



Unpackaging Human Enterprise And Communicating With The Public

Can Science Save us if Science has Outpaced the Governmental Capacity to Respond to What's Happening to the Planet, or has What's Happening to Governments Outpaced Science?

This 11-year transdisciplinary study draws on the physical and social sciences and humanities in response to the overwhelming scientific evidence that people are changing the planet.

Based upon the empirical evidence, if we wait for a response from global leaders and policy makers it will be too late. Governments must act. Reducing carbon dioxide (CO₂) will require legislation, but this will not be enough to reduce our transgression of planetary boundaries which places humanity at grave risk.

There are also multiple social tipping points that urgently need to be addressed, including global changes in financial regulation. Immediate action must be taken to stop speculative trading in vital commodities such as oil and food which causes extreme volatility in the market. Gambling on the price of food is catastrophic for vulnerable populations, counted in the billions, for whom the rapid rise in the price of food is a matter of life or death. When food prices rise rapidly there are cascading effects, including a rise in social unrest and armed conflict, public health emergencies, the internal displacement of people, and massive migrations, all of which lead to further destruction of ecosystems, accelerating climate change, and diminishing the essential conditions for human life as we know it.

The call from the international scientific community is for scientists to "deliver knowledge", "build the capacity to deliver solutions", "effectively deliver end-to-end environmental services", "to provide new insights and solutions", "to solve real world problems", and most recently to deliver "actionable science".

This begs the question: *Can science save us if science has outpaced the governmental capacity to respond to what's happening to the planet, or has what's happening to governments outpaced science?* It is a version of the question Hannah Arendt first asked, and one of the most prescient questions scientists are attempting to address.

Can we in this time of great danger and uncertainty, undertake global initiatives in response to climate change and ecological destruction of the planet without considering the *super complexity* of the *non-linear, dynamic interrelationships* between the global economic crisis, extreme poverty and wealth, armed conflict, and public health emergencies? Is it possible to address any of these interrelated catastrophes without also taking into consideration the *great acceleration* in the industrialization of the planet? Or, to act without recognizing that a rapid increase the number of people from 7 billion to more than 9 billion by the middle of this century will lead to an unprecedented increase in natural and human disasters? Will we adapt? Will human societies be transformed? Or, increasingly become sites of civil unrest and armed conflict?

In response to the uncertainty about the future, many scientists are repositioning themselves, moving from highly specialized, disciplinary research to interdisciplinary research which creates opportunities for researchers to address the complexity of the Earth System changes taking place. Still other scientists are taking a more radical stance and engaging in transdisciplinary scholarship that brings together the physical and social sciences in new and dynamic ways. Now researchers in the physical scientists are re-negotiating their role in the society by asking:

How can timely actions be undertaken at unprecedented and multiple geographical and geopolitical scales, where the nature and scale of the issues involved means that the actors have widely differing—and—disconnected values, ethics, emotions, spiritual beliefs, levels of trust, interests and power?

The question comes from the International Council for Science's (ICSU) 2010, Grand Challenges document. It is the question that hides behind the question Can science save us?, the *Question of Questions*, the *QoQ* that has dogged people long before Montaigne. It is the *QoQ* that politicians have abysmally failed to answer, and Earth System Scientists are only just beginning to address.

Such enduring questions are not the forte of Cartesian science. Descartes, Newton, Hobbes, the belief that the physical world and man can be rationally understood through mathematical reasoning and formal argumentation, leaves little room for strong emotions or for the violent and passionate manifestations of human behavior that are constitutive of the *QoQ*. Ideologies, values, and beliefs defy logic and reason and in a world divided into sovereign nations that are parsed into widely differing political, religious, ethnic and racial groups with disconnected values, ethics, emotions, spiritual beliefs, levels of trust, interests and access to power.

The *QoQ* has a long history in the social sciences and humanities, and provides an opportunity for social scientists and scholars to work collaboratively with scientists in the physical sciences.

However, for many social scientists, the pressing problems of today leave little time for such questions. But in the midst of their struggle to respond to the long term misery and degradation in human societies, massive upheavals and seismic shifts in human populations are taking place which could conceivably be one of many indicators of a *step change* in human history. The fallout from the future is happening now. The ways in which we think, conceptualize knowledge, and live our lives is changing fast, but not in ways that support human life on Earth.

The ICSU On-Line Global Visioning Consultation Which took Place in August, 2009, and was a Precursor to the ICSU Visioning Open Forum in Paris in 2010.

In *Science*, July 17, 2009 Walter Reid, Catherine Bréchnignac, and Yuan Tseh Lee write "In the past, a small group of scientists would be charged with determining the most pressing research questions," they explain. "Now, given the urgent need to confront human-induced global environmental change and the imperative to focus our scientific resources, we need to spread the widest possible net to make sure that the world's scientists will be addressing the questions that are the most critical".

1016 scientists from 85 countries registered on the Consultation Visioning site. 323 research questions were posted. An analysis of the questions and responses revealed:

Many of the questions are embedded in ways of thinking – highly evolved disciplinary metatheories parsed into sub areas of specialization, each with signatures of practice so esoteric that only those within the sub-specialty can fully understand the significance, with many ways of knowing only actualized in situ through the actual doing of science.

Many of the questions address problems about the impact of human enterprise on the planet that require economic and political considerations and input from the public, as well as the social and physical sciences.

A few questions address the impact of human-induced change on vulnerable people and communities, but there are very few responses to these questions.

One group of questions calls for changes to take place in the communicative interface between the scientific community, policy makers and the economic drivers of environmental and climate change, but there are few responses and no responses to the seven questions that follow.

1. "What are the main constraints to successful Earth System governance and what are our options for addressing these constraints in a timely, effective and accountable manner?" asks Laszlo Pinter, director, Measurement and Assessment Program, IISD, Organization for Economic Co-operation and Development (OECD). (Q. 84)

The failure to make adequate, or any progress on Earth system issues such as poverty, ecosystem degradation or greenhouse gas emissions are related to society's inability to fully grasp the gravity of the situation," Pinter writes. "We need to understand much more clearly what are the formal and informal barriers and biases in our policy mechanisms, public and private institutions (down to the role and interests of individual decision-maker) that help prolong unsustainable patterns of practices and behaviors."

2. How can the perceived imperative in market-economies for continuous open-ended economic growth, be reconciled with the need from a natural science perspective for the collective human impact on the biophysical Earth system to be stabilized or decreased in order to sustain human well-being indefinitely?" asks Robert Gifford, Department of Psychology, University of Victoria, Canada. (Q. 126)

"The conflict between economic and natural science perspectives addressed by this question is the ultimate driver behind the biophysical Earth System issues that are of concern and have led to the emergence of the idea of Earth System Science," Gifford writes. "Unless the conflict between the socio-economic drivers of national and international policy can be reconciled with biophysical (environmental) drivers of policy, solutions to earth system problems at the whole-system level are doomed to failure. It will take a long time for the two world views to become reconciled into a single workable approach. The sooner the ESS starts addressing the issue the better".

3. "How do we best understand the set of power relations between governments, corporations and civil society in a globalized world that keep us on unsustainable pathways? How do we transform these relations?" asks Kamal Kapadia, Oxford University, Environmental Change Institute (ECI). (Q. 170)

"The key reason why we face so many ecological and human crises is because we are locked into developmental pathways sustained by certain power relations in this world," Kapadia writes. "It is thus imperative to understand these relations in order to know how to tackle and transform them. Obstacles include diverse and conflicting conceptual models in the social sciences on how best to understand the operation of power in a globalized world. Obstacles also include a serious dearth of funding for such research, and an overwhelming importance given to economics amongst the social sciences (which does not address issues of power".

4. "What changes in policies (global to local) and human behavior will most strongly reduce human pressures on the planet's life support systems, and how can the scientific community influence their implementation?" asks F. Stuart Chapin, Professor of Ecology, in the Institute of Arctic Biology at University of Alaska Fairbanks, whose research focuses on impacts of high-latitude climate change on ecosystem services and society. (Q. 246)

"Humanity has perhaps a couple of decades to radically reshape the relationship between society and the biosphere," Chapin states. "This requires research on human perceptions and motivations as well as communications between scientists and society. Very little global change research is focused on these critical issues which will determine whether more basic research on global change will have any impact at all."

The Self-Destruction of the Apparatuses that the Modern World has been Building up on a Planetary Scale

Will we adapt? Will human societies be transformed? Or will we be annihilated by our destruction of the planet? Has the great human project really failed? Unsettling as it may be, no one knows for sure. Practicing ventriloquy, politicians offer the reassurances of lobbyists and funders, while the public relations firms working for multinational corporations convince us that oil is green in the aftermath of BP, and that nuclear power is good in the aftermath of Fukushima. And in this way we are lulled into believing or wanting to believe that they speak the truth, until Sabu Kohso (2011), who was born in Okayama, Japan, shouts at us and shakes us up:

What has been happening in Japan since 3/11/2011 cannot be deemed merely a situation particular to a nation-state in the Far East, but unfortunately a new phase of human history, an opening toward an apocalypse, or a total transformation or both. It is a universal experience in the sense not only of its economic and environmental impact but also of the self-destruction of the apparatuses that the modern world has been building up on a planetary scale.

Many Earth System scientists agree with Kohso. In 2009, Johan Rockström and twenty eight Earth system scientists, including James Hansen and Will Steffen, identify nine planetary boundaries for human life on Earth. "Transgressing one or more planetary boundaries," these scientists write, "may be deleterious or even catastrophic due to the risk of crossing thresholds that will trigger non-linear, abrupt environmental change within continental- to planetary-scale systems". The article is technical but the message is not. Rockström et al. state in the introduction, "We estimate that humanity has already transgressed three planetary boundaries" – 1) Climate Change; 2) Rate of Biodiversity Loss; and 3) Changes to the Global Nitrogen Cycle. They stress, "Planetary boundaries are interdependent, transgressing one may both shift the position of other boundaries or cause them to be transgressed." They write, "There is significant uncertainty surrounding the duration over which boundaries can be transgressed before causing unacceptable environmental change and before triggering feedbacks that may result in crossing thresholds that drastically reduce the ability to return to safe levels".

This transdisciplinary study is an attempt to put humans into the Earth system models, as Steffen encourages us to do, rather than positioning them –us—as an "outside force" perturbing the planet. It begins with an "inside" perspective of Earth system science, which is followed by the *unpackaging of human enterprise* to expose the *unearthing of people* that has taken place in the last four hundred years. The negative consequences of the protection of "invested interests" and the limited piecemeal and mechanistic responses of governments is examined, and is used to support the proposition that it is the inertia of governments, combined with the aggressive competition of geopolitical markets and the greed of global financial institutions, that provide the tipping elements for a step change for the planet and for humanity.

In *Climate Change 2009: Faster Change and More Serious Risks*, Will Steffen (2009) writes about "putting humans into Earth system models". He states, "One of the most challenging research tasks ahead is to couple economic and social dynamics with the biophysical climate system in an interactive way". For Earth system scientists the incompleteness of science without humanity is a huge dilemma. "At present," Steffen writes, "human actions are usually represented as an outside force perturbing the "natural" climate system via a greenhouse emission scenario, or climate is simply represented by a damage function related to temperature embedded in a much more complex economic model. Achieving a balance between the human and biophysical components of a global-scale model has proven difficult".

When people arrive on the scene all complex systems become ambiguous, and models can be thrown off by human activity. Steffen tries to address this when he writes, "In terms of human dynamics, a challenge for future modeling efforts is to capture the complexity of the ways in which societies are responding to climate change and will do so in the future. New approaches aimed at meeting this challenge include massive agent-based modeling, social network theory, game theory, evolutionary psychology and complex systems theory, or some combination of these".

But all of these approaches are inadequate, and none of the social models have the predictive capability of physical models. Just as in science there are no absolutes, in social life nothing is certain. It is the nature of humanity that where there is order there is disorder, and while many social events can be anticipated and explainable, most are unpredictable. At the present time we are not well prepared for extreme weather events, for global economic instability, for the impact of food and water shortages, for public health emergencies, for industrial disasters, for natural disasters, or for the social and political unrest and armed conflict that is often associated with these extreme conditions.

Without the support and backing of the World Superpowers how "timely" will the "actions" be? What chance will scientists have to provide new insights and solutions to solve real world problems if the research is delivered to the U.S. Congress, but rendered ineffective by the irrational ideological gridlock of fractious partisan politics, and the deep associations of politicians with corporate lobbyists who represent the global financial institutions and multinational corporations that have become immensely rich on the backs of the people and at the expense of the planet?

The *unpackaging of human enterprise* that has *unearthed people* will take the efforts of scientists and scholars in the humanities working together to expose the negative consequences of the protection of invested interests by governments, which in turn are compromised by the aggressive competition of geopolitical markets and the greed of the global financial institutions, that provide the tipping elements for a step change for the planet and humanity.

In the spirit of Stephen Toulmin, it is going to take millions of people, of widely differing and disconnected values, ethics, emotions, spiritual beliefs, levels of trust, interest and power, working together in small groups and organizations, to ensure that billions of people do not lose their lives in the struggle to survive.

On June 22, 2010, the International Council for Science (ICSU) held a Visioning Open Forum at UNESCO in Paris

For one day at this Visioning Open Forum, the curtain was drawn back on the workings of Earth system science as researchers from the geo biophysical sciences and a few from the social sciences gathered to talk across paradigms and disciplines about a draft of the Grand Challenges document which frames ICSU's plans for a new ten year Earth system global sustainability research initiative.

Questions were raised about the problems and limitations of interpretations of complex, dynamic, non-linear phenomena that do not take into consideration the artificial institutional divisions the sciences have constructed between the natural and human world.

Counter narratives emerged that reveal different understandings of Earth system science and of how to care for the planet and sustain life on Earth. No one contested the proposition put forth that while dangerous changes are taking place over time, abrupt changes are most dangerous. Cataclysm and cataclysmic were the descriptors used – ratcheting up the language used to describe the increase in concern for the potential for an unprecedented global disaster.

There was talk of the "urgency" being "so daunting" that there is a critical need for the scientific community to restructure to meet the challenges. "The tremendous message," as one scientist put it, "is that under the present institutional structures we will not be able to answer in time the research questions that confront us." "Scale," "focus," and "intensity" were used to describe the work that must be done. Scientists spoke of restructuring governmental agencies, funding agencies, research institutions, universities, and schools to respond in this time of global emergency.

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What these scientists were talking about was how to achieve a total *rethinking on a global scale* of the relationships between the *ecological* and the *social* – quite literally a repositioning of billions of people on the planet through a scientific revolution that even Thomas Kuhn might have found difficult to imagine.

Scientists agreed, as Will Steffen puts it in *Climate Change 2009: Faster change and More Serious Risks*, that "One of the most challenging research tasks ahead is to couple economic and social dynamics with the biophysical climate system in an interactive way", and that "achieving a balance between the human and biophysical components of a global-scale model has proven difficult".

The ISSC joined ICSU in confronting the dilemma of how to integrate the social, cultural, economic and political dynamics of human existence with geo biophysical global change research. Heide Hackmann, the Secretary-General of the Council, who stated that "the integration of the social sciences and humanities is no longer a choice but a necessity" in framing the global challenges that confront Earth system science. She spoke of "creativity and energy" and of "the urgent need to reach out to the broader social science community". She argued that it is "not possible to underestimate the significance" of the social sciences and humanities which can "no longer be left in the margins". She talked of including the social sciences in the "framing process" and of reaching out to the broader communities of the social sciences, "to bring them into full partnership with the natural sciences", and within this context she spoke of "mobilizing social scientists" of "more deep social science" and "more global observation".

Descriptors that were frequently used by presenters and participant included: "the co-creation of new knowledge", "large knowledge gaps in disciplines and between disciplines", "the integration of scientific expertise", "capacity building", "the bidirectional flow of information", and "research as a catalyst for cultural change". Talk focused on "the connections between people doing science and policy makers not working", "international cooperation", "creating social movements", and "deep transformations of societies".

There was talk of the "importance of reaching out to broader communities", the "capacity for international collaboration", and the "use of multiple methodologies", and of the "lacking of mutual respect". "We're all working at the edges of our disciplines," a participant said, "It's not an easy place to be".

The conversation often turned to the inadequacy of communication between scientists and policy makers, and to the ineffectual presentation of the scientific evidence to the general public. "Communication is central," a participant said, "communicating science to the media".

"We need for a clear vision of who the decision makers are," another participant said. "There's an urgent need for policy response".

There was general acknowledgement that the findings of Earth science research will not count for much unless: (1) the communicative practices in the interspace between science and parliamentary and governmental agencies are transformed; and (2) deep transformations in societies are achieved through social and political action.

