2–4 April 2008, Oxford, UK

This international conference is organised by GECAFS – Global Environmental Change and Food Systems, a sister project of GWSP in the family of ESSP Joint Projects. *Please visit: www.foodsecurity.elsevier.com.*

4th IGBP Congress 5–9 May 2008, Cape Town, South Africa

'Sustainable Livelihoods in a Changing Earth System' is the theme of the 2008 Congress of the International Geosphere-Biosphere Programme. *Further information is available at: www.igbp2008.co.za.*

NeWater-GWSP Summer School 2008 9–19 July 2008, Königswinter, Germany

"Managing Change: Tools and Methods for Adaptive River Basin Management" is the theme of next year's summer school for young researchers. *More information will be available soon from www.newater.info and www.gwsp.org. You also may wish to contact Caroline van Bers (cvbers@usf.uos.de) or Daniel Petry (daniel.petry@uni-bonn.de) for further information.*

Global Change and Water Resources in West Africa 25–28 August 2008, Ouagadougou, Burkina Faso

At this status conference the research results of the German-African GLOWA projects IMPETUS and VOLTA will be presented and discussed. GLOWA is a German government funded research programme on global change and the hydrological cycle. *Further information will be available soon from the programme website (www.glowa.org) and the respective project websites:*

- IMPETUS (www.impetus.uni-koeln.de/en/project.html)

- GLOWA Volta (http://www.glowa-volta.de/)

13th IWRA World Water Congress 2008 1–4 September, Montpellier, France

In 2008, the International Water Resources Association focuses its quadrennial congress on 'Global Changes and Water Resources: confronting the expanding and diversifying pressures'. *More information is available at: http://wwc2008.msem.univ-montp2.fr/.*

HydroChange 2008 – Hydrological Changes and Managements from Headwater to the Ocean Kyoto, Japan, 1–3 October 2008

The international symposium is organised by the Research Institute for Humanity and Nature, Kyoto, Japan, and is co-organised by GWSP. *Further information is available from http://www.chikyu.ac.jp/HC_2008/index.htm.*

IHDP Open Meeting 2008 16–19 October 2008, New Delhi, India

'Social Challenges of Global Change' is the overarching theme of the 7th International Science Conference of the International Human Dimensions Programme on Global Environmental Change. *More information is available from: www.ihdp.org.*

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The Global Water System Project
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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 on Global Environmental Change (IHDP), the World Climate Research Programme (WCRP) and DIVERSITAS, an international programme of biodiversity science. The *overarching question* of the 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.

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an international programme
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IGBP

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World Climate Research Programme

IHDP
International Human Dimensions Programme
on Global Environmental Change