

Earth System Research for Global Sustainability (ESRGS): A New 10-Year Research Initiative

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The pace and magnitude of human-induced global change is currently beyond human control and is manifest in increasingly dangerous threats to human societies and human well-being. Decision-makers and citizens have an urgent need for knowledge and solutions that will enable effective responses to these threats and that will provide the basis for achieving sustainable development goals. The sheer scale of threats and needs mean that depending on opportunistic and ad hoc measures alone will not suffice.

Therefore, just as the scientific community established the global environmental change (GEC) research programmes 30 years ago in a revolutionary effort to further our grasp of the earth system, ICSU, ISSC and partners now propose an effort that is no less revolutionary: an innovative 10-year Initiative on Earth System Research for Global Sustainability (ESRGS), structured as a cutting-edge network encompassing the best of all relevant scientific disciplines, and which is highly integrative, flexible and responsive.

The goals of the Initiative are to:

- Deliver at global and regional scales the knowledge that societies need to effectively respond to global change while meeting economic and social goals;
- Coordinate and focus international scientific research to address the “Grand Challenges in Global Sustainability;”¹
- Engage a new generation of researchers in the social, economic, natural, health, and engineering sciences in global sustainability research.

Many building blocks would come from the existing GEC landscape; but they will need to be organized in fundamentally new ways to address new research priorities. The Initiative will inspire and enlist the best researchers, be they anthropologists or geophysicists, northern or

¹ There are five interlinked Grand Challenges in all: 1. Forecasting, 2. Observing, 3. Confining, 4. Responding, and 5. Innovating.

southern, young or veteran. And it will mobilize diverse teams quickly and strategically to tackle emerging challenges and deliver solutions at the local, regional and global scale.

Why a New Initiative?

The establishment of the global environmental change research programmes thirty years ago represented a revolutionary response by the scientific community to the need for international coordination of research in order to understand the functioning of the earth system. The Initiative proposed here is no less revolutionary. The scientific community must now deliver the knowledge that will enable countries to meet needs for sustainable development, poverty alleviation and environmental protection in the face of global change. While deepening our understanding of the earth system and of human impacts, the scientific community must now build the capacity to deliver solutions to pressing sustainability challenges at regional scales. It must attract the brightest young scientists, particularly in developing countries, to tackle compelling challenges associated with global sustainability. It must significantly expand the involvement of social scientists and economists in the grand challenge research agenda. It must increasingly adopt research approaches that actively involve stakeholders and decision-makers in the process of defining and carrying out research. And it must effectively deliver end-to-end environmental services.

This past June, when ICSU convened a two-day meeting with the GEC programme sponsors, funders and other key parties, visions for the future shape of global sustainability research sometimes varied. Yet one sentiment united the room: ***business as usual is not an option.*** Current global research arrangements are unable to adequately meet these needs. They do not address the full range of global sustainability research challenges, particularly with regards to research on policy, institutional and behavioral responses to global change. They do not adequately address the needs for regional and decadal prediction of global change; or include a sufficient focus on social science, economic, and transdisciplinary research. And, they do not adequately engage younger scientists or take full advantage of the potential of networked organizational arrangements.

Initiative Characteristics

The Initiative will have the following core characteristics:

Focus on global sustainability research. The Initiative will mobilize the scientific community to deliver the knowledge that societies need at global and regional scales to effectively respond to global change while meeting economic and social goals. This would lead to improved integration of scientific disciplines and organizational structure.

Cutting-edge network structure. The progress that has been made on global change research over the last three decades was due in no small part to the effective use of coordinated research networks. In these “first generation” networks, relatively small coordinating secretariats, guided by scientific steering committees, served to identify research priorities and facilitate the involvement of scientists and the support of national and regional funders for that work. This Initiative will require “second generation” research networks. Some of the features of this network would be:

- Cutting edge knowledge management system;
- Capability of identifying network-wide research priorities and fostering strategic intensity to ensure that those priorities are addressed, and the solutions delivered in a timely fashion;
- Possesses the nimbleness and flexibility to adapt as the challenges evolve;
- Built around bias for innovation at all points in the network to ensure a constant flow of new ideas and talent;
- Designed to mobilize the network to support needs of regional nodes while also mobilizing regional nodes to address global questions;
- Distributed network management and coordination arrangements.

Built around strong regional nodes. Strong regional research nodes that can more effectively identify and respond to needs and priorities of decision-makers at regional and national scales. At the same time, regional research and analysis is increasingly needed to understand Earth system functions, human impacts, and potential responses. A strong regional research presence also facilitates the involvement of younger scientists and helps to build research capacity.

Active engagement with decision-makers. Mechanisms already exist through which the global change scientific community can interact with decision-makers at the global scale. These include the Intergovernmental Panel on Climate Change and the new Intergovernmental Platform on Biodiversity and Ecosystem Services. Through these mechanisms, policy-makers are able to identify their highest priority needs and the scientific community is able to assess the state of knowledge bearing on those needs. These mechanisms also help to reveal policy relevant gaps in research and knowledge and consequently they have helped the global change research and funding community set priorities.

A critical need now exists for similar arrangements to better facilitate science-policy interactions at regional scales. Information provided at regional scales can better inform the key regional and national decisions that will ultimately determine how effective societies are in responding to global change. The Initiative will thus place significant emphasis on either

utilizing existing mechanisms for science-policy interactions (e.g., in Europe) or creating new mechanisms to engage with decision-makers where such mechanisms do not exist.

Actively engage the full range of disciplines. Social sciences have long been a component of Earth system research, but tackling the grand challenges for global sustainability research requires a stronger involvement and greater integration of the social sciences, economics, health sciences, engineering and humanities, along with the natural sciences. The goal of expanding the involvement of the social sciences in global change research has been difficult to achieve. We believe that the strongly regional and networked structure of this Initiative combined with the focus on research aimed at understanding how to achieve sustainability in the context of global change will provide a transformative opportunity for more active engagement of the social sciences, economics and health sciences in particular. In designing the Initiative, we will identify active steps that could be taken to ‘grow’ the involvement of these disciplines in the Initiative through time.

Actively engage young scientists. The GEC research programmes have been successful over the past three decades because of the caliber of young scientists that became engaged in the programmes when they were established. These research challenges were seen as cutting edge research opportunities around which young scientists could build their careers. Based on our experience of involving young scientists in developing the Grand Challenges for Global Sustainability Research, we believe that the set of new research priorities that more directly address the sustainable development agenda provides a similar opportunity to engage the brightest young scientific talent. To succeed, the Initiative must focus on exciting research questions, must be open to “bottom up” innovation in research directions, and must proactively ensure that governance and decision-making in the Initiative actively incorporates both younger and more senior scientists.

Creating the ESRGS

Building the overarching structure

At the June 2010 meeting of sponsors, funders, GEC programme chairs and key partners, many participants shared a belief that even a reform of the existing Earth System Science Partnership (ESSP) would not be able to effectively guide the initiative. There needs to be a new, overarching structure with the authority and resources that the ESSP never had, and which would be crucial for nudging the GEC community towards a more integrated research.

It is proposed to create a new Steering Committee whose tasks are to oversee the creation of the initiative, and take the lead on the initiative’s vision, strategy, fund-raising, and relationships with partners and stakeholders, as well as to provide scientific guidance to the entire Initiative. This Committee will act as an interim governing body to the new initiative and

should be appointed for 18 months to lead its creation and design, and to explore options for its future governance structure. During the 18 months, this group would decide on governance options, explore funding options, obtain the necessary 'high level' commitments from governments, and propose the final Board structure and composition. After the 18 months design period, the Committee would transition into the full board, to govern and implement the initiative. In order to ensure continuity, some of the Committee members may be asked to stay on in the new governance structure.

This Committee will have high level representation from all the main stakeholders including researchers, funders, industry, and other stakeholder groups. The membership of this Committee may look like the following:

1. *Current core programme sponsors*
 - International Council for Science (ICSU) and International Social Science Council (ISSC), and possibly other UN organizations.
2. *Research donors*
 - Representatives of the Belmont Forum and the International Forum of Research Donors (IFORD)
3. *Scientists (6)*
 - Internationally renowned scientists, including at least one early career scientist. The set of scientists will have to have a fair balance with regards to region, gender and scientific background/discipline.
 - Representation of the existing GEC programmes, e.g. via inclusion of the chair of the ESSP.
4. *Users of global sustainability information and knowledge*
 - Individuals with experience at the interface of global change research and policy. This should include people working at global, regional and national scales.
5. *Representatives of civil society and business*
 - This would include representatives from industry, NGOs, and could include other distinguished individuals (e.g., a retired government leader, etc.)

Note that current core programme sponsors may sit on the Committee in ex-officio capacity. Collectively, the set of individuals selected for the Steering Committee (and ultimately for the governing Board) would provide outstanding substantive guidance and bring a set of relationships that could be mobilized in support of the initiative. More specifically, the set of individuals would meet the following criteria:

- World renowned scientific leaders.

- Among the non-scientists, individuals with a strong affinity with science and with the potential use of science in decision-making.
- Individuals with a strong commitment and engagement to both environmental and social concerns.
- Individuals capable of interacting and engaging across existing GEC Programmes and fora.
- Individuals with direct experience and knowledge of political decision-making around environmental issues at the highest levels.
- Individuals who can help open doors for possible core funding and research funding.
- Individuals with expertise in building and governing complex network-based institutions.
- Individuals with experience in building scientific capacities at individual, organizational and systemic levels.
- Appropriate gender and regional balance.

Integrating existing GEC programmes

Although integrated research is already happening in the GEC programmes and outside of institutions and networks contributing to the GEC programmes, these scattered efforts do not constitute a concerted, coordinated global effort. In the absence of a global agenda, research efforts in many countries continue to be left out. The Initiative will thus integrate the current GEC programmes, when necessary and feasible. While there is not yet a consensus for deep integration within the GEC community, there is strong and growing recognition that more effective integration is necessary.

Designing and Creating the Initiative

Once the Steering Committee is in place, it will oversee the development and early implementation of the Initiative. The design of a global interdisciplinary research network such as that proposed here will require an intensive design phase that must draw on the expertise of the scientists who will be involved in the research, but equally importantly must draw on the deep knowledge and expertise that now exists regarding network design and knowledge management. We anticipate the following steps:

1. Engage organizational design experts. As its first task, the Steering Committee will issue an RFP to retain a firm with extensive experience in organizational and network design to 'staff' the design process.

2. Initiate a Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis of existing GEC research. Using the Grand Challenges in Global Sustainability as the framework, analyze success of and gaps in the existing research activities at both global and regional scales and gaps in capacity to carry out the necessary research.
3. Explore the greater integration of GEC programmes. One possibility would be that the Steering Committee will successively replace the current ESSP when it starts. Supported by the outcomes of the SWOT analysis, it will carry out discussion with the GEC programmes regarding their integration into the new structure.
4. Assemble information on obvious regional 'nodes' for the network. Dialogs will be carried out with those institutions/organizations in order to identify a set of candidate nodes that could fill gaps in the network.
5. Explore alternative options for the governance, funding, and priority setting for the network (see Figure 1.). The Steering Committee has a life time of 18 months, after which it will be replaced with a more permanent governance structure.
6. Explore options for knowledge management systems.
7. Develop a detailed research plan for the first three years of the Initiative. Based on the Grand Challenges document, develop a much more concrete and specific action plan. As a first step in this effort, a small number of priority areas/directions must be established.
8. Co-design and coordinate an implementation plan. An open call should be issued to scientific community including those who are currently engaged in GEC research and those who are willing and able to contribute to the needs of the action plan. This includes the identification of organizations/institutions that will be responsible for components of the research, the funding needed, and the outputs anticipated.
9. Develop a formal relationship among the relevant network nodes that will be promoting and/or carrying out the research and a funding plan for those nodes and for the Initiative management.
10. Reach out to potential partners and user. As an example, the UN High Level Panel on Global Sustainability would be one of such groups.

Launching the Initiative

The 2012 "Planet Under Pressure" conference would provide a useful opportunity to launch the initiative.

Figure 1. Network Design Models (Source: McKinsey & Co.)

| | Web | Enabled network | Loose federation | Tight federation | Single org |
|--|---|--|---|---|---|
| Governance | <ul style="list-style-type: none"> No joint governance | <ul style="list-style-type: none"> Minimal joint governance | <ul style="list-style-type: none"> Limited joint governance, limited if any shared services | <ul style="list-style-type: none"> Strong shared governance, and targeted shared services | <ul style="list-style-type: none"> Single entity, centralized governance and decision making |
| Shared processes & infrastructure | <ul style="list-style-type: none"> Ad hoc knowledge and resource sharing | <ul style="list-style-type: none"> Facilitated knowledge exchange and collaboration on selected issues | <ul style="list-style-type: none"> Some shared infrastructure; facilitated knowledge exchange | <ul style="list-style-type: none"> Significant shared infrastructure and knowledge sharing | <ul style="list-style-type: none"> Majority of processes & infrastructure are shared |
| Role of the center | <ul style="list-style-type: none"> N/A – no core Complete autonomy of independent organizations | <ul style="list-style-type: none"> Center or "lead node" facilitates collaboration among autonomous organizations | <ul style="list-style-type: none"> Center coordinates key issues on behalf of field Strong local autonomy | <ul style="list-style-type: none"> Center facilitates high level strategic policy Local flexibility in delivery | <ul style="list-style-type: none"> Center leads/ supports strategy development (with input from field) |
| Examples | <ul style="list-style-type: none"> Linux | <ul style="list-style-type: none"> Global Fund ICBL WWF | <ul style="list-style-type: none"> GAVI Visa (pre-reorg) | <ul style="list-style-type: none"> Amnesty International | <ul style="list-style-type: none"> CI Ashoka |