Geophysical Research Abstracts
Vol. 14, EGU2012-8763, 2012
EGU General Assembly 2012

Exploring predictions of safe operating spaces for human water use

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In the Nature article 'A safe operating space for humanity', Rockström et al. (2009) introduce the idea of a safe space for human activities that will not push the planet out of the 'Holocene state'.
Rockström et al. have identified nine earth-system processes and associated thresholds which, if crossed, are expected to generate unacceptable environmental change. Rockström et al. (2009) focus on the scientific prediction of these thresholds. Concerning the use of these boundaries for public policy, these authors limit their efforts to concluding that the evidence so far suggests that, as long as the thresholds are not crossed, humanity has the freedom to pursue long-term social and economic development.
The approach advocated by Rockström et al. (2009) is plagued by two related problems: uncertainty and dynamic complexity (Molden, 2009; Brewer, 2009). The latter problem addresses the reductionist approach of Rockström et al and argues, in opposition, that the limits on each of the nine earth-system processes are co-depended and thus the safe operating space constitutes a single multi-dimensional space that can only be identified holistically. The first problem is that our current scientific knowledge and understanding of the earth system is incomplete and partly contested. A majority of the authors reacting on the global limit concept do however emphasize their relevance as "targets for policy makers". However, the two problems imply that the establishment of predicted global limits as a substantive base for public policy is meaningless. Still, the presence of scientific uncertainty and dynamic complexity and thus the omnipresence of unpredictability need not be used as an excuse to ignore the importance of a substantive grounding of these policies.
In this paper, we argue and show how despite dynamic complexity and irreducible uncertainty, policies can be designed, tested, and shown to be effective in reaching broad social goals related to social and economic development. To this end, we utilize ANEMI (Davies and Simonovic, 2011), a dynamic impact assessment model of the planetary fresh water cycle and related systems (e.g. economy, land use, population, and climate). We assess the dynamics of this model over a broad range of different uncertainties; we identify combinations of uncertainties that produce dynamics that threaten the flourishing of humanity, and use these insights to develop public policies that can counteract these undesirable dynamics.