Global Sustainability Science IGBP

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Science Editor

GLOBAL CHANGE IGBP International Geosphere-Biosphere Programme

ICSU International Council for Science

Science for a sustainable planet

GLOBAL CHANGE IGBP International Geosphere-Biosphere Programme

Science for a sustainable planet

IGBP Strategic Vision

To provide essential scientific leadership and knowledge of the Earth system to help guide society onto a sustainable pathway during rapid global change

Integrated Earth-System Approach

Atmosphere

Land-Atmosphere

Land

Land-Ocean

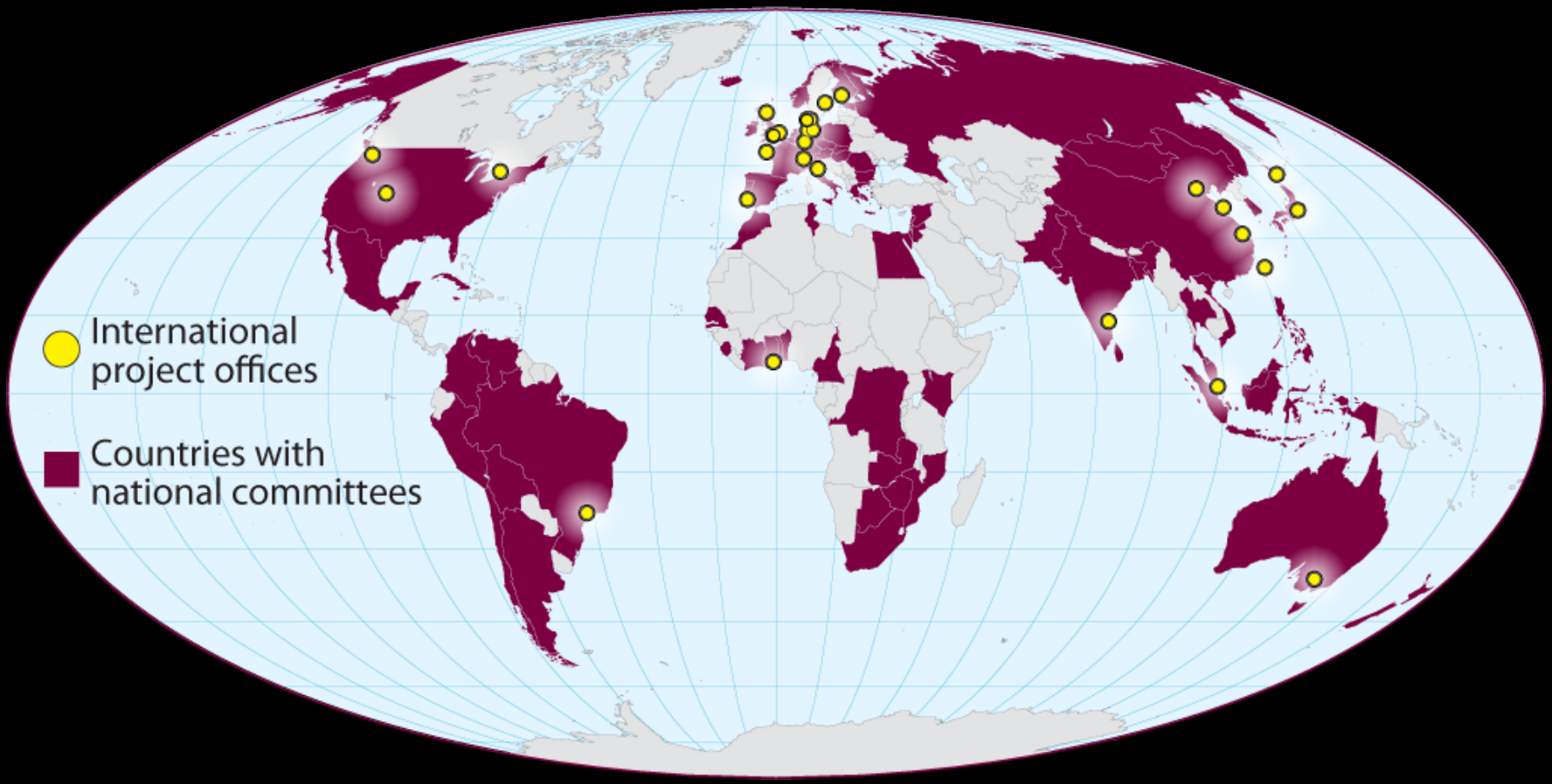
Ocean

Ocean-Atmosphere

Synthesis

Integrated Earth-System Approach

Global Presence



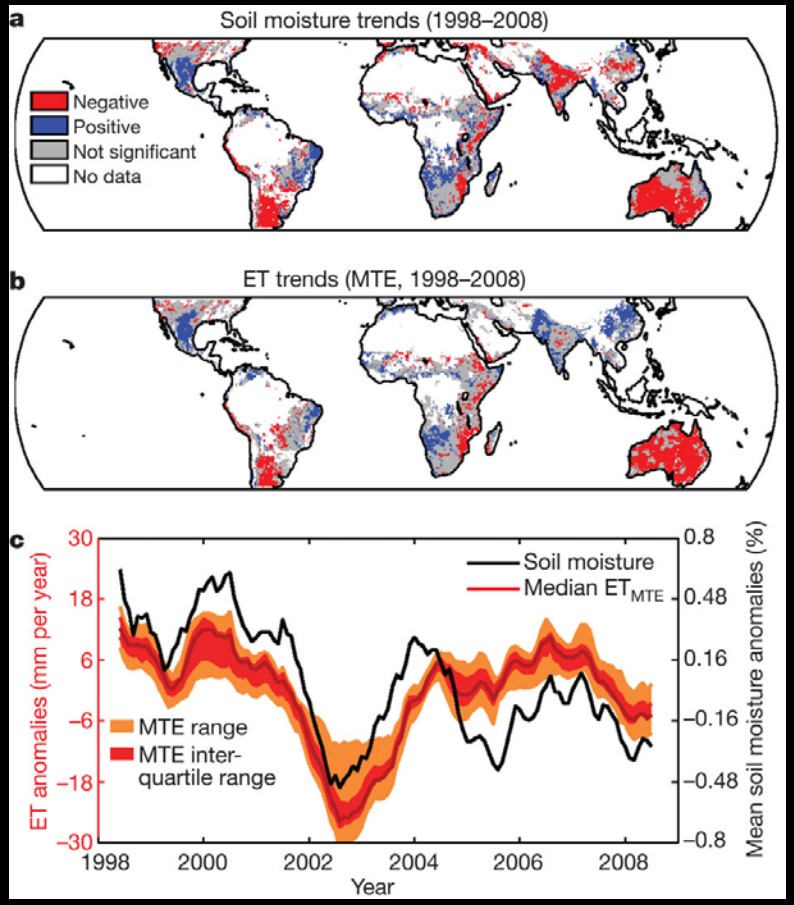
IGBP-GWSP synergies (real and potential)

- Core-project research
- IGBP second synthesis
- Communication

Coordinate world-class expertise

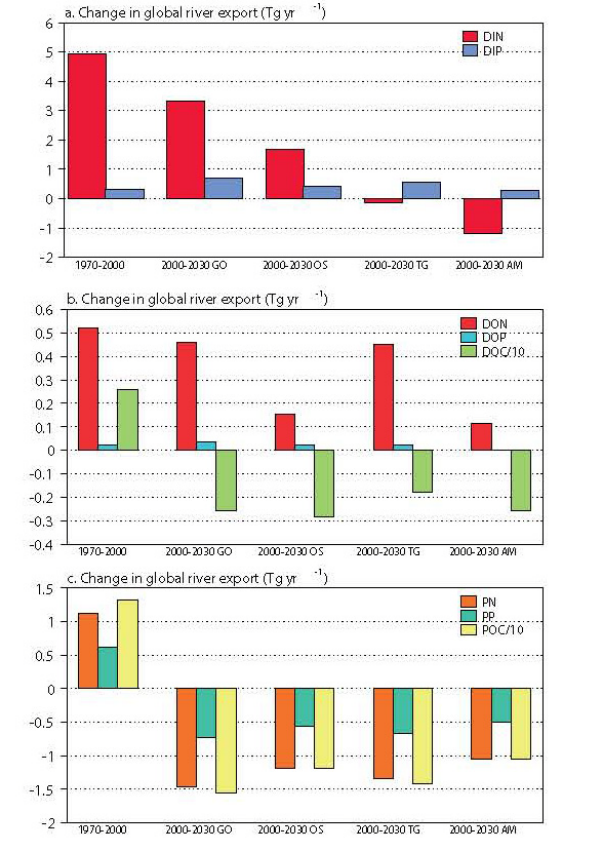
- Core-project research
- IGBP second synthesis
- Communication

Soil moisture limitation of evapotranspiration



M Jung *et al*. (2010) ***Nature*** 467: 951-954, doi:10.1038/nature09396

River catchment-coastal sea interactions



Seitzinger et al. (2010). Global Biogeochemical Cycles 23, doi: 10.1029/2009GB003587

Coordinate world-class expertise

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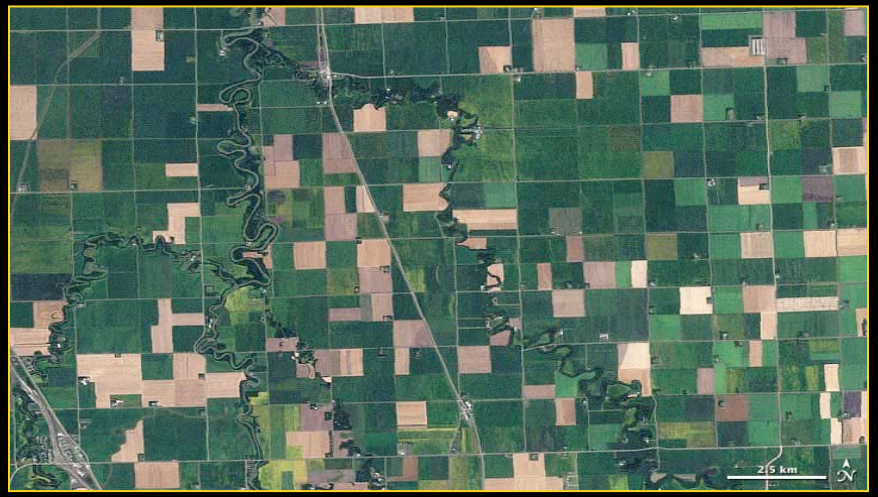
Impacts of the changing cryosphere

- Will evaluate, for example, impacts of receding glaciers on water availability to downstream populations and ecosystems
- Workshops planned for this year include mountain glaciers and permafrost

Led by SC member Ray Bradley

Landuse/land cover changes and climate

- Will evaluate, for example, the feedbacks between land-use-induced land-cover changes and climate



- An understanding of changes to the water cycle are is important to this evaluation

Coordinate world-class expertise

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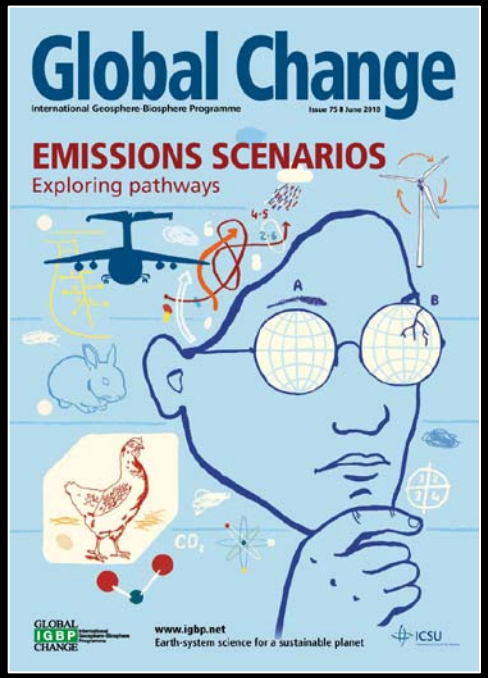
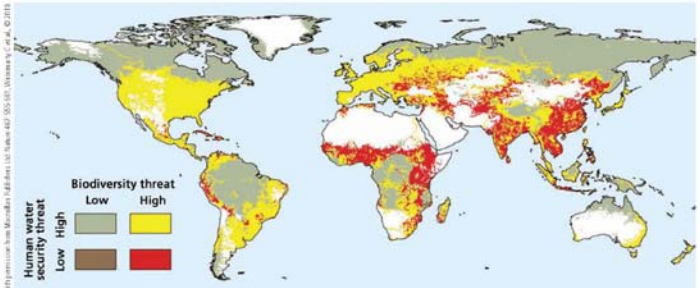
IGBP *Global Change* magazine



GWSP in *Global Change*



GLOBAL WATER INSECURITY ANALYSED IN MAJOR STUDY

THE WATER security of around five billion people – 80 percent of the human population – is threatened, according to research published in the journal *Nature*.

Scientists associated with the Global Water Systems Project have created a global database of rivers pinpointing risks to human water security and biodiversity. They took 23 parameters affecting river health including, for example, water diverted to cropland, livestock density, nitrogen enrichment, pesticide levels, sediment deposits, damming and invasive species.

By combining these parameters, the scientists, led by Charles Vörösmarty and Peter McIntyre, produced a set of global maps showing areas at high risk.

Densely populated regions face the highest risk to their water security. "A strikingly small fraction of the world's rivers remain unaffected by humans," the authors report.

Countries facing the highest joint threats to water supply and biodiversity are in the developing world: China, India, Peru, sub-Saharan Africa, parts of Central Europe and Central Asia.

Rich nations – Europe, Australia and North America – have avoided threats to water security by expensive engineering projects: building dams and treatment plants, managing rivers and erecting barriers to allow crops on flood plains. But these technical fixes have reduced biodiversity. The authors note that with instant access to clean water, people in these countries have largely ignored the growing threats to biodiversity.

The authors argue these technological solutions are often unnecessary. Vörösmarty told the Reuters press agency: "If your concern is flooding you might wish to preserve flood plains and wetlands in low-lying areas as they absorb the shock of floods."

Now decision-makers are caught in a dilemma. Societies in poorer countries face the highest risk to their water security. If they adopt the same solutions as rich nations it will be costly, further harm ecosystems they depend upon and fail to deal with the underlying cause.

The paper says, "The decision to construct large-scale dams is a prime example of how development pressure is often at odds with biodiversity conservation."

It adds that human water security must be established in the developing world "while preserving biodiversity". This will be an additional financial burden if these countries follow practices in Europe and North America. But another route is open: "integrated water resource management that expressly balances the needs of humans and nature".

Vörösmarty and colleagues conclude, "Although our results offer *prima facie* evidence that society has failed to institute this principle broadly, there are promising, cost-effective approaches to preserve and rehabilitate ecosystems. Engineers, for instance, can rework dam operation rules to maintain economic benefits while simultaneously conveying adaptive environmental flows for biodiversity.

"Protecting catchments reduces costs for drinking water treatment, whereas preserving river flood plains sustains valuable flood protection and rural livelihoods. Such options offer developing nations the opportunity to avoid the high environmental, economic and social costs that heavily engineered water development systems have produced elsewhere."

The authors are not expecting a quick fix, arguing that if climate negotiations are any guide, "a generational timeframe may be necessary to stimulate sufficient political willpower to address the global river health challenge."

Meanwhile, the majority of people on the planet and countless freshwater species remain living on the edge.

Vörösmarty *et al.* *Nature* 467: 555–561, doi:10.1038/nature09440.
www.riverthreat.net

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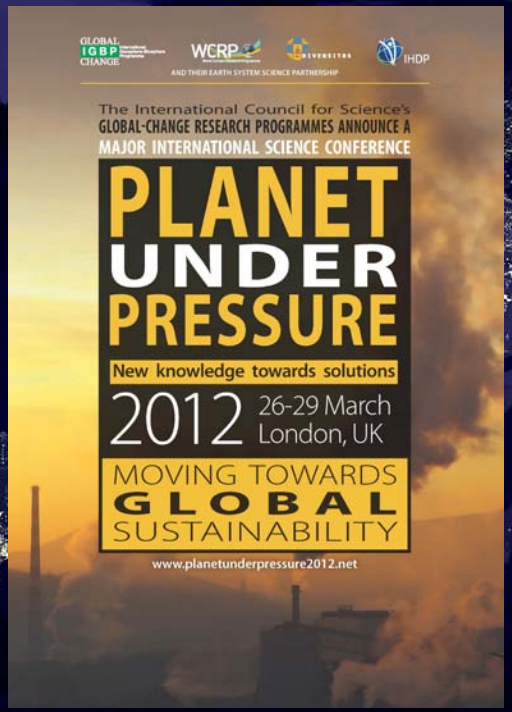
Science for a sustainable planet

Open Science Conference 2012

Chief Scientific Advisor: Elinor Ostrom



London, 26-29 March 2012

WCRP World Climate Research Programme

IHDP

DIVERSITAS an international programme of biodiversity science

Earth System Science Partnership

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