Integrated Governance of Disaster Risk and Financial Uncertainties for Sustainable Development

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Context and Motivation

How can we turn the challenge of extreme events into an opportunity for social learning in a sustainability perspective? This is one of the most urgent challenges faced by today's world society as well as its scientific community. The global financial crisis of 2007 and the climate conference in Paris in 2015 illustrate how important the challenge has become in very different fields. At the same time advances in the understanding of disaster risks in socio-ecological systems enable the scientific community to provide methods and tools to face this challenge. It would be irresponsible for scientists to ignore this task.

Key research questions

Preliminary remark: the following questions shall be addressed in view of a variety of empirical cases, but in a particularly systematic way in view of paradigmatic instances of extreme events. They could be the East African drought of 2011, the European heat wave of 2003, the Tohoku earthquake of 2011, and the financial crisis of 2007.

1. How can the insights about how small socio-ecological systems (SES) successfully deal with disaster risks through self-organization be broadened into related insights about large systems up to the global society of the 21st century? This includes the need to enhance the tradition-based early warning systems of many small SES with science-based early warning systems that are well-coupled with emergency management.
2. How can the difference between shocks that destabilize an SES without pushing it out of its current basin of attraction and shocks that lead to different possible basins be understood, and how can this understanding be translated into management and governance practice? This includes the need to complement analyses of tipping points and critical non-linearities in biophysical systems with integrated analyses of multiple equilibria in SES.
3. How can the answers to questions 1 and 2 help to embed the model of absolute individual rationality that has driven partially successful, but unsustainable scientific, technological and economic developments into more diverse forms of rationality adequate for a global sustainability transition? This includes work on new forms of uncertainty representation as well as enhancement of established procedures for cost-benefit analysis in view of extreme events.

Expected methodologies and disciplines involved

The main methodologies are case studies, discourse analysis, data mining, computer simulations, social experiments and action research.

Key disciplines include geography, economics, political science, mathematics, computer science, systems engineering, environmental science and evolutionary biology.

Stakeholders involvement needed

It is crucial to engage with local populations, with government agencies as well as NGOs, and with businesses faced with risks both from global environmental change and from policies aiming at a sustainability transition.

Relevant scale / regions

The topic is relevant at all scales from small regions to large nations to the world as a whole. The global scale is the most important one. Temporal scales range from days (as with earthquakes or financial crises) to generations (as with the transition to a sustainable world that will be able to handle conflicts without large-scale violence and to provide prosperity without large-scale disaster risks).

Expected societal impact

The impact of this research will consist first of all in small marginal improvements of policies and strategies pursued by decision-makers faced with risks of extreme events. Such small improvements can then generate the trust needed for disruptive innovations in the way both decision-makers and the general public presently deal with such risks. Examples for far-reaching innovations fostered by Future Earth research along the lines proposed here include insurance for pilot regions engaging in new energy systems, new forms of intellectual property rights that facilitate the spread of sustainable solutions, incentives for financial operators to shift from pure speculation to investing in sustainable solutions, and many more.