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Extreme Geohazards: Reducing the Disaster Risk and Increasing Resilience

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Extreme geohazards have the potential to escalate the global sustainability crisis and put us close to the boundaries of the safe operating space for humanity. Exposure of human assets to geohazards has increased dramatically in recent decades, and the sensitivity of the built environment and the embedded socio-economic fabric have changed. We are putting the urban environment, including megacities, in harm's way.

Paradoxically, innovation during recent decades, in particular, urban innovation, has increased the disaster risk and coupled this risk to the sustainability crisis. Only more innovation can reduce disaster risk and lead us out of the sustainability crisis. Extreme geohazards (volcanic eruptions, earthquakes, tsunamis) that occurred regularly throughout the last few millennia mostly did not cause major disasters because population density was low and the built environment was not sprawling into hazardous areas to the same extent as today. Similar extreme events today would cause unparalleled damage on a global scale and could worsen the sustainability crisis. Simulation of these extreme hazards under present conditions can help to assess the disaster risk. The Geohazards Community of Practice of the Group on Earth Observations (GEO) with support from the European Science Foundation is preparing a white paper assessing the contemporary disaster risks associated with extreme geohazards and developing a vision for science and society to engage in deliberations addressing this risk (see http://www.geohazcop.org/projects/extgeowp).

Risk awareness and monitoring is highly uneven across the world, and this creates two kinds of problems. Firstly, potential hazards are much more closely monitored in wealthy countries than in the developing world. But the largest hazards are global in nature, and it is critical to get as much forewarning as possible to develop an effective response. The disasters and near-misses of the past show that adherence to scientific knowledge, particularly during the early warning phase, can reduce disasters. This suggests that a strong global monitoring system for geohazards is needed, not least to support the early detection of extreme hazards. Secondly, low risk awareness combined with poverty, corruption, and a lack of building codes and informed land use management creates the conditions to turn hazards into disasters throughout much of the developing world. Democratizing knowledge about extreme geohazards is very important in order to inform deliberations of disaster risks and community strategies that can reduce the disaster risk by increasing resilience and adaptive capacities without compromising the livelihood of communities.

We use a four-order scheme to define disaster risk outcomes and associated societal processes. This framework can be implemented in the context of deliberative democracy and governance with participation of the community. The current dialog between science and society is not fully capable of supporting deliberative governance and a democratizing of knowledge. Most scientific knowledge is created independent of those who could put it to use, and a transition to co-design and co-development of knowledge involving a broad stakeholder base is necessary to address the disaster risk associated with extreme events. This transition may have the consequence of more responsibility and even liability for science.