

Developing a New Vision and Strategic Framework for Earth System Research

Overarching Goal:

To engage the scientific community to explore options and propose steps to implement a holistic strategy for Earth system research. This strategy will both encourage scientific innovation and address policy needs.

The proposed consultation process to develop this strategy should have a major and far-reaching influence on the future of Earth system¹ research for the next decade and beyond. It will be spearheaded by the International Council for Science (ICSU) in cooperation with the International Social Science Council (ISSC) and will have significant implications for all stakeholders with an interest in conducting, supporting, or using science in this field.

Background

Twenty eight years after the creation of the first global environmental change programme, there is a realization that the planet is in a ‘no-analogue’ state. While there has been much progress on understanding the complexity and vulnerability of the Earth system, there is the growing recognition that research needs to be translated into action. Science is urgently needed to address how complex social-ecological interactions play out across scales—impacting the Earth system and subsequently affecting local livelihood conditions for all humankind. There are three billion people in urgent need of improved social and economic development, and the global population is expected to increase by another three billion by 2050—on a planet that is increasingly showing signs of limits to its carrying capacity. More than ever before, science is needed to inform societal decisions on mitigation and adaptation to global environmental change. The situation poses new constraints and challenges in the quest for poverty alleviation, development, and, ultimately, global justice.

Scientific research has revealed the urgency of the challenges for humankind (e.g., unforeseen global warming positive feedbacks and significant deterioration in ecosystem services over the last century). This urgency has begun to be recognised politically. For example, implementation of the UN’s Millennium Development Goals by the target date of 2015 requires an integrated scientific approach to the Earth system and its management. There is both an urgency and a unique window of opportunity to engage, promote, and develop Earth system research for the benefit of society.

¹ The Earth system is defined as the unified set of physical, chemical, biological, and social components, processes, and interactions that together determine the state and dynamics of the Earth, including its biota and its human occupants. Earth system research includes global environmental change research.

Process paper

Current status of global environmental change research

There are four major global environmental change programmes that have been the recognised leaders (*Science*, 14 March 2008) in the planning and coordination of international global environmental change research. These are:

1. World climate Research Programme (WCRP)
2. International Geosphere-Biosphere Programme (IGBP)
3. International Human Dimensions Programme (IHDP)
4. DIVERSITAS: An International Programme on Biodiversity Science

In 2001, these programmes created the Earth System Science Partnership (ESSP) to develop common initiatives. The programmes are either sponsored solely by ICSU or co-sponsored with other international organizations. The programmes and the partnership promote, coordinate, and integrate research projects that are funded mainly from national or regional funding sources. With a total annual budget of only ~€7 million, the programmes have a disproportionate influence on the world-wide investment on global environmental change research (estimated in 1995 by International Group of Funding Agencies for Global Change Research [IGFA] to be nearly €2 billion per year) and have a major impact on regional and national research agendas.

Since 2006, ICSU, together with the co-sponsoring partners and IGFA, has conducted reviews of IHDP, ESSP, IGBP, and WCRP. A review of DIVERSITAS is scheduled for 2010-2011. The recurring message from all the completed reviews—from both within and outside the global environmental change community—is the need to implement a single strategic framework for Earth system research in the near future (by ~2014). The reviews conclude that the current research landscape is complex, confusing, and often leads to inefficient use of human, institutional, and financial resources. This concern is shared by the major agencies funding Earth system research.

In order to succeed, a strategic framework for Earth system research would need to be built upon priorities that have been determined in broad consultation with scientists and other key stakeholders. The programme reviews diverge on how such a framework can be implemented in practice. For example, the ESSP and IGBP reviews differ on the future role of the ESSP. There is now an urgent need to reconcile these differing conclusions and agree upon a common approach.

The way forwards in three steps

In collaboration with key partners, ICSU will lead a broad consultative process to address the decision from the ICSU General Assembly (October 2008) to outline options for an overall framework for Earth system research. The process will have three steps, and is founded on the principle that form should follow function:

- 1) a consultation primarily with, but not limited to, the scientific community to envision a research strategy and priorities for the next decade;
- 2) a consultation on the institutional framework needed to deliver the scientific vision that results from Step 1;
- 3) development of a plan to guide the transition from existing structures to the needed structure.

Process paper

This process is scheduled to conclude by the end of 2010. ICSU enters into the process with no pre-conceived conclusions, and the ultimate goal is to strengthen, galvanize, and focus the entire Earth system research community on the most pressing societal issues.

Scientific Visioning (Step 1)

Scientific visioning will begin with a broad online consultation that feeds a brainstorming meeting to analyze and distill the online contributions into a draft research strategy. Another broad consultation on the draft strategy will follow.

In the initial online consultation, the Earth system research community and the broader stakeholder community will be asked to identify the decadal-scale Earth system research questions that are most relevant to the needs of decision-makers concerned with global environmental change and human well-being. Contributors will also be able to vote questions up or down, thus creating an initial ranking of the major research questions.

Meeting aims

The meeting component of Step 1 will take place 30 September to 1 October 2009. Taking into account the recent reviews of the global environmental change programmes, meeting participants will be asked to **agree upon a preliminary set of research questions that will ultimately benefit society and form the basis of an Earth system research strategy.**

Participants will be expected to

- consider the scope of research questions to be investigated (this will include consideration of the balance between basic scientific questions and societal needs),
- suggest how to finalize the set of research questions using the input from the wider stakeholder community, and
- consider how to distill the research questions into a preliminary research strategy. The participants are not being asked to propose the institutional framework to support the research strategy: this is for Step 2.

Meeting Participants

Participants will be carefully selected, after consultation, to include current and future scientific leaders and innovators. The overall balance of participants will be as follows: meeting chair; a representative of each of the global environmental change programmes plus ESSP, as chosen by these bodies; review chairs, funders; experienced global environmental change scientists; science policy experts; and early career Earth system scientists (15-20). There will be roughly four representatives for each of the listed sectors unless indicated otherwise. With the ICSU planning team, the total number of participants is expected to be about 50.

The expertise of the participants will span the natural and social sciences. In general, individuals who have interdisciplinary expertise will be sought. Having a diversity of perspectives, including those from

17 June 2009

Process paper

developing countries, is highly important, as is the participation of early career researchers who are expected to be key players in shaping Earth system research over the next 20-plus years.

New Institutional Framework (Step 2)

With the initial research strategy and community's feedback on it from Step 1 as input, Step 2 will examine options for institutional arrangements to support the research strategy. After consulting broadly on structural questions, ICSU will invite the co-sponsors of major global environmental change programmes (IOC, ISSC, IUBS, SCOPE, UNESCO, UNU, WMO), the four global environmental change programmes themselves, ESSP, funding agencies, and other organizations to a meeting in May 2010 to discuss the needed international framework to facilitate the new Earth system research strategy. The participation of these key partners will ensure that the proposed approach will be beneficial to the broad international community.

The institutional framework should take into account the context in which the global environmental change programmes and the ESSP operate, including the connections to relevant bodies (e.g., stakeholders, research initiatives, conventions/assessment processes). In addition, the following questions should be addressed:

- How should the priorities be converted into action?
- How to determine the balance between “top down” and “bottom up” approaches?
- How to interact with stakeholders?
- In terms of keeping the research strategy relevant and up to date: how should a participatory prioritization process to evaluate the research questions work, including how often should priorities be re-evaluated?

Transitioning (Step 3)

The goal of this final step is to decide on how to implement the transition from the existing structures to the new institutional framework. As with the other steps in the process, information will be gathered from the wider community on the pros and cons of possible transition pathways. At a final meeting in late 2010, agreement will be sought on the optimal transition pathway and its associated timetable. The transition process will need to be transparent and should galvanize the Earth system research community. Ideally, timelines of existing programmes and projects should dovetail into the new structure to reduce disruption. Efforts will also be made on the institutional side to make the transition as smooth and efficient as possible.

Annex

Timetable

2008	
October	Decision of the ICSU General Assembly to “to note that CSPR [Committee on Scientific Planning and Review] is planning to organize a consultation, including a high-level meeting, with relevant partners to outline options for an overall framework for global environmental change research and its policy relevance, once the reviews of IGBP and WCRP are completed”.
2009	
February	Completion of the IGBP and WCRP reviews; first CSPR discussion on the scientific visioning meeting
March	Dialog with the co-sponsors and global environmental change programmes (including ESSP)
15 July	Activation of online consultation on Earth system research questions
15 August	Deadline for submission to the online consultation
30 September – 1 October	Scientific visioning meeting (Step 1)
2 weeks after the scientific visioning meeting	Circulate the outcomes of the scientific visioning meeting to the participants and finalization of the report
November-December	Consultation period with the relevant partners to gather perspectives on the draft research strategy from Step 1.
2010	
Jan-Feb.	Consultation period with the relevant partners on ideas for the structural framework to be discussed at the Step 2 meeting. Feedback on draft research strategy organized for Step 2.
May	Meeting to examine the needed structure that will invigorate and facilitate the new Earth system research strategy (Step 2).
Second half of 2010	A meeting to determine how to transition from existing structures to the needed structure (Step 3).

Acronyms

CSPR	Committee on Scientific Planning and Review (ICSU)
DIVERSITAS	An international programme of biodiversity science
EB	Executive Board
ESSP	Earth System Science Partnership
ICSU	International Council for Science
IGBP	International Geosphere-Biosphere Programme
IGFA	International Group of Funding Agencies for Global Change Research
IHDP	International Human Dimensions Programme on Global Environmental Change
IOC	Intergovernmental Oceanographic Commission
ISSC	International Social Science Council
IUBS	International Union of Biological Sciences
SCOPE	Scientific Committee on Problems of the Environment
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNU	United Nations University
WCRP	World Climate Research Programme
WMO	World Meteorological Organization