Science on Natural Hazards and Environmental Disasters

Statement of the IUGG Commission on Geophysical Risk and Sustainability

Adopted, 7 January 2005
Revised and adopted, 25 January 2010

On 12 January 2010 a large earthquake of magnitude 7 occurred 25-km from the capital city of Port-au-Prince, Haiti. According to the Haitian government, more than 111,000 people died in the earthquake, 194,000 were injured, and 609,000 became homeless[1]. Our hearts go out to those in Haiti who have suffered losses of beloved people and personal property during the earthquake disaster.

Although humans will never be able to prevent the occurrences of natural phenomena entirely, scientists continue to gain a better understanding of the complex mechanisms that cause disasters and are able to deliver their knowledge to disaster management agencies in order to be prepared to cope with such extreme events. It is common knowledge that timely warnings save lives. Haiti was not prepared to cope with the large earthquake. Again the world faces tragedies caused by ignorance and irresponsibility.

The IUGG Commission on Geophysical Risk and Sustainability has revised its Statement issued on the occasion of the Indian Ocean Tsunami Disaster (7 January 2005; http://www.iugg-georisk.org/Statement_Indian_Ocean_Tsunami2004.pdf) and

Recommends that:

1. The countries in and around the Caribbean region set up a Disaster Management Centre in order to monitor the land, ocean and atmosphere in relation to all types of natural hazards. Such Centres should be established in disaster-prone regions where they do not already exist.
2. Multidisciplinary and multinational research programs and research networks on geophysical hazards and risks be developed in all countries prone to natural hazards including those of the Caribbean region and Latin America in order to integrate diverse data streams, to improve understanding of the natural phenomena associated with the disasters, to develop predictive modelling capability, and to generate and to disseminate timely and accurate information needed by decision makers and the public.
3. The International Council of Science, the International Social Science Council and the U.N.-International Strategy for Disaster Reduction sponsored major program “Integrated Research on Disaster Risk” should lead the above action by integrating natural and social scientists, engineers including health experts, administrative practitioners and decision makers to ensure the integrity of the process and put the scientific findings into practice through knowledge based decision making.

The IUGG Commission on Geophysical Risk and Sustainability *considers that*:

- Information alone cannot save human lives. Management procedures, public preparedness, hazards maps, evacuation routes and shelters are needed prior to any natural disaster. Research on temporal changes of vulnerability to natural

[1] CNN, 23 January 2010 (http://www.cnn.com/2010/WORLD/americas/01/23/haiti.earthquake/index.html)

disasters is essential to enable periodic updates and critical revision to natural hazard and risk maps.

- Self help and mutual help of the people led by acknowledged local leaders at local disaster sites are the most effective means (especially at the initial stage of the disaster) to prevent the growth of disaster losses. Capacity development towards such community defence is necessary, together with capacity to utilize available knowledge and technologies.
- Co-ordination of observation systems and data will reduce losses due to natural disasters. Extensive use of satellite data as well as airplane laser scanning data is an important component of disaster management.
- After a disaster occurs, rescue agencies and civil defence managers need immediate quantitative estimates of the extent of the disaster and losses. Recent technological and communication advances are improving the speed and accuracy of loss estimates immediately after natural disasters (e.g. earthquakes, tsunamis, etc.) so that injured people may be rescued more efficiently. In many developing countries, urbanization and population are increasing at an unprecedented pace. Therefore, it is necessary for loss estimation to include up-to-date information on the present population as well as the current quality of buildings and their soil properties.
- Scientists can and should help to save human lives by providing governmental institutions with predictions (as accurate as possible) on natural disasters with a good lead-time. Reduction of predictive uncertainty is the most important scientific challenge in natural hazards mitigation.
- Before any natural extreme event, international commissions of scientific experts should make available all reliable knowledge related to such events to the regional disaster management authorities (national and/or international). In addition, the disaster management authorities should request reliable data and information on natural hazards and risks, from national and international commissions of scientific experts.
- After a natural disaster occurs,
    1. foreign scientists should establish contacts with the scientists of the region of the disaster and provide assistance in evaluating the occurrences of subsequent events (large aftershocks, landslides, tsunamis etc). The lessons and experiences accumulated during such cooperative research will help when the next disaster occurs.
    2. space agencies should consider the possibilities for immediate release of the data related to a natural disaster that recently occurred to scientists and disaster agencies.
    3. the government of the country of the natural disaster should issue visas for foreign scientists and engineers without delay to allow them to access the region of the disaster and to assist the local scientists to undertake urgent assessment of the scale of the disaster and its possible aftermaths.

Furthermore, the IUGG Commission on Geophysical Risk and Sustainability *considers that*:

As the global population continues to increase, our vulnerability to natural disasters is magnified with each passing year. The first decade of the 21st century has been marked by a significant number of natural disasters and humanitarian tragedies, such as earthquakes (e.g. Aceh-Sumatra in 2004, Kashmir in 2005, Sichuan in 2008, and now Haiti in 2010) accompanied by landslides (China in 2008) or tsunami (Indian Ocean in 2004, killed 230,000); floods (e.g. West and Central Europe in 2002; China in 2007; Taiwan and Philippines in 2009); cyclones (e.g. Katrina in 2005; Nargis in 2008); and

several others. The tragic event in Haiti has illustrated again the vulnerability of humankind to natural threats. Scientists must apply their expertise and experience to the mitigation of these disasters. To mitigate and adapt to large-scale disasters, the scientific community must be involved in an extensive campaign of knowledge exchange and communication with the various groups involved including government officials, the general public, etc. Risk evaluation must rely heavily on modelling of extreme events' scenarios and visualization of physical, technological, biological and social processes and their implications. The results need to be easily grasped by emergency planners, the insurance industry, policy makers, and the public.

Living in an often turbulent and unpredictable public environment, scientists can contribute to decision-making through a risk management framework that examines natural, technical and social issues related to sustainability and consists of the following:

- Anticipates natural and human-made risks through widespread *consultation*.
- Determines *concerns* by using risk assessment techniques for various scenarios.
- Identifies the *consequences* by systematically cataloguing hazards.
- Undertakes *calculations using* appropriate models.
- Evaluates the *certainties***,** uncertainties, and the probabilities involved in the calculations of the vulnerability and of the exposure.
- Determines and acts on options to *control***,** mitigate and adapt to the risk.
- *Communicates* the results to those who need to know.
- Promotes and guides *monitoring* systems to collect, assimilate and archive data relevant to the determination of sustainability and risk, now and in the future.
- Integrates the knowledge and understanding from all relevant disciplines to provide society with the tools to *review* the sustainability and the risks of proposed policies and plans.

Though rational scientific methods hold the promise of an improved science of risk and sustainability, it must be remembered that the priorities for analyses are likely to be heavily influenced by the public and political agenda of the day. This means that implementation of risk management to achieve sustainability can be reached only through an interaction of theory and praxis.