Global Water System Project

GLOBAL WATER NEWS

No. 3

Earth System Science Partnership

No. 3 | February 2006 | www.gwsp.org

EDITORIAL

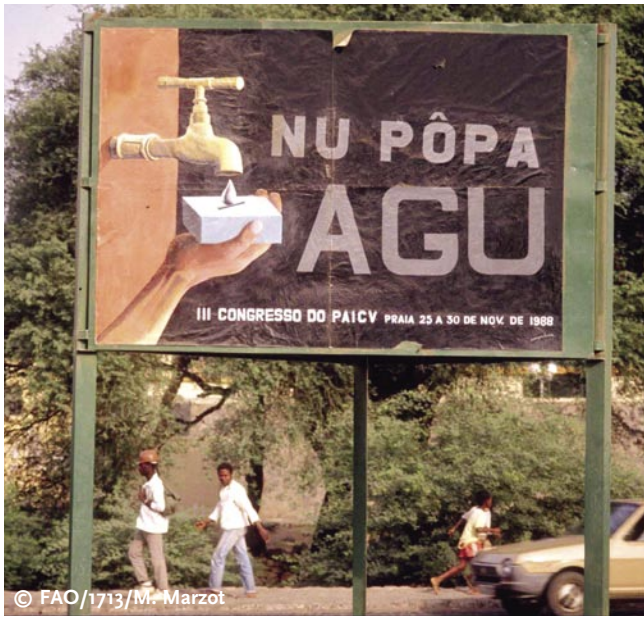
The mission of the GWSP is to understand the ways in which humans influence the dynamics of the global water system and to inform decision makers on how environmental and socio-economic consequences of these impacts can be mitigated. In order to get a clear picture of modifications and to be able to implement appropriate mitigation strategies, several open questions need to be answered and actions on various spatial scales have to be defined (the lead article in this issue gives us an example from Africa). The identification and prioritisation of major issues is especially relevant for the Asian regions with their strong population growth and economic development, and requires researchers from various scientific disciplines with regional insights. The GWSP has therefore joined with colleagues to establish its first regional networks. A set of regionally focused initiatives will arise from these networks and illuminate various aspects of the GWSP's scientific framework (see the articles on GWSP Japan, China, and Asia). The activities initiated by the regional networks will provide important jigsaw pieces needed to understand human impacts on the global water system. To extend the picture, nevertheless, further activities at regional and global scale will be needed (see our call for proposals). In this spirit we are looking forward to forging new partnerships and welcome more contributions towards an improved understanding of the global water system.

Marcel Endejan
Deputy Executive Officer, International Project Office (IPO)

FRESHWATER RESOURCES OF AFRICA: MAJOR ISSUES AND PRIORITIES

Introduction

The availability of and a ccess to freshwater largely determine patterns of economic growth and social development. This is particularly the case in Africa where people primarily live in rural areas and are still heavily dependent on agriculture for their livelihoods.



Placard urging not to waste drinking-water, Cape Verde.

Freshwater is a necessary input also for many sectors of the African economies as well as the maintenance of terrestrial (including some coastal) ecosystems. In particular, subsistence and commercial agriculture, livestock production, fisheries and tourism provide people with employment and national economies with export earnings. Besides being an economic good, water is a precondition both for health and for success in the fight against poverty and hunger in Africa. Safe water supply and appropriate sanitation are the most essential components for a healthy prosperous life. The provision of safe drinking water and adequate sanitation facilities to the rural and rapidly expanding urban population can reduce morbidity and mortality rates of water-borne and water-related diseases such as cholera, diarrhoea, and malaria.

Overview of freshwater resources

Africa's extreme variability of rainfall in time and space is reflected by an uneven distribution of surface and groundwater resources from areas of severe aridity with limited freshwater resources like the Sahara and Kalahari deserts in the northern and southern parts to the tropical belt of mid-Africa with abundant resources. Africa's internal renewal of freshwater resources averages 3950 km³/year (see table 1). This figure is about 10 percent of the freshwater available globally and closely resembles Africa's share of the world population at 12 percent (Donkor 2003).

Table 1. *Renewable water resources and their use (FAO 2003)*

Sub-Region	Population (million)	Area (1000 km²)	Average Precipitation		IRR* (km³/yr)
			mm/yr.	(km³/yr)	
Northern Africa	174	8259	195	1611	79
Western Africa	224	6138	629	3860	1058
Central Africa	82	5366	1257	6746	1743
Eastern Africa	144	2758	696	1919	187
Southern Africa	150	6930	778	5395	537
Western Indian Ocean Islands	19	594	1518	2821	345
Total	**793**	**30046**	**744**	**22351**	**3950**

***Internal Renewable Resources** (Average annual flow of rivers and recharge of aquifers generated from endogenous precipitation (FAO 2003: xi)).

There are about 80 internationally shared river and lake basins in Africa. Most of the surface water resources are concentrated in the Congo, Niger, Ogooue, Zambezi, Nile, Sanga, Charilongone, and Volta river basins and in the Great Lakes basins (e.g. Lake Victoria) in Eastern Africa. Many basins such as the Nile, Volta, and Zambezi include large dams (>60 meters high) for water supply and power generation, and new dams are currently under construction in the Niger, Orange, and Oued Draa river basins. Compared with the last few decades, the rate of construction of new dams has greatly slowed down (WRI 2003).

Major issues and obstacles

Africa is endowed with immense renewable natural resources. Yet, natural phenomena, such as climate change and variability, and human factors, such as population growth, competition over water and pollution, increasingly threaten the sustainability of Africa's freshwater resources, and hence, the livelihood of the many poor living in Africa. The continent suffers from one of the most unstable rainfall regimes worldwide, causing severe aridity in areas such as the Sahara and extremely humid tropical conditions in areas such as the Congo Basin. The high temporal and spatial rainfall variability has also repeatedly led to extreme climatic events (droughts and floods) that pose a continuous risk to Africa's people and their livelihoods and its national economies. In addition there are hydrological risks, which amplify the variability and lack of reliable rainfall supplies (see figure 1 and box 1).

Whereas certain water-scarce regions in northern Africa have succeeded in providing water-supply facilities to large segments of their population, in other parts of Africa with abundant water such as central Africa, water supply and sanitation coverage is limited to less than half of the population. Thus, these regions are falling far behind the pace set under the Targets of the Millennium Development Goals (WHO/UNICEF 2004). This shows that the fundamental issue facing water resources in Africa does not appear to be one of water availability only but of human factors as well. These human factors are related to the governance of the available resources, legislative and institutional frameworks, overexploitation and pollution of the resources, conflict and political instability, inadequate technical know-how and institutional capability, and low priority given to water and sanitation in terms of securing financial resources. Other important issues are the high rates of population growth and urbanization.

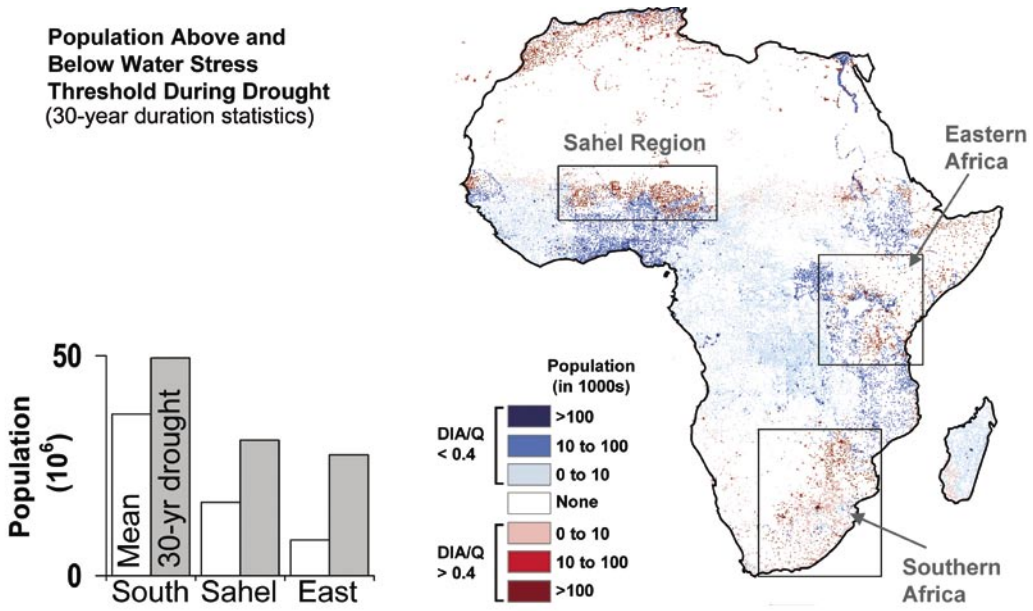
In summary, key issues on freshwater resources in Africa include:

- Climate variability and change
  - High spatial and temporal rainfall variability
  - Droughts and floods
- High population growth and urbanization rates
- Inadequate governance of water resources
  - Insufficient human capacity, knowledge and data
  - Scarce financial resources and arrangements

The consequences of these issues are:

- Declining water availability
- Overexploitation of water resources
- Pollution of water resources
- Lack of access to safe water and sanitation services
- Conflicts and political instability (both a consequence and a cause)

Figure 1. *Population and water stress in Africa (Vörösmarty et al. 2005).*



Box 1.

HYDROLOGIC SCARCITY & VARIABILITY: A BASIC FACT OF LIFE FOR MUCH OF AFRICA

While climate and its variation are certainly critical for determining the reliability of rain-fed agriculture and local water supplies, a more complete picture must consider how river corridors focus spatially distributed runoff into discharge. Dry areas in Africa with little or no local water can thus have access to a potentially abundant and reliable resource generated far upstream and delivered through large rivers, floodplains, and deltas. Paradoxically, many of the arid and semi-arid regions of Africa that show low variability in climate have much higher variations in local river flows due to episodic runoff. The within-year variability of discharge in Africa is generally high, and the transition zones between wet and dry climates show the greatest intra-annual fluctuation. Only in humid tropical areas and along large, highly regulated rivers (i.e. the Nile and Orange) is the seasonal and inter-annual variability low.

One of the most critical manifestations of such variability is hydrologic drought, shown in figure 1, which expresses densities of human population living above (red) or below (blue) the relative water use threshold of 40%, presumed to indicate severe stress, under the 30-year recurrence drought. Three examples of the sensitivity in regions located in hydrologically complex transitional zones between arid/semiarid and humid climates are shown. In these regions, substantial water stress is experienced and becomes a significant environmental challenge – and in some cases catastrophe – at least once every generation.

Charles Vörösmarty

Vörösmarty, C., Douglas, E., Green, P. and Revenga, C. (2005). Geospatial indicators of emerging water stress: An application to Africa. Ambio 34: 230-236.

⇒

Priorities for action

African consensus on the urgency of the radical change in approach that is needed to adequately address these issues resulted in a road map towards achieving the *Africa Water Vision 2025 (UN Water/Africa 2003)*. In this framework, action is called for in four thematic areas with corresponding activities (Donkor 2003) summarized in table 2. This vision and framework for action will also support priorities and targets formulated by the NEPAD (New Partnership for Africa's Development) and the Millennium Developmental Goals (MDGs) of poverty alleviation, economic recovery and securing a sustainable environment in Africa.

References

(1) Donkor, S. M. K. (2003). *Development Challenges of Water Resource Management in Africa*. African Water Journal, December 2003.

(2) FAO (2003). *Aquastat*; ftp://ftp.fao.org/agl/aglw/aquastat/aquatat2003.xls

(3) WHO/UNICEF 2004. *Joint Monitoring Programme for Water-supply and Sanitation; Meeting the MDG drinking water and sanitation target; a mid-term assessment progress.*

(4) WRI (2003). World Resources Institute. *Water Resources eAtlas* (Watersheds of the world – global maps); www.waterandnature.org/eatlas/

Eric O. Odada

Contact: pass@uonbi.ac.ke or eodada@uonbi.ac.ke

The author is Professor at the University of Nairobi, Kenya, and Director of the Pan-African START-Secretariat. He is also a member of the GWSP's Scientific Steering Committee.

Table 2. *Framework for Action of the Africa Water Vision 2025*

Strengthening governance of water resources

- Developing and implementing institutional reform and capacity building at local national and transboundary water basin levels;
- Using the water basin as the unit for water resource management;
- Strengthening river basin and aquifer basin management;
- Creating and enabling environment for cooperation between countries sharing international water basins;
- Mainstreaming management at the lowest appropriate level and creating institutional arrangements for full stakeholder participation; and
- Liberalizing water markets while meeting the basic needs of the poor.

Improving water wisdom

- Establish a sustainable system for data collection, management, and dissemination, including standardization and harmonization of data;
- Building institutional and human capacity for effective water management;
- Facilitating access to internet services at local levels; and
- Mainstreaming gender and youth concerns in all activities.

Meeting urgent water needs

- Expanding safe water supply and sanitation services to meet basic human needs;
- Ensuring adequate water for sustainable food security;
- Ensuring that water for environment is adequate in quantity and quality;
- Ensuring adequate water for economic development in the areas of agricultural production, energy and hydropower production, industry, tourism, and transportation;
- Managing drought and desertification;
- Conserving and restoring ecosystems;
- Protecting water sheds and controlling siltation of hydraulic structures;
- Meeting the needs of rural energy supply; and
- Developing non-conventional water resources such as desalinization and re-use of water.

Strengthening the financial base for the desired future

- Mainstreaming cost recovery and severe differentiation, allowing a range of service options, each with its own price tag;
- Securing sustainable financing and initial donor assistance for tackling urgent water needs;
- Securing sustainable financing for institutional reform;
- Securing sustainable financing for information generation and management;
- Shifting from government to private sector financing in the water sector; and
- Establishing mechanisms for sustainable financing of water resources management.

GWSP NETWORKS

GWSP activities are carried out by scientists from all over the world. First regional networks have been established in Asia and will be introduced in this section. If you are interested you are cordially invited to get in touch with the contact persons for further information and involvement.

GWSP Japan

Monsoon Asia is a region characterised by distinct contrasts between dry and humid areas. The effect of climate change on the water cycle at a regional scale is a serious problem particularly in Asia. Shortage of water resources, water quality degradation, and water-related hazards are amongst the most pressing challenges in this region. Direct human impacts caused by rapid population increase and urbanisation assert further pressure on water resources and the water cycle.


© L. Wever

There are numerous projects and organisations working on water-related issues in Japan, but networking activities remain weak. Therefore, the Japanese committee of GWSP was formed to foster the integration and exchange of knowledge as well as to advance collaborative efforts.

GWSP Japan was established in 2004 under the Science Council of Japan. There are currently 26 members and three advisers, representing 20 institutions, including the Research Institute for Humanity and Nature (RIHN); the University of Tokyo; Kyoto University; Nagoya University; Kyushu University; Tohoku University; the University of Tsukuba; National Institute for Environmental Studies; and the Japan International Cooperation Agency (JICA). Members of GWSP Japan are also involved in other projects of IGBP (such as LOICZ), WCRP (such as GEWEX and CLIVAR), DIVERSITAS (such as freshwater BIODIVERSITY), and IHDP (such as the Industrial Transformation Project). The main purposes of GWSP Japan are to exchange information on water-related projects in Japan and to seek possibilities to support joint studies financially.

Activities of GWSP Japan so far included participating in a GEWEX/IGWCO/GEOSS meeting. GWSP Japan also organised and raised funds for the first GWSP-Asia meeting, held in Kyoto, Japan, from 29-31 August 2005 (see corresponding article in this issue).

Makoto Taniguchi
Contact: makoto@chikyu.ac.jp
Research Institute for Humanity and Nature, Japan.

GWSP CHINA

China, as the world's largest developing country, faces lots of challenges caused by its rapid economic development and population growth. Water-related problems in China, such as flooding, water shortage, and the degradation of its aquatic eco-systems, are known worldwide by now. If China wants to overcome the challenges of the 21st century it is necessary to (a) understand the impacts of climate change and human activities on the water cycle and on renewable water resources, (b) assess the impacts of rapid socio-economic development on water security, and (c) determine the water needs for the environment (eco-environmental flows).

The Chinese National Committee of GWSP was founded late 2004 based on the Chinese National Committee for IGBP-BAHC (Biospheric Aspects of the Hydrological Cycle). The major research topics of GWSP China comprise (a) water and heat fluxes, as well as CO_2 assimilation in the soil-plant-atmosphere system, (b) the development of laws and the maintenance mechanisms of renewable water resources of the Yellow River, (c) impacts of environmental change on the water cycle and water resources security at a watershed scale, (d) quantitative assessment of water and heat fluxes using remote sensed data, (e) water-related institutional frameworks and assessments of ecological and environmental flows in north, northwest and northeast China.

The major goals of GWSP China are (a) to promote integrated research on water issues at a range of scales, (b) to contribute to international water projects organised by GWSP and to relevant international programs, such as the Co-operative Programme on Water and Climate, (c) to enhance analyses of linkages and feedbacks between climate change and water resources, ecological systems, and human behaviour, and to strengthen socio-economic analysis in ongoing projects. GWSP China will also assist in organising the second GWSP-Asia Meeting, to be held in Guangzhou, China, from 8-11 June 2006, where GWSP China will organise a workshop on "Global Water System Hotspots in the Asian region: Mega cities and dams". A major activity of GWSP China will be to prepare a propo-

sal on the "China Water Cycle Observation Programme". Possible contributions of GWSP China to the GWSP could be to provide data on physical, biogeochemical, biological, and socio-economical elements of the global water system and to conduct inter-comparison and validation exercises with global data sets. Furthermore, a sub-regional study for northern China or the Yellow River Basin focusing on groundwater depletion in arid and semi-arid zones is planned for the Northern Eurasian Earth Science Partnership Initiative (NEESPI).

At present, GWSP China has more than 30 members from 15 relevant institutions throughout the country including the Institute of Geographical Sciences and Natural Resources Research and further institutes of the Chinese Academy of Sciences, several universities, as well as the Ministry of Water Resources.

Changming Liu
Contact: liucm@igsnrr.ac.cn

and Jun Xia
Contact: xiaj@igsnrr.ac.cn
Both authors work at the Institute of Geographical Sciences and Natural Resources Research, China.

GWSP ASIA

The GWSP Asia Network was an outcome of a regional workshop conducted in Kyoto, Japan, 29-30 August 2005. The aim of the "GWSP Asia Meeting" was to discuss water-related trends and challenges in Asia, to establish a network of experts in the field of GWSP relevant issues, and to identify needs and opportunities for international research collaboration.

The meeting was hosted by the Research Institute for Humanity and Nature (RIHN) and attracted around 50 participants from 16 countries, who presented their research and discussed important GWSP-related questions in plenary sessions and working groups.

Initial presentations were made by researchers representing China, Hong Kong, India, Indonesia, Japan, Malaysia, Singapore, Taiwan, Thailand, and Vietnam. Working groups then discussed the three 'hotspot' issues: dams, irrigation, and water diversions; mega cities in coastal zones; and land use and land cover change.

The first working group emphasised the need for extensive information about dams, including their location, size, purpose, and operating practices; the group proposed to organise a workshop on the cumulative impacts of dams on various aspects of the global water system (including hydrology, ecology, biodiversity, food production, industrial, and socio-economic development, as well as sediment and nutrient transport).

The working group on mega cities in the coastal zone pointed out that mega cities differ from smaller urban areas not only in population size but also in the scale of economy, infrastructure, consumption of resources, pollution etc. Therefore mega cities can impact the water system at a regional and global scale. Associated aspects of the GWSP agenda, as well as that of Land-Ocean Interactions in the Coastal Zone (LOICZ), include water supply and water security, and groundwater problems. The working group also suggested a workshop in order to launch a research agenda on Asian mega cities in the coastal zone.

Members of the working group on land use and land cover change discussed common areas of interest and possible future research collaboration. The areas of mutual interest include developing a common framework of methodologies, tools, and datasets for studying land use and land cover change throughout Asia; an understanding of how socio-economic changes and human activities may affect land use and land cover and have an impact on the regional hydrological regimes; and an understanding of the need for different water management schemes due to changes in water availability and water quality.

To support the establishment of a GWSP network of researchers and stakeholders in Asia, RIHN set up a GWSP Asia website. It will also develop a database on GWSP-related projects and experts. For the initial stage of the GWSP Asia Network, the representatives of the countries involved in this first GWSP Asia Meeting will serve as national contact points. Contact details are given in the proceedings of the GWSP Asia Meeting, which is available at the GWSP Asia website (see below).

The second GWSP Asia Meeting is planned to take place in combination with a workshop on mega cities and dams. The Meeting is due to be held in Guangzhou, China and scheduled for 8-11 June 2006. To get further information about the upcoming meeting or about the GWSP Asia Network, please consult the GWSP Asia website http://www.chikyu.ac.jp/USE/GWSP/GWSPasia.htm) or contact Dr. Makoto Taniguchi or the GWSP IPO.

Marcel Endejan
Contact: marcel.endejan@uni-bonn.de
GWSP IPO

and Makoto Taniguchi
Contact: makoto@chikyu.ac.jp
Research Institute for Humanity and Nature, Japan.

GWSP RESEARCH

Workshop Report on Environmental Flows: Part of a new GWSP-GRSP Partnership

In light of rapid population growth and economic development throughout the world, the future of the global water system will increasingly be defined by interactions with society, water governance, and water engineering. Water engineering, often on a massive scale, delivers freshwater services that can literally make the difference between life versus death, prosperity versus poverty, for billions of people. At the same time, the *pandemic control* and use of water often has quite the opposite effect on downstream ecosystems and their resident biodiversity, which are keenly adapted to hydraulic cues from natural flow regimes and their variability over both space and time.


© L. Wever


© Global Nature Fund

Through storage, consumptive use, and interbasin transfers, several of the world's largest rivers have been transformed into highly stabilized and in some cases seasonally non-discharging river channels, with severe impacts on downstream freshwater as well as coastal seas. Determining how much water can be safely allocated to human uses or distorted through flow stabilization such as dam construction without loss of ecosystem integrity is central to an understanding of how the global water system can continue to support both human well-being and ecosystem integrity.

In June 2005 the Global Water System Project organized a workshop with the Global River Sustainability Project (GRSP) on this subject that took place in Estes Park, Colorado (USA). This was the second of two workshops convened under the auspices of the GRSP, a new grass-roots initiative with the main objective of characterizing and modeling the freshwater "needs" of riverine ecosystems in the face of growing human consumptive uses and climate change on regional to global scales. The first workshop was held at Griffith University, Brisbane, Australia, in November 2004, which focused on identifying key hydrologic drivers required to sustain critical riverine ecosystem processes contributing to resilience and thus helping to provide socially-valued goods, services, and amenities. The Estes Park workshop united an international group of riverine ecologists and hydrologists to identify the most promising hydrologic tools and models available to support the key ecological questions. Both workshops were partially funded by the US National Science Foundation (NSF), with additional support from Land and Water Australia, the GWSP and DIVERSITAS.

The short-term goals (1-2 years) of the GRSP are to better consolidate and articulate the scientific understanding of hydro-ecological relations, to identify key interdisciplinary research challenges, to build capacity to tackle these challenges, and to more effectively translate knowledge of hydrologic needs of ecosystems to managers and policy makers. This complements well the GWSP initial Fast-Track Activity on a Global Study of Environmental Flows. The longer-term goals (3-8 years) are to build an international network of scientists (ecological, physical, social) and interested public (e.g., NGOs, managers) to pursue scientifically-informed fresh water resources management and ecosystem restoration. The effort is admittedly ambitious, and must have its foundation on an ongoing, strong, and direct collaboration between the ecological and hydrological disciplines, which together form the core of the scientific understanding of freshwater ecosystems.

The GRSP-GWSP Estes Park Workshop was highly interdisciplinary, with the participation of more than 20 experts from the fields of hydrology, ecology, biodiversity, biogeochemistry, fisheries management, and wetland sciences. In addition to its interdisciplinary breadth, the Workshop also drew from a wide range of approaches (data sources, tools, models) that span many space, time, and precision scales, from the local (process-based) to the regional/global (synoptic or integrative). Importantly, the effort engaged

the ecological and hy drologic communities simultaneously in an open dialogue about how to bridge intra- and inter-disciplinary approaches in a framework that focuses on complementary approaches for addressing important questions in river ecology and ecosystem management that span many scales.

The primary objective of the workshop was to establish a framework for conducting hydro-ecological assessments and evaluating ecological vulnerability from water resources for river basins around the world. Today, there is a critical need for assessing the ecological condition of river basins at the global scale, and this workshop was therefore viewed as an initial scoping or brainstorming event to better articu late the way forward to integrating or melding physical tools and models with ecological issues at large scales. It is important to note that a global assessment does not necessarily mean that relatively local-scale, process-based tools/models can be dispensed with. Indeed, many hydro-ecological questions will require fine-grained information (e.g., nutrient retention on floodplains as a function of inundation regime and vegetation), whereas others may require only coarser-grained physical characterization (e.g., fish diversity as a function of seasonal hydrology). The tension between local scale approaches and regional/global scale approaches (in both ecology and hydrology) began to be creatively focused during the workshop in order to make progress in the critical area of global ecological assessment and riverine ecosystem management. It was also appreciated that some kind of hierarchical classification approach may be desirable, since the physical modeling support required to address a particular ecological endpoint may vary among major climatic zones (e.g., high latitude rivers vs. temperate vs. tropical rivers or mesic vs. arid zones).

The output from the workshop will be two-fold. The first is a multi-authored, peer-reviewed publication that describes the framework needed to conduct global ecological assessments for river basins, with a focus on four thematic areas of broad ecological interest but having variable data mapping requirements: floodplain habitat, nitrogen retention, physical channel integrity, and instream biological communities. The target journal for this paper is "BioScience". A larger strategic document to appear as a GWSP "Issues in Global Water System Research" series report will lay the foundation for future collaborative research by identifying key gaps as well as opportunities for hydro-ecological synergies. A series of early-term global products are envisioned, including a mapping of key drainage basins at risk and an inventory of floodplain habitat.

Charles J. Vörösmarty, LeRoy Poff, and Robert J. Naiman
Contact: LeRoy Poff at poff@lamar.colostate.edu

GWSP TRAINING

GWSP undertakes various activities for capacity building including engaging young scientists in international teams working on water researcher. A dynamic educational programme is pursued in the form of training and research workshops for young scientists. The following two reports reflect experiences of GWSP sponsored participants in two training seminars held in 2005.

Report on Training Seminar: Understanding Vulnerability to Global Environmental Change

The training seminar, held in Königswinter, Germany, from 6-8 October 2005, as well as the subsequent open science meeting of IHDP provided a broad overview of recent research findings and advances in conceptualising various aspects of the interactive effects of human security and the natural environment in the context of global environmental change and globalisation.

The need for taking global trends and context into account for understanding vulnerability at the national, local, as well as the individual level was discussed from multiple perspectives. Human beings interact with the natural environment in the framework of a dynamically evolving system. Thus, artificial separations of trends and processes into sectors and levels, for analytical purposes, often have the counter-productive effect of hampering understanding of relevant inter-linkages. The persistent divide between the natural and social sciences in particular obscures understanding of the interactive effects between the on-going global processes of change in the natural and in the human environment. It thus often leaves the multiple threats as well as the opportunities for overcoming them outside the scope of conventional assessments of risks and development options. Similarly, restrictions of the level of analysis could impose limitations on understanding the causes of e.g. seemingly local problems that may in fact be manifestations of global processes and trends and the other way around, and thus on the search for promising solutions and for potentially replicable best practices.

The concept of vulnerability has the potential to serve as an analytical tool enabling us to integrate multi-level and multi-sectoral factors and processes. This helps us to understand threats, identify promising coping strategies and prioritise capacity needs and responses. The term vulnerability, however, cannot serve as a policy relevant analytical concept unless the perceptions of vulnerability of different actors are understood and balanced against each other, and integrated in a framework acceptable to relevant stakeholders. A standarised measurement of vulnerability using


© L. Wever

indicators is essential if policy makers have to compare threats and prioritise responses based on it. The development of vulnerability indicators, however, is a challenging task. It requires trans-disciplinary collaboration in a participatory research framework, which is flexible enough to be adjusted to the specific threats and to the context in which they are situated. Given the above-mentioned complexity, the practical exercises undertaken in the course of the training seminar as well as the conceptualisation of an actual vulnerability assessment questionnaire proved an effective tool for reminding the seminar participants of the core questions (e.g. vulnerability assessment of whom, to what, by whom, for what purposes, etc.).

The new contextual and conceptual frameworks in which the much explored research topics were situated during the seminar provided a stimulus for addressing old problems from a new perspective and through new approaches. This is of particular relevance to the work of the Environment and Sustainable Development (ESD) Programme of the United Nations University (UNU).

The discussions on the concept of vulnerability and its practical applications provided useful insights for the integration of vulnerability assessments in a project proposal on sustainable land management in the High Pamir and Pamir-Alai Mountains that ESD finalized and submitted for GEF review recently.

Nevelina Pachova
Contact: pachova@hq.unu.edu
United Nations University, Japan.

Report on User Workshop: Analysis of Spatial Data for Human Dimensions Research

The user workshop on "Analysis of Spatial Data for Human Dimensions Research" took place from 6-8 October 2005 in the framework of the 6th IHDP Open Meeting of the Human Dimensions of Global Environmental Change Research Community from 9-13 October 2005 at the University of Bonn, Germany. The workshop's purpose was to provide young and/or developing country researchers with training in cutting edge approaches for spatial data integration and analysis. The workshop was organised in collaboration with IHDP (International Human Dimensions Programme on Global Environmental Change), CIESIN at Columbia University, the University of Bonn and the Population-Environment Research Network (PERN).

The first part of the workshop focused on the construction and the use of socioeconomic and ecological data sets such as the Gridded Population of the World, the urban extent database, and data sets on global malnutrition, in-


© L. Aguiar

fant mortality, and global land cover. Furthermore biophysical and infrastructure data sets (e.g. climate, agricultural suitability, transportation, distance to ports, land use and land cover, digital elevation information and other data sets) for analytical and data integration purposes.

The workshop's second part concentrated on local-level applications (particularly in Africa), on the issues of global data availability versus local needs and data needs for an integrated modeling framework.

A particular focus was on the statistical and spatial integration of hydrological data. A very interesting example was the presentation of an integrated approach to the efficient management of scarce water resources in West Africa (Marocco, Benin) as being applied in the context of GLOWA-Impetus, a multidisciplinary project of the Universities of Cologne and Bonn in Germany.

This training helped me to improve my knowledge regarding spatial data analysis and enabled me to share my own experience in spatial analysis obtained during my geography training with the other participants.

We want to implement what we learned during the workshop in our own research analysing the impacts of climate change on the wetlands of Senegal (West Africa) by quantifying the correlation between precipitation and the depth of the groundwater table and its impacts on the vegetation cover. The methodology is based jointly on spatial and temporal analysis, as well as on statistical analysis.

Besides, I intend to share my experiences with other researchers, and to support authorities in the decision making process. We also plan to organize a workshop in Senegal about the integration of data and space analysis, with the aim of bringing together students of Senegalese universities and of initiating and reinforcing knowledge on the new geographical information systems.

Lazar A. A. Aguiar
Contact: lazaraguiar@yahoo.fr
Université du Québec à Montréal

ANNOUNCEMENTS

New Fast-Track Activity Coordinator at the IPO

We are pleased to announce the appointment of Dr. Daniel Petry as Scientific and Fast-Track Activity Coordinator at the International Project Office of GWSP in Bonn. He has a diploma degree in geography with a special emphasis on soil science and freshwater ecology issues. He finished his PhD at the UFZ Centre for Environmental Research in Leipzig, Germany, in 2001, working on the integrated assessment of landscape functions in environmental planning contexts. His recent research has been on integrated ecological and economic assessment as well as on governance and institutional regimes in Integrated Water Resources Management. He also has substantial experience in coordinating scientific projects. His main focus at the IPO will be on the coordination of GWSP's Fast-Track Activities.

Daniel Petry
Contact: Daniel.petry@uni-bonn.de

20-23 June 2006 in Bonn, Germany

International Workshop on "Governance and the Global Water System"

Global environmental change has multi-fold impacts on water related services, uses and functions at different scales, and thus is aggravating water related conflicts. Water governance regimes are under growing pressure to adapt to these global challenges. The key objectives of the workshop are to identify (a) institutions, actors and scales which are of key relevance for enhancing adaptive capacity of governance regimes towards global environmental change, and (b) how governance regimes can be enabled to strengthen the adaptive capacity and resilience of the global water system. Further information is available at www.gwsp.org/gov_workshop.html

27 September – 7 October 2005 in Peyresq, France

Summer School on Adaptive Water Management

The NeWater project (www.newater.info) will convene a summer school for young researchers on "Adaptive Management in the context of Integrated Water Resources Management" organised by the Institute of Environmental Systems Research, University of Osnabrück, Germany, in cooperation with the Global Water System Project (GWSP). *The GWSP is able to offer funding for up to 5 participants and invites applications including a CV and an abstract of the applicant's related ongoing research work. Deadline for applications is 30 April 2006.* For further information and applications please contact the GWSP IPO (gwsp.ipo@uni-bonn.de). Further information will be available soon at www.gwsp.org.

9-12 November 2006 in Beijing, China

Global Environmental Change: Regional Challenges – An Earth System Science Partnership (ESSP) Global Environmental Change Open Science Conference

Conference Objectives:

- To present the results of the last five years of global environmental change research, emphasising the Earth System Science approach, in particular as it relates to carbon, food, health, and water.
- To highlight the rich variety of research conducted by the global environmental change community, particularly the Core Projects of the four international GEC Programmes, and how that research contributes to and supports the objectives of the ESSP.
- To point the way for the next decade of Earth System Science.

Call for Contributions:

We invite scientists, policy makers, practitioners, scholars, members of the private sector, and journalists to participate in this Conference and to submit abstracts (oral or poster presentations). Please note that this call will mostly be for poster presentations, and that poster sessions will be an integral part of the Conference. Deadline for submission of abstracts is 1st of May 2006.

Young Scientists' Conference:

Immediately prior to the main Conference, the 2nd International Young Scientists (YSC) Global Change Conference (7-8 November 2006) organised by START will provide an opportunity for selected young scientists to present and discuss their work and to participate in the ESSP Open Science Conference.

For more information, please visit the Conference website: www.essp.org/ESSP2006/index.html

CALL FOR RESEARCH PROPOSALS CONCERNED WITH THE GLOBAL WATER SYSTEM

The Global Water System Project (GWSP) of the Earth System Science Partnership (ESSP) is in its formative stage and has cast its work around several Fast-Track Activities that address the central research question:

How are humans changing the global water cycle, the associated biogeochemical cycles, and the biological components of the global water system and what are the social feedbacks arising from these changes?

The GWSP seeks to expand its portfolio of activities and to develop partnerships with colleagues around the world by endorsing pioneering projects concerned with critical questions about the global water system. We are therefore *calling for partnership proposals to bring high quality and well-established research projects into the GWSP family of activities*.

Themes of proposed projects should fit well to those of the GWSP described in its Scientific Framework Document (see www.gwsp.org/products.html). Preference will be given to projects that are science-driven, address questions of global importance, and cover at least medium-to-large watersheds. Especially encouraged are proposals involving multiple research teams, international collaboration, a multi- or interdisciplinary approach, and the human dimension aspects of the global water system. One example is the recently consolidated Northern Eurasian Environmental Partnership Initiative (NEESPI) (see www.gwsp.org/cur_activities.html)

While the GWSP cannot offer funding to these projects, its endorsement provides the following benefits:

- listing as an endorsed project of the GWSP and partnership in a world-wide network of GWSP-endorsed projects;
- open invitation to participate in GWSP workshops and other activities, to help develop mutually beneficial activities; and
- recognition by the international scientific and donor communities that the endorsed project plays a key role in global water research.

Since this call for partnerships will only be issued once a year, researchers are urged to submit project proposals as soon as possible. For details about how to apply for endorsement please consult: www.gwsp.org/get_involved.html or contact the IPO.

IMPRINT

Publisher:
The Global Water System Project
International Project Office

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.

Contact:
GWSP IPO
Walter-Flex-Str. 3
D-53113 Bonn
Germany
Phone: + 49 - 228 - 73 61 88
Fax: + 49 - 228 - 736 08 34
Email: gwsp.ipo@uni-bonn.de
www.gwsp.org

Editors:
Marcel Endejan, Daniel Petry,
Alma van der Veen, Lara Wever

Publishing Management:
Katharina Moraht, Lara Wever

Layout:
Karina Waedt, DTP-Produktion, Bonn, Germany

Printers:
Rautenberg Media & Print Verlag KG, 53840 Troisdorf, Germany

CONTENTS