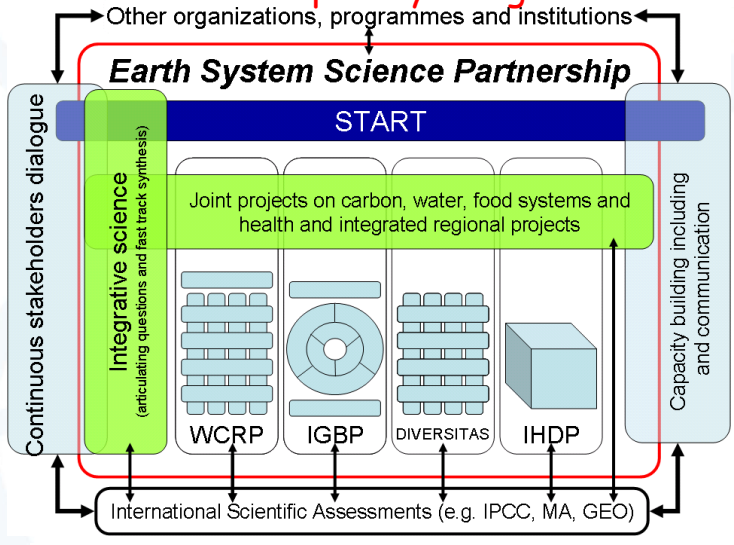
GEC Research

WCRP (established in 1980) climate
IGBP (1987-) geosphere biosphere processes
IHDP (1996-) human dimensions
DIVERSITAS (2002-) biodiversity

Earth System Science Partnership (2001)

Earth System Science Partnership:
Towards transdisciplinary integrative science



Synthesis of the Reviews

On the future of the ESSP, the ESSP and the IGBP reviews differed on the way forward.

"There is a clear need for an internationally coordinated and holistic approach to Earth system science that integrates natural and social sciences from regional to the global scale. In principle, the ESSP should be able to assume this role." (*ESSP review*)

"Further detailed examination of the role and need for ESSP is required" (*IGBP review*)

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Synthesis of the Reviews

Common recommendations

- Priority setting
- Effectiveness
- Integrated research framework

"The vision should provide a framework extending 10 years into the future and be consistent with the overall evolution of GEC research" - IGBP Review, recommendation 1

"WCRP, in partnership with other global environmental change programmes, should develop a framework for future joint research operation" - WCRP Review, recommendation 10

"Under a flagship model, all GEC programmes share a common vision." –ESSP Review p. 31

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Decision of the 29th GA of ICSU (Maputo, October 2008)

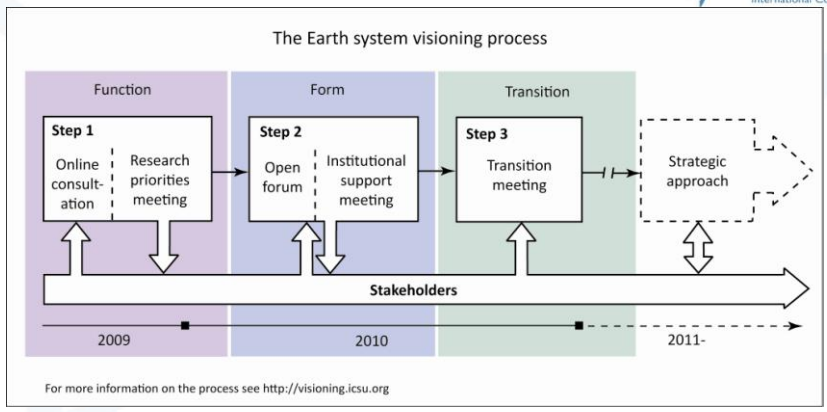
"to note that CSPR is planning to organize a consultation, including a high-level meeting, with relevant partners to outline options for an overall framework for global environmental change research and its policy relevance, once the reviews of IGBP and WCRP are completed."

EARTH SYSTEM VISIONING CONSULTATION

Visioning Sustainability Research

Task team: *Johan Rockström (Chair)*, Heide Hackmann, Elinor Ostrom, Kari Raivio, Walt Reid (past Chair), Hans Joachim (John) Schellnhuber, Anne Whyte

Three Step Process



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

http://www.icsu-visioning.org/

Overview

- **7,227 "unique" visitors from 133 countries** (unique = different IP addresses, excludes internet "bots")
- **1,016 registered users** from **85 countries**
- **323 research questions** posted

Meeting to distil the research questions

- Early career scientist meeting [29 Sept]
- Visioning Earth system research meeting [30 Sept – 1 Oct, 2009]
  - Early career scientists & senior scientists
  - Science-policy experts
  - Funders
  - GEC programs
  - ICSU and ISSC
- Discussion focused on the research priorities

Outcome: "Grand Challenges in Global Sustainability Research: A Systems Approach to Research Priorities for the Decade"

Criteria for selection

- Scientific importance
- Relevance to decision-makers
- Broad support
- Global coordination
- Leverage

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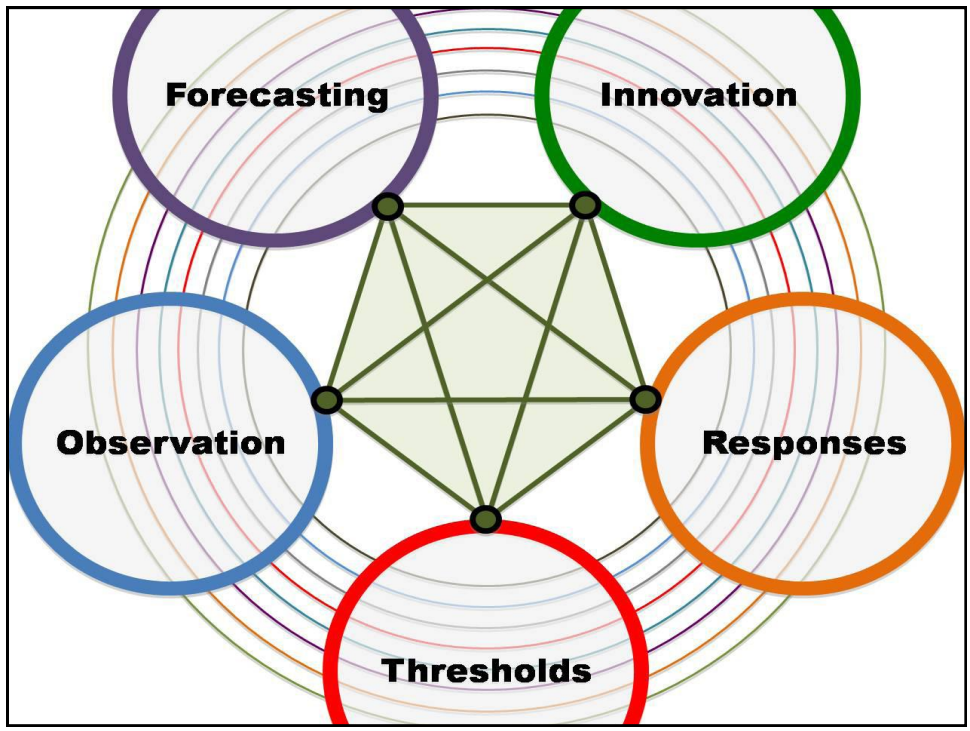

Draft Grand Challenges

Challenge #1 (Forecasting): Improve the usefulness of forecasts of future environmental conditions and their consequences for people.

Challenge #2 (Observation): Develop the observation systems needed to manage global and regional environmental change.

Challenge #3 (Thresholds): Determine how to anticipate, avoid and adapt to abrupt global environmental change.

Challenge #4 (Responses): Determine what institutional, economic, and behavioural changes can enable effective steps toward global sustainability.

Challenge #5 (Innovation): Encourage innovation (coupled with sound mechanisms for evaluation) in developing technological, policy, and social responses to achieve global sustainability.

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Challenge #3: Determine how to anticipate, avoid and adapt to abrupt global environmental change.

3.1. Which aspects of the coupled social-environmental system pose significant risks of runaway dynamics?

3.2. How can we identify, analyze and track our proximity to thresholds and discontinuities in coupled social-environmental systems? When can thresholds not be determined?

3.3. What strategies for avoidance, adaptation and transformation are effective for coping with abrupt changes, including massive cascading environmental shocks?

3.4. How can the need to curb global environmental change be integrated with the demands of other inter-connected global policy challenges, particularly those related to poverty, conflict, justice and human security?

3.5. How can improved scientific knowledge of the risks of global change and options for response most effectively catalyze and support appropriate actions by citizens and decision-makers?

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Expected Deliverables

- Validated models of human-environment systems at global to local scales. (Challenge #1 and #2)
- Prioritized needs for Earth system observations of physical, chemical, biological and social variables and the design features of a system for delivering that information. (Challenge #2)
- A framework for forecasting the likelihood, location, drivers, severity and risk of abrupt or non-linear changes associated with global environmental change. (Challenge #3)
- Designs for practices and institutions that can take effective action in response to signals of impending dangerous changes or can be resilient to those changes. (Challenge #3 and #4)
- Increased human and social capital to create and use the knowledge base for managing human-environment systems. (Challenge #4)
- Policies and practices that accelerate social and technological innovation relevant to the needs of managing global change. (Challenge #5)
- Models for exploring the costs, benefits and risks of alternative geo-engineering strategies. (Challenge #5)

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INSTITUTIONAL FRAMEWORK MEETING

Goal:
Through a consultative visioning process develop a new institutional framework with the ability to successfully address the Grand Challenges in global sustainability research. By institutional framework we mean both the organizations involved and the institutions and operational rules which govern their relationships and capacity to work together. The framework should address "core elements": scientific integration, funding, governance, human capacity, policy impact and communication. Several models of institutional frameworks will be proposed for consideration.

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Institutional Framework for Global Sustainability Research - Meeting

Goal: to draft a proposal outlining the Institutional Framework to address the Grand Challenges in Global Sustainability Research.

Methodology: Propose several institutional framework models. Plus, specific examples of how to implement several priority research questions.

Approach: Consultative (Web survey; Discussion with funders, the GEC and wider ICSU community and beyond; Open Forum, Meeting)

Invitees: Co-Sponsors [ICSU, ISSC, IOC, IUBS, SCOPE, UNESCO, UNU, WMO + UNEP], Funders, GEC, institutional experts, …

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KEY CRITERIA FOR INSTITUTIONAL FRAMEWORK

- **Facilitate integrated science**
- **Ensure effective policy impact and communication**
- **Support stakeholder engagement, trans-disciplinary research and coproduction of knowledge**
- **Promote sufficient long-term research funding**
- **Foster collaborative research networks that are truly global in scope**

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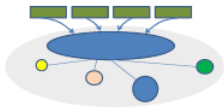
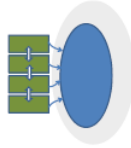
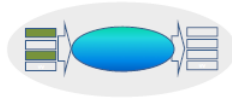
EXAMPLES OF POSSIBLE INSTITUTIONAL STRUCTURES

ALLIANCE WITH GLOBAL NODES	INTEGRATION WITH FLAGSHIP INITIATIVE	DEEP INTEGRATION	MERGER
			

Key: Green – Elements of current GEC programs that remain intact; white – strategic initiatives; blue oval – core structure for leadership, execution, resource allocation, capacity building and science-policy bridging of new program; grey oval – the entire global sustainability research program

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TO NOTE ABOUT THE VISIONING PROCESS

- Triggered by expert reviews of current programs
- Energized by the urgency of global environmental change
- Science primary, structures secondary
- Honest attempt to engage the scientific community
- Open, interactive, iterative process
- The Grand Challenges must be taken as a whole
- The Grand Challenges are not a research program

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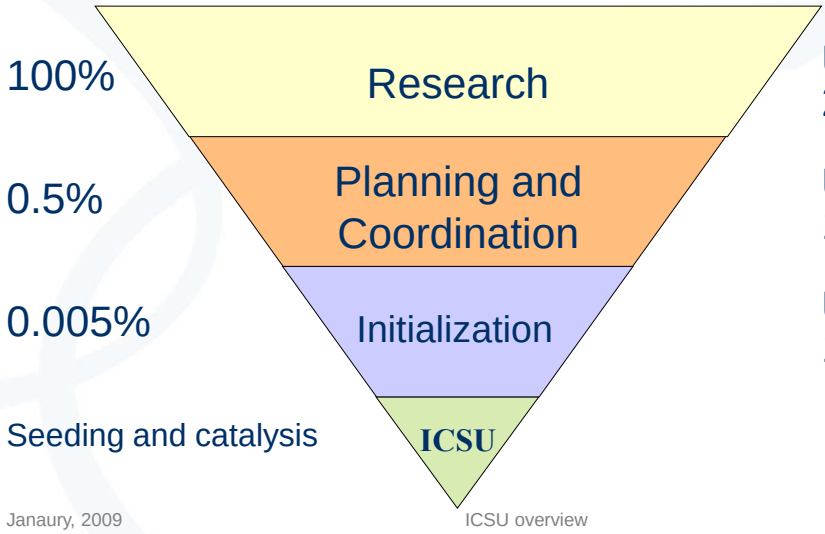
ICSU's role: the Global Change example



Science

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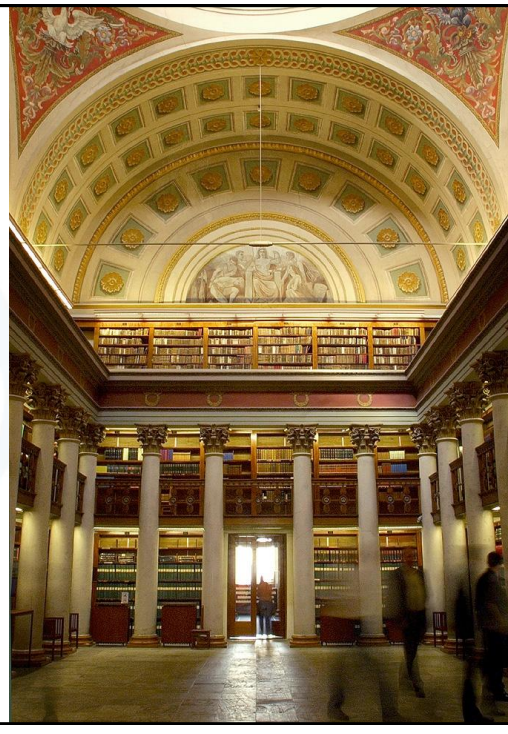

ICSU
International Council for Science