GWSP
Global Water System Project

GLOBAL WATER NEWS

Earth System Science Partnership

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EDITORIAL

The content of this Second Issue of Global Water News reflects the gathering pace of the implementation of the Global Water System Project. The lead article by Malin Falkenmark, member of the GWSP Scientific Steering Committee (SSC), concerns the need to emphasise so-called green water which is vitally important to the fight against world hunger. This Issue also reports on the fast track activities chosen for accelerated development by the SSC at its first meeting in February; the detailed planning and implementation of these fast track activities presents a major challenge. Co-ordination of this effort is the responsibility of the SSC assisted by the IPO, but it will be achieved only if we can engage a broad cross-section of the scientific community in GWSP-related activities. The highest priority is to forge links with the core projects of the four ESSP programmes. Our strategy is to organise a series of conferences, meetings and workshops; reports on some of these are included in this Newsletter. The first is the major conference that the GWSP organised on 23-25 February, in Bonn. Other meetings were held in Wallingford (UK) and Egmond aan Zee (NL) to address specific fast track activities. We greatly appreciate the enthusiasm with which the GWSP has been welcomed by our many colleagues at these meetings, and hope that the collaboration continues to grow like a snowball.

Eric Craswell
Executive Officer International Project Office (IPO)

GREEN WATER – CONCEPTUALISING WATER CONSUMED BY TERRESTRIAL ECOSYSTEMS

Photosynthesis a highly water consumptive process

The driving forces in terms of population growth and demand increase linked to hunger alleviation and expectations for improved quality of life, are largest in regions conventionally seen as water poor. It is increasingly being realised that we cannot expect irrigation to solve the challenge of escalating global food requirements. When comparing future food needs with projected increase of food production, given feasible development of irrigated agriculture and global markets, a "hunger gap" is being left over Subsaharan Africa and South Asia. There is however another type of water that can be put to much more efficient use: the naturally infiltrated rain, the water resource that was never discussed at the Rio Conference in 1992. In fact, rainfed crop production has conventionally been dicussed more in terms of nutrients than of soil water.

We are therefore in a situation where conventional water resource perceptions are incomplete. Their focus is on liquid or *blue water*. They served the particular needs of engineers quite well, involved in water supply and infrastructure projects of various kinds. The blue water that has dominated the water perceptions in the past however represents only one third of the basic water resource, the rainfall over the continents.

Taking a step back in the water cycle to the rain over the continents, it is now being realised that most rain goes as *consumptive water use by the vegetation* back to the atmosphere. Much of the interest of the water expertise has in fact been concentrated on how to use beneficially only 4 percent of the available resource. Out of the vapour flow, about 10 percent is consumed by crop production which is almost twice as much as all the blue water withdrawn for societal use (1). Most of the remaining 90 percent is consumed by other terrestrial ecosystems.

Soil moisture – core resource for the terrestrial ecosystems

When discussing African future, the natural soil moisture is an essential resource to focus on since most of the agricultural production in Subsaharan Africa is rainfed. This was also the background against which the concept *green water* was introduced by Swedish scholars, as a synonym to soil moisture, at a FAO-seminar in January 1993 (2). In later years it has been further developed and the green water flow branch represents the consumptive water use/vapour flow as indicated in Figure 1.

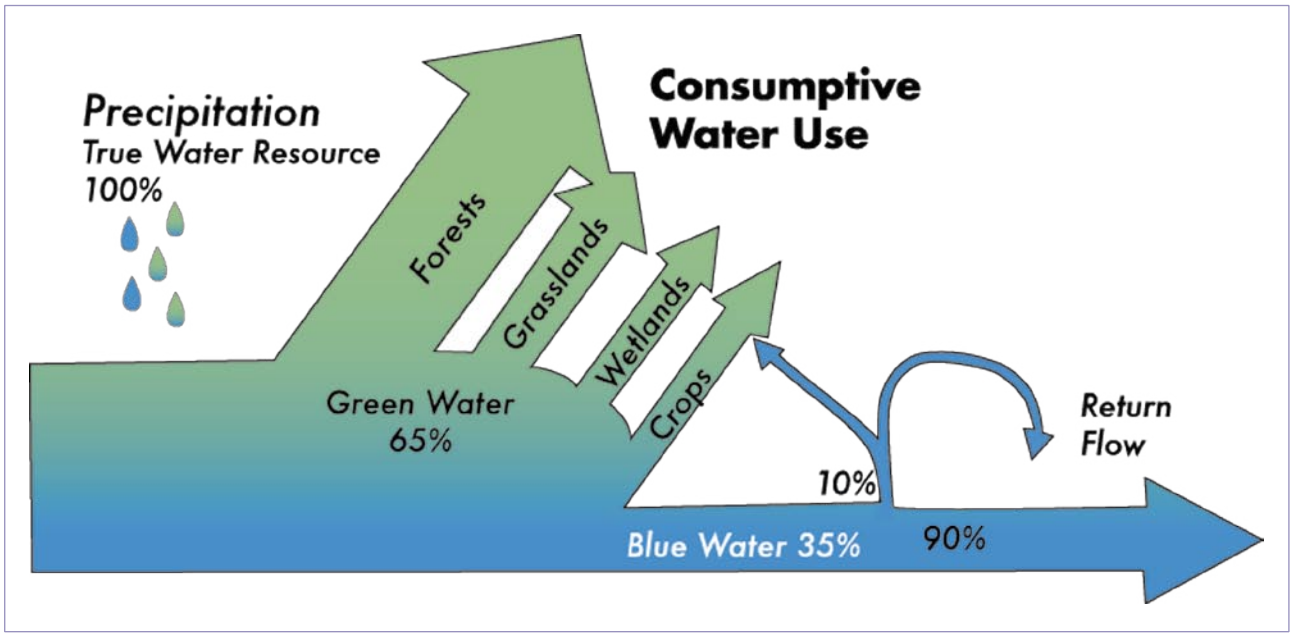

Figure 1. *The blue water represents only one third of the basic water resource, the rainfall over the continents. Most rain goes as green water, i.e. consumptive water use by the vegetation, back to the atmosphere.*

The relevance of this concept for discusssions of future global food security is evident when realising that most of the socalled "top and high priority countries" highlighted in the Millennium Project are located in the savanna zone with semi arid climate and very high evaporative demand. In that zone only a very limited percentage of the rainfall forms runoff, blue water. Consequently, water for socio-economic development becomes an issue of balancing societal water-dependent activities against water requirements by the natural ecosystems.

This will demand an integrated approach to land use and water since land cover changes tend to alter the rainfall partitioning between green and blue water branches, in other words impact on runoff generation. This phenomenon is by South African water lawyers referred to as streamflow-impacting activities.

The new hydrology for development

In the discussions on how to balance water requirements by humans and nature, four different realms of water use are being distinguished (3): on the one hand between green and blue water uses, on the other between *direct uses*, i.e. societal water uses (blue water for conventional water needs as opposed to green water for crop production) and *indirect uses* by ecosystems (green water dependent terrestrial as opposed to blue water dependent aquatic ones). See Table 1.

This new blue/green approach to water resources will constitute a cornerstone in a *new hydrology for development* to meet the evident need for a better conceptual base clarifying the biophysical preconditions for development in a region. What is being referred to are the particular challenges that have to be successfully coped with to secure development of human quality of life for rapidly growing populations. In the semi arid zone, water scarcity evidently complicates development of water-dependent activities in society and represents a natural phenomenon to be overcome by human ingenuity.

It has been shown that with such an approach, a more realistic idea emerges about the food security challenges of the future (4). Using current levels of water productivity, the water requirements behind a nutritionally acceptable diet for the world population one and two generations ahead involve the need to appropriate for food production an additional green water flow of 3600 km^3/yr by 2025 (5600 by 2050). Already the former amount is of the same order of magnitude as the total blue water withdrawals today.

The next question is from where all this additional water may be redirected towards on crop production. How much can be saved by the crop per drop approach and where does the rest come from (3)? It has been shown that an expanded and more efficient irrigation can probably at the most cover some 14 percent of the 2050 needs, while redirecting huge evaporation losses from low efficiency rainfed agriculture might to cover another 30 percent. This means that there will remain more than 50 percent that will have to involve horizontal expansion to tropical forests and grasslands, appropriating the green water now involved in the biomass production in those areas.

Water Flow Domain Use Domain	Green	Blue
Direct	Economic biomass growth: Rain fed food, timber, fibres, fuel wood, pastures, etc.	Economic use in society: Irrigation, industry and domestic uses
Indirect	Ecosystem biomass growth: Plants and trees in wetlands, grasslands, forests and other biotopes	Ecosystem functions: Aquatic freshwater habitats
	Biodiversity	Biodiversity

Table 1. *Incorporating the green water in the water conceptualisation means a much more realistic understanding of the resource base.*

Need to develop green water governance

The blue/green approach to water resources has rapidly gained interest in the scientific and development communities. This was evident from a recent international workshop co-convened by Stockholm Environment Institute (SEI) and Stockholm International Water Institute (SIWI). Issues highlighted by the workhop attendants were policy instruments for streamflow reduction activities; green water credits to farmers upstream as incentive for good management of the critical interface between land use and runoff generation; ongoing development of a global green water resource map; etc. The blue/green distinctions of water as a resource had already been introduced in several river basin studies in both Africa and South Asia.

The emerging relevance for development studies of this broadened approach to water resources evidently involves the need for development of tools and mechanisms for *green water governance*. A SIDA-supported Green and Blue Water Inititiative with this goal is currently being developed by SEI and SIWI in cooperation with IWMI, IUCN, IFPRI and SWMNet as core partners. The workshop referred to above was part of these efforts.

References

(1) Rockström, J., Gordon, L., Folke, C., Falkenmark, M. & Engwall, M. 1999. *Linkages among water vapor flows, food production, and terrestrial ecosystem services.* Conservation Ecology, 3(2): 5. Available online at URL: http://www.consecol.org/vol3/iss2/art5/

(2) FAO 1995. *Land and water integration and river basin management.* Proceeding of an informal workshop 31 Jan-2 Febr 1993. Land and Water Bulletin. Food and Agricultural Organization. Rome.

(3) Falkenmark, M. & Rockström, J. 2004. *Balancing water for humans and nature.* Earthscan. London.

(4) SIWI, IFPRI, IUCN, IWMI. 2005. *Let it reign: The new water paradigm for global food security.* Stockholm International Water Institute. Stockholm.

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WATER SCIENCE AND POLICY MEET IN THE RHINE CITY OF BONN

The GWSP took the lead in organising the international conference 'Integrated Assessment of Water Resources and Global Change: A North-South Analysis' that was held in Bonn, 23-25 February 2005. The meeting was organised in co-operation with the Project on Global Change in the Hydrological Cycle (GLOWA) at the Centre for Development Research (ZEF), University of Bonn, Germany; the German Federal Ministry of Education and Research (BMBF); the German National Committee of the International Hydrological Programme (IHP) and the Hydrology and Water Resources Programme (HWRP); the initiative Hydrology for the Environment, Life and Policy (HELP) of the United Nations Educational, Scientific and Cultural Organization (UNESCO); the Challenge Program on Water and Food (CGIAR); and the International Association of Hydrological Sciences (IAHS). The 130 participants from 29 countries presented 45 papers during six sessions, and exhibited 34 posters. UNESCO, BMBF, the government of the Federal State of North Rhine-Westphalia (NRW), the City of Bonn, and InWEnt (Capacity Building International, Germany) supported the Conference financially.

Professor Malin Falkenmark of the Stockholm International Water Institute delivered the keynote speech in which she emphasised the shift in thinking required to address the 21st century hunger gap. She referred to the need for a new generation of water professionals that is able to address the water implications of changing land use.

The growing gap between North and South was also an important issue dealt with in another context. The gap is still large, not only concerning water availability and quality, but also concerning the capacity to apply science and its solutions. Thus, integrating components of local capacity-building for people in the South has become a major goal in research projects like the ZEF led GLOWA Volta project. Scientists should have a role as facilitators that are presenting scientific output to inform local stakeholders rather than to dictate policy decisions. Hereby, also the gap between scientists and politicians can be bridged.

András Szöllösi-Nagy (UNESCO, France) gave a presentation on the UNESCO International Hydrological Programme.

Scientists at the Conference also showed new modeling tools allowing human and natural processes to be coupled and understood better. The meeting also emphasized the importance of combining new scientific methods and practical tools, which allow a participatory assessment and better approaches to adaptive management. But it is also clear that satisfactory answers and applicable solutions for the local level cannot be found if the global scale is not taken into account, particularly in terms of global environmental change. Through the increasing international cooperation between water research programs, global observation systems can be employed effectively to help to predict environmental change. At the same time, water users and managers at the river basin scale can be helped as well.

Discussion at the poster area.

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LOICZ (LAND-OCEAN INTERACTIONS IN THE COASTAL ZONE) AND THE GWSP: NEW OPPORTUNITIES FOR COLLABORATION

A workshop session on the "LOICZ II – GWSP Collaboration" was held on 29 June at the LOICZ Open Science Meeting in Egmond-aan-See, in the Netherlands. The meeting drew about 30 participants, was chaired by Michel Meybeck of LOICZ, and involved Joseph Alcamo, Stuart Bunn, Felino Lansigan, and Eric Craswell from the GWSP. The meeting started with presentations about LOICZ and GWSP activities and plans, and about the importance of mega-cities in environmental change research (by Frauke Kraas, of the University of Cologne). After a lively discussion, the following areas and questions of mutual interest for collaboration between LOICZ and GWSP were identified:

Comparing Governance of Freshwater and Coastal Systems

The use and management of water resources in both coastal regions (e.g. regional seas) and river basins (e.g. international river basins) are regulated by a patchwork of treaties, regulatory agencies, and other institutions. Despite the geographic overlap between freshwater and coastal systems, little attention has been given to the consistency of institutions that regulate these systems.

- What are the similarities or differences/contradictions between the institutions used to manage river basins and the coastal regions they are linked to?
- What role does poverty play as a driving force of change in river basins and the coastal zone?

Improving Scientific Understanding of Saltwater Intrusion to Coastal Aquifers

The saline contamination of coastal groundwater is a major water supply issue in many populated coastal areas. Contamination stems from both coastal processes such as sea level rise, but also from inland processes such as the upstream diversion of freshwater. Indeed, abstraction of freshwater upstream in coastal watersheds is already permitting seawater to intrude into many important coastal aquifers.

- Where are the major global areas under threat of saltwater intrusion?
- At what level of freshwater abstraction does saltwater intrusion become a problem?
- What policies and actions are most effective in counteracting saltwater intrusion?

Assessing the Impact of River Diversions and Climate Change on Coastal Processes

Upstream river diversions (including abstraction from aquifers and interbasin water transfers) and climate change/variability lead to changes in the input of freshwater and materials to estuaries and therefore profoundly affect physical, biogeochemical and ecological processes in the coastal zone.

While river diversions and climate change modify the volume of freshwater inputs to estuaries, sea level rise at the same time will increase the inland penetration of saltwater. The combination of these drivers could lead to major changes in the salinity boundaries of estuaries and in the effective long-term spatial extent of the estuarine environment.

- What do we know about the current impact of river diversions on sediment flux and other coastal processes?
- What are various scenarios of changes of freshwater input to world estuaries under climate change?
- How will sea level rise and changes in freshwater input modify the effective boundaries of future estuaries?

Analysing the Impact of Land Use Change, in Particular Mega-City Growth, on Coastal Processes

The growth of so-called "mega-cities" is putting tremendous pressure on water and other resources. Since many of these cities are at the mouths of large river/estuary systems, the growth of these cities are an important issue for both the LOICZ and GWSP scientific communities.

- What is the current impact of mega-cities on water resources and ecosystems in freshwater and estuarine systems?
- What are the potential new impacts of growing mega-cities on water resources and ecosystems?

Identifying and Comparing Environmental Flows of Freshwater and Estuarine Systems

The concept of "environmental flows" has been developed to gain understanding about the minimum flows and flow regimes needed to sustain aquatic ecosystems. While this concept has been developed for freshwater systems, it also is beginning to be used in studies of estuaries.

- How do environmental flows (flow regime, minimum flow) compare between freshwater and estuarine ecosystems?

- What methodology can be used to assess requirements of both freshwater and estuarine ecosystems?
- How can environmental flows be reconciled with flow requirements for navigation and industrial cooling?

Characterising Large-Scale Nutrient Cycles

Society has caused large scale changes in the fluxes of nutrients to the global water system and this is leading to changes in the nitrogen and other global nutrient cycles. While the GWSP has a particular interest in observational and modeling studies of the nutrient cycle in freshwater systems, LOICZ has a parallel interest in these studies in the coastal zone. Joint activities need to be identified to bring the outputs of these parallel activities together.

- What are the upstream inputs of nutrients to estuaries?
- How can knowledge of freshwater and coastal nutrient cycling be combined for a more comprehensive understanding of global nutrient cycles?

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WALLINGFORD INDICATOR WORKSHOP

The use of indicators is increasingly seen as important in the water sector, and the purpose of this article is to outline progress that has been made in the development of integrated approaches to indicator development during a one-week workshop held on 16-20 May 2005 at the Centre for Ecology and Hydrology in Wallingford, UK. From the GWSP, Charles Vörösmarty, SSC Co-Chair, Stuart Bunn, SSC member, and Eric Craswell, the executive officer, attended the meeting; the participating institutions included the Centre for Ecology and Hydrology (CEH) at Wallingford, the Center for International Earth Science Information Network (CIESIN) at Columbia University, Griffith University (Australia), the International Food Policy Research Institute (IFPRI), the International Water Management Institute (IWMI), the Institute for Environmental Systems Research at Osnabrueck University, and the Water Systems Analysis Group of the University of New Hampshire.

The *Global Water System Project* has an interest in using indicators within its forthcoming *Digital Water Atlas*. In addition, the *Challenge Programme for Water and Food* is currently seeking solutions to how indicators can best be used for comparative management purposes, and it was considered useful to streamline the efforts of these two groups on indicator use. Having extensively reviewed the indicator literature, these two programmes have expressed interest in the structure of the *Water Poverty Index*, a holistic and integrated water index developed from research led by CEH. As a result, it was decided to bring together these initiatives at this workshop, with a view to generating an indicator more specifically targeted towards the issue of food security and the need for basin-scale assessment.

During the meeting, considerable discussion took place on the structure and use of integrated indices such as the Water Poverty Index. Strengths and weaknesses of such indices were identified, and suggestions were made as to how these could be addressed at the basin scale. With a focus on food and health in relation to water and poverty, a new set of indicator variables were identified after several periods of intense discussion in break-out groups. Discussion also focused on the structure of such indices, and the use of a more complex matrix structure was considered. It was agreed that the output of the indicator component of this workshop will remain as an *index*, which in order to be differentiated from the *Water Poverty Index*, will be referred to as the '*Water Wealth Index*'. One of the reasons for this was the fact that it was observed that the term *poverty* was often considered pejorative, and so this more positive name was proposed.

The workshop also provided an excellent opportunity to facilitate the testing of the GRIMS web-based integrated monitoring tool. This has been developed by the University of New Hampshire, and brings together some 130 global datasets. This tool facilitates the calculation of

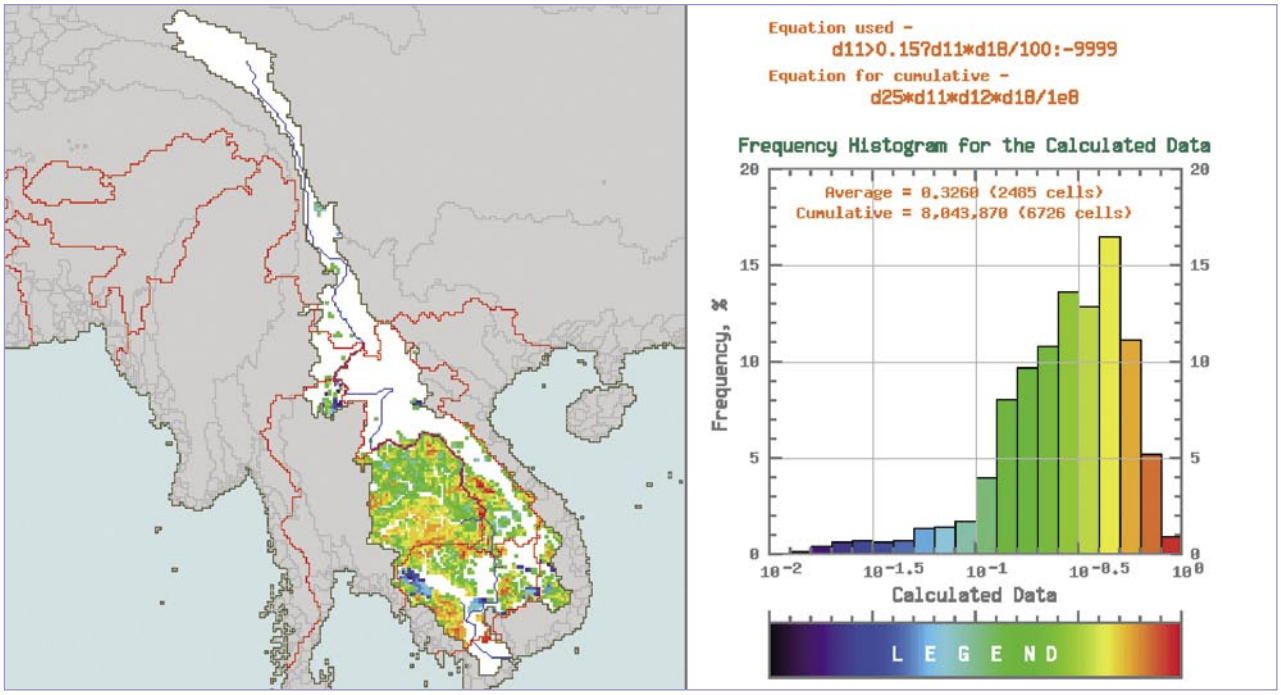

Figure 2. *Intensity of croplands with low nutrient soils: Mekong River Basin. Computations constrained to cropland area > 15% of grid cell area. Total number people living on low nutrient croplands = 8,044,000. Source: Output from the Indicator workshop in the UK, 16th-20th of May 2005, GRIMS tool, University of New Hampshire (Global Rapid Integrated Monitoring System for Water Cycle), CIESIN (Center for International Earth Science Information Network), and other data sources.*

integrated queries, and generates values which can be use for use in a variety of ways. The facility of mapping the outputs provides users with useful visualization tools, and this meeting provided a pilot testing ground for its application in a variety of major river basins throughout the world.

While there is no doubt that there is much further work to be done on both of these types of tools, much progress has been made to address the challenges associated with data assimilation, data integration, up and down scaling, data representation and indicator structures. A detailed report about the outcomes of the workshop is in preparation. It is hoped that the initiative described in this report will be seen as progress in this debate, and will serve to highlight priority areas for future work. It is important, however, that the contents of the report are seen as being a preliminary result of work in progress, and with more time, these results will become much more complete and robust.

In the hands-on-exercise, several parameters were mapped at the basin scale for the lower Mekong basin using the Global Rapid Integrated monitoring System (GRIMS) of the University of New Hampshire (see Figure 2).

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FAST-TRACK ACTIVITIES

The GWSP Scientific Steering Committee (SSC) held its first full meeting in early 2005 in Bonn, Germany. During this meeting, a set of fast track activities was identified and initiated. The following activities are some examples of Fast-Track Activities that are on the GWSP agenda for 2005-2006.

Digital Water Atlas

The Digital Water Atlas is envisioned to be a GWSP product evolving over time as the project moves forward. It will provide a consistent set of annotated maps that will help to describe the basic elements of the Global Water System, the interconnection of these elements and changes in the state of the Global Water System. The Atlas will take a broad temporal perspective encompassing past, present and future time domains and will emphasise in particular the effects of global change on the Global Water System. The Atlas will focus on maps with global coverage and will use indicators from different scientific disciplines thus fostering a multi- and inter-disciplinary approach. The fast-track activity will promote in particular the collection, analysis and consideration of social science data on a global basis which will also be used to contribute to the GEOSS initiative. An associated part of the atlas will be an improved estimate of the world water balance. As part of this activity a workshop will be organised to exchange and harmonise model experiments of scientists working on world water balance estimations.

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Pelicans, water buffalos and flamingos at Lake Nakuru, Kenya.

Workshop on "Key Issues in the Global Governance of Water"

A planned workshop on Global Water Governance will address the central questions at which scale water governance and water management regimes should operate and how they influence the adaptive capacity and vulnerability of the global water system. Based on an analysis of governance and management regimes, and key factors of human influence on the water system, recommendations for research on improved governance of water issues at global scales will be developed. The workshop will be directed at participants from scientific and policy communities. Results of the workshop will be published in a scientific journal.

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Global Environmental Flow Indicators

Scientific Committee Meeting of the DIVERSITAS Freshwater Biodiversity Cross Cutting Network (FREDY) in Paris.

There is no doubt that the modification of natural flow regimes is one of the major drivers of change in aquatic biodiversity and river ecosystem health. The GWSP in collaboration with the Global Rivers Sustainability Project (GRSP) aims to: (1) agree on a set of hydrological parameters that are ecologically relevant; and (2) identify which of these can be modelled at the global scale and report on changes to these parameters at river basin and/or country scales. Two workshops have already been held and a conceptual paper has been prepared for submission to Environmental Management. A list of potential environmental flow indicators will be reported from these workshops and a subset of these selected that can be modelled and reported at basin and country scales.

This fast-track activity will underpin a larger joint activity between GWSP, GRSP and DIVERSITAS, which has developed a Freshwater Biodiversity cross-cutting network (FREDY). The longer-term goals of this project include determining (1) how much flow variables can be modified without major degradation to river ecosystems; and (2) how this is likely to vary between biomes and climatic regions.

In addition to this project on environmental flow indicators, we also aim to develop additional indicators of river ecosystem health that will include measures of key drivers such as land use impacts and barriers to dispersal, as well as direct measures of aquatic biodiversity. An initial workshop was held in May 2005 at the Centre for Ecology and Hydrology, Wallingford (UK) with collaborators from the CGIAR Challenge Program on Water and Food.

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Modifications of natural flow regimes threaten river ecosystem health.

Global Water System Lexicon

The Global Water System Lexicon is an early GWSP product that will provide the basis for a coherent description of the elements of the Global Water System by giving a collective set of term definitions agreed by all project participants. The GWS Lexicon will enable a consistent description of the Global Water System and its components and will help reduce miscommunications between scientists from various disciplines that are caused by differing definitions of terms in different scientific fields or by divergent views of the same system.

The lexicon will facilitate an open online discussion on definitions of terms which can be added, modified and extended as lexicon entries online. Such interactive participation of scientists will contribute usefully to the GWSP goal of promoting a discourse between the various scientific disciplines. The discussions related to terms with multiple meanings used by different scientific disciplines will be emphasised to promote awareness of any differences, and to show why a particular definition is chosen and preferred within the GWSP. In addition, linking terms visually using a graphical notation will be used to provide a first overview of how the conceptual model of the Global Water System can be described.

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

This initiative is developing a cooperative venture promoted by GWSP and START and supported by the projects Institutional Dimensions of Global Environmental Change (IDGEC) and Industrial Transformation (IT) of the International Human Dimensions Programme on Global Environmental Change (IHDP). It will be jointly hosted by the Institute for Environmental Studies, Vrije Universiteit Amsterdam and the UNESCO-IHE Institute for Water Education, Delft. The Advanced Institute is a capacity building effort that aims at (1) providing developing country participants with training in the field of the vulnerability of water resources to global environmental change, (2) fostering the establishment of a research network among the participating scientists, (3) helping participants develop project proposals on the theme of the Institute in the context of issues and challenges in their respective regions. The Advanced Institute will consist of a training period/workshop, a period of research conducted individually by the participants but supported through mentorship, and a follow-up synthesis workshop.

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GWSP PROJECT ENDORSEMENT PROCEDURE

The GWSP Scientific Steering Committee has approved the following guidelines by which projects can be submitted and endorsed as part of the GWSP research agenda:

Projects submitted for endorsement should make a significant contribution to the GWSP Scientific Framework. Form and proposal: a 5 page executive summary would be required for all such requests, pointing out in specific terms how the project in question would contribute to the GWSP scientific framework. The following headings should be used in the document:

1. Background
2. Goals
3. Activities/Research proposed
4. Relevance to the GWSP Scientific Framework
5. Leadership
6. Contributing research groups
7. Timetable (3-5 year timeframe)
8. Plans for funding
9. Expected outcomes/products

The proposal should be sent firstly to the International Project Office (IPO) for comment and assessment (specifically assessing how the project fits into the GWSP objectives and framework). The IPO then consults with the GWSP Scientific Steering Committee (SSC) for comment, endorsement, and approval, by distributing the documentation on eligible proposals to the co-Chairs and full SSC. A time deadline and a no-objection approach will be used to streamline the process. The IPO will write an endorsement letter (if project is accepted) on behalf of the SSC.

Registered projects will be required to give summaries (4 or 5 pages) each year about the ongoing research, key knowledge, lessons learned, reached milestones, publications etc. As directed by the SSC, the IPO will make (specific or general) "calls for projects" that would then be subject to the endorsement process.

Endorsement Criteria

A Project will be recognized for a specified project duration. It should be of high scientific quality and match well to the themes and activities of the scientific framework of the project. The main themes involve studying the role of humans in the global water system and the consequences of their interactions. GWSP activities should have some or all of the following characteristics:

- science driven
- global in perspective
- past, present and future in temporal perspective
- scientifically integrative
- focussed on freshwater

Encouragement will be given to:

- projects that foster affiliation with the Global Environmental Change Projects (GECPs) and/or Earth System Science Partnership (ESSP) projects
- projects that foster multi investigator and international collaboration
- medium to large scale watershed projects
- interdisciplinary projects, including those considering human dimensions

Requests to endorse "project proposals" to be submitted for funding will be treated in the same way as funded projects. The IPO will keep a copy of all endorsed project proposals. The list of endorsed projects with links to the project's webpage will be included on the GWSP website.

Obligations & Benefits

Obligations include:

- providing an annual report (approx. 5 pages) on progress suitable for publication on the GWSP web site
- datasets and information developed as part of the project, made openly available to the scientific community
- acknowledgement of GWSP endorsement in publications and other outreach products. In the case of scientific publications, make an explicit reference in the acknowledgements as follows: e.g., "This paper contributes to the implementation of Activity 3.3 Water Requirements for Nature and for Humans, in the Scientific framework of the Global Water System Project."
- endorsed projects will acknowledge that they contribute to the GWSP implementation
- the GWSP may use results from endorsed projects (with appropriate acknowledgement of the principal investigators) to showcase the diverse research agenda of the GWSP

Benefits for the projects endorsed:

- recognition of being part of an ESSP project
- listed as an endorsed GWSP project (on the web site)
- open invitation to participate in GWSP workshops etc.
- participation in a global network of GWSP-endorsed projects
- being part of the GWSP scientific community
- donor recognition that the project is part of the global GWSP effort

You are welcome to contact us for further information.

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CALENDAR

29-31 August 2005
1st GWSP Asia meeting
Kyoto (Japan)

1-2 September 2005
2nd GWSP Scientific Steering Committee meeting
Kyoto (Japan)

9-13 October 2005
6th Open Meeting of the Human Dimensions of Global Environmental Change Research Community
Global Environmental Change, Globalization and International Security: New Challenges for the 21st century
Bonn (Germany)
http://openmeeting.homelinux.org/

9-12 Nov 2005
1st DIVERSITAS Open Science Conference – Integrating biodiversity science for human well-being
Oaxaca (Mexico)
http://www.diversitas-osc1.org/

9-12 November 2006
ESSP Open Science Conference
Global Environmental Change: Regional Challenges
Beijing (China)
http://www.essp.org/essp/ESSP2006/

Call for Papers is open from February 1st – Mach 10th !
6th Open Meeting of the Human Dimensions of Global Environmental Change Research Community

GLOBAL ENVIRONMENTAL CHANGE, GLOBALIZATION AND INTERNATIONAL SECURITY: NEW CHALLENGES FOR THE 21st CENTURY,
University of Bonn, Germany, 9-13 October 2005

Application Timeline:
Sessions: 15 September–15 November 2004 [Closed]
Paper abstracts and posters: 1 February–10 March 2005
Training seminars: 15 November 2004–15 February 2005
Details at:
http://openmeeting.homelinux.org and http://www.ihdp.org
Please submit all applications to the OM website.

IMPRINT

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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 (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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