A Roadmap for the Geohazards Community of Practice of the Group on Earth Observations

STRATEGIC TARGET OF THE GHCP

By 2020 put in place all building blocks for comprehensive monitoring of geohazards and the provision of timely information on spatio-temporal characteristics, risks, and occurrence of geohazards, in support of all phases of the risk management cycle (mitigation and preparedness, early warning, response, and recovery), and as a basis for increased resilience and disaster reduction.

This will be achieved

by developing a global network of very few carefully selected core sites. These core sites will provide focal points for a large geographical region, where all building blocks of a value chain from observations to end users can be linked together and applied to the phases of the risk management cycle relevant for this region. Thus, these core sites will demonstrate the concept, enable scientific studies and technological developments, provide for capacity building, and inform policy and decision making in the region.

PREAMBLE

This roadmap addresses Earth observation support for all phases of the risk management cycle (mitigation and preparedness, early warning, response, and recovery). Although the roadmap focuses on the risk management cycle as it applies to geohazards, it is to a large extent generic and provides an example for all hazards. Thus, the roadmap is a pilot initiative for all hazards considered in the frame of the Disaster Societal Benefit Area (SBA) of GEO.

In many regions, geohazards pose serious threats to the lives and properties of humans. In order to prepare for the occurrence of hazardous events, to mitigate the danger of these events causing disasters, and to ensure proper response and recovery from unavoidable disasters, humanity urgently needs information about the types of hazards to be expected in a region, their spatio-temporal characteristics, and, in case of specific hazardous events occurring, timely early warnings. This roadmap lies the ground to utilize the Global Earth Observing System of Systems (GEOSS) in a best effort to provide this information to society and the relevant policy and decision makers.

Official regulations, adaptations, warnings, and response and recovery actions are mostly mandated to governmental agencies. The roadmap recognizes and respects these mandated activities, and the goal is to support and inform authorities in their mandated responsibilities where needed.

This roadmap is developed and implemented under the lead of the Geohazards Community of Practice (GHCP) of the Group on Earth Observations (GEO). The GHCP brings together national and international organizations concerned with geohazards and their impacts on society, and aims to link these organizations to GEO, to provide coordination, and to facilitate support for relevant GEO Work Plan Tasks. The GHCP was proposed to the GEO User Interface Committee (UIC) in 2005. In an initial phase lasting from 2006 to 2008 most of the activities of the GHCP were initiated and coordinated by the Geohazards Bureau hosted by BRGM. In December 2008, this Bureau was closed, and the activity level of the GHCP dropped significantly. During 2009, the future of the GHCP was discussed during several meetings of the GEO UIC and GEO Science and Technology Committee (STC) as well as separate splinter meetings of the GEO Secretariat with a core GHCP group. As a result of this dialog, it was agreed to draft a roadmap for the GHCP.

The roadmap specifies activities that would lead to a broad and strong GHCP in support of GEO. This roadmap is addressed to the Member Countries and Participating Organizations of GEO and provides a framework for coordination of national and international programs and activities of the Participating Organizations to facilitate progress towards comprehensive coordinated observation and information in support of geohazards-related applications through GEOSS.

The roadmap involves science and technology communities whose active participation is needed in order to reach the challenging but highly gratifying goal of providing observations and information needed to improve risk management and reduce disasters. For these communities, the roadmap provides guidance and the context for necessary activities. Achieving significant reduction of disasters caused by geohazards requires coordinated, multi-disciplinary input into all phases of the risk management cycle (mitigation and preparedness, early warning, response, and recovery). The roadmap aims at facilitating the coordination of these activities, in particular across national and disciplinary boundaries.

ORIGIN OF THE ROADMAP

The roadmap was drafted during the 1st Workshop of the GHCP held on January 18-21, 2010 at UNESCO Headquarters, Paris, France. The draft was iterated after the Workshop in a larger community of individuals, international organizations, GEO committees, and other relevant institutions.

INTRODUCTION

Natural hazards are a societal challenge. Globalization and population growth leads to more exposure of increasingly larger populations to natural hazards due to increasing settlements and infrastructure extending into hazardous areas.

Widespread poverty is common in hazardous areas, limiting the means to mitigate and build resilience. This combination of increasing exposure of population and infrastructure to natural hazards leads to rapidly growing numbers of major disasters with the tolls in damage to infrastructure and loss of human lives growing likewise.

The extent of disasters caused by natural hazards often depends on anthropogenic factors, and much of the damage, loss of lives and property results from a lack of mitigation through reduction of exposure, building of resilience, and a general preparedness. Reducing disasters caused by natural hazards requires appropriate human adaptation leading to mitigation of risks and resilience.

The concept of the risk management cycle captures the necessary steps in order to reduce the number and scale of disasters. Comprehensive information about natural hazards is a prerequisite for a successful implementation of this concept. But information is not sufficient. First, this information needs to be brought to policy and decision makers in an understandable and actionable way. Then policy and decision maker need to have the mandate and will to act on this information. Finally, society needs to be informed about the natural hazards and thus be able to judge the policies and decisions made in terms of their potential for success.

It is our primary goal to support policy and decision makers in their effort of a responsible implementation of the risk management cycle through relevant Earth observations and information derived from these observations.

Why geohazards?

Each year, natural hazards cause major disasters with many casualties and large damages. Many of the disasters cause by natural hazards originate from geohazards, such as earthquakes, volcano eruptions, landslides, and tsunamis. Increasingly, large urban settlements are sprawling into areas exposed to geohazards, thus increasing the likelihood for extreme disasters that can disrupt whole economies.

Many of the geohazards are related to common processes, and the observational requirements for the mapping and monitoring of the hazards, the early detection of hazardous events, and the information needed for response and recovery are to a large extent similar or overlapping across the different geohazards. It therefore appears reasonable to consider geohazards as a separate subgroup of natural hazards. Considering the importance of geohazards, the GEO Work Plan emphasizes geohazards: In the current GEO Work Plan, most Tasks within the Disaster SBA address specifically geohazards.

Over the last decades, we have collected a lot of information on geohazards and for many regions, we know the hazards increasingly well. We understand many of the driving processes, and we have increasingly comprehensive descriptions of the characteristics of geohazards, for example, in the form of hazard, risk, and vulnerability maps. Early detection of hazardous events increasingly is feasible thus enabling early warning as a key element in disaster reduction. Nevertheless, in many regions on the globe, the number and scale of disasters caused by geohazards are rising. Partly, this is due to a rapid growth of population and infrastructure into hazardous areas. However, in many cases, the scale of the disasters is due to the fact that available information was not exploited for mitigation, preparedness and early warning.

Prior to disasters, public awareness of the risk often is often very limited, particularly in less developed areas, and information of geohazards and associated risks is not integral part of the public environmental information basis. Relevant policy and decision making, for example, related to zoning and building codes, often ignores the available information, thus limiting mitigation and adaptation particularly in areas with poverty. The comparison of the extreme disaster caused by the recent M=7.0 earthquakes in Haiti to the very small impact of similar earthquakes in California provide a clear indication of how informed policy making for mitigation and adaptation can strengthen resilience and significantly reduce the disaster cause by these events.

GEOSS will facilitate a growth of information pertaining to geohazards both in quantity and quality, and by that additional research will be enabled and improve the understanding of the driving processes and the spatial and temporal characteristics of the hazards. In order to prepare the ground for improved exploitation of the available and expected information and products for risk management and disaster reduction, a focus on geohazards appears a valuable exercise.

Why a GHCP?

The Strategic Target for the Disaster SBA (see below) underlines the focus of GEO and GEOSS on coordination of observing and information systems. The GHCP, which brings together data providers, scientists, and decision makers can:

(1) support the implementation of GEOSS through links to relevant S&T communities;
(2) provide updated user requirements for application related to geohazards and the risk management

cycle; and
(3) ensure the delivery of information to the end users and by that facilitate the use of the information.

Where we want to go? (The goal)

The GHCP has the goal to improve all four phases of the risk management cycle in order to reduce the loss of lives and property caused by geohazards. Many of the disasters caused by geohazards could be significantly reduced, if decisions and policies were informed by and consistent with our understanding and knowledge of geohazards. Significant disaster reduction requires a clear understanding of the hazards (mapping, assessments, probability density function, ...), timely information about likely occurrence of a specific hazardous event, capacity building, information of decision and policy makers, early warning. In order to achieve its goal, the GHCP aims to enable a better exploitation of this knowledge and relevant Earth observations to ensure that comprehensive information about geohazards is available to decision and policy makers during all phases of the risk management cycle. This implies that information gaps are identified and addressed through observation and research. and that efficient links between data providers, researchers and the end users, the decision makers and the public, are established in order to ensure the information flow. It also implies that information is made available in applicable form and that expert support is provided for capacity building in the use of the information.

Where do we stand?

As pointed out above, in many parts of the world, much is known about geohazards, both in terms of the driving processes and the spatial and temporal characteristics, although significant knowledge gaps still exist. However, in too many cases, the knowledge is not or not sufficiently taken into account. Decision and policy making is often not sufficiently informed or ignoring the available information, particularly in developing regions. As a consequence mitigation and adaptation measures are insufficient, and preparedness is low. Timely detection of hazardous events is often not possible due to a lack of observations and or operational detection systems, and early warnings are not issued due to a lack of infrastructure and or decision processes, or ineffective due to limited preparedness.

Over the last few decades a number of international programs, both intergovernmental and non-governmental science-driven, have reacted to the increasing losses caused by natural disasters and focused on disaster reductions. The Hyogo Framework for Action 2005-2015 aims on building resilience of nations and communities to disasters, and the International Strategy for Disaster Reduction (ISDR) and the ISDR system has the overall objective to generate and support a global disaster risk reduction movement to reduce risk to disasters through implementation of the Hyogo Framework. By setting the priorities for action, the ISDR implicitly summarizes the current status: ISDR priorities for 2005-2015 are

1. Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation;
2. Identify, assess and monitor disaster risks and enhance early warning;
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels;
4. Reduce the underlying risk factors; and
5. Strengthen disaster preparedness for effective response at all levels.

What is needed in order to get from here to there?

Improved risk management and disaster reduction will not be possible without a broader awareness of the hazards and of the options for adaptation to these hazards and the mitigation of the risks. Consequently, a focus needs to be on creating the awareness in all societal areas and supporting mitigation. Awareness and mitigation will reduce the scale of disasters and ease response and recovery. Awareness of the hazards and risks and willingness to adapt and mitigate inherently increases resilience. Integrating mitigation and adaptation considerations into planning and development of settlements and infrastructure long before the occurrence of a specific hazardous event is a prerequisite for resilience. Improved data access, better availability and use of information, improved understanding of the hazards, their causes, and their potential impacts are necessary building blocks for efficient risk management.

The GEOSS Strategic Target for the Disaster SBA acknowledges the importance of coordinated observations and information systems (see Box 2). The GHCP can support GEO and GEOSS in its effort to enable the global coordination. But the GHCP also can bring in complementary activities focused on end users involved in risk management on various levels from the planning of resilient cities, settlements, and infrastructure to public education

GEOSS STRATEGIC TARGET OF THE DISASTER SBA:
Enable the global coordination of observing and information systems to support all phases of the risk management cycle associated with hazards (mitigation and preparedness, early warning, response, and recovery).

This will be achieved through:

- more timely dissemination of information from globally-coordinated systems for monitoring, predicting, risk assessment, early warning, mitigating, and responding to hazards at local, national, regional, and global levels;
- development of multi-hazard and/or end-to-end approaches, as appropriate to meet the needs for disaster risk reduction, preparedness and response in relevant hazard environments;
- supporting the implementation of the priorities for action identified in the Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities to disasters (HFA).

Below we identify activities that will lead to risk management informed by Earth observations. Some of these activities are already addressed in GEO Work Plan Tasks, while others need to be implemented through new initiatives.

THE WAY FORWARD (THE MAP)

The activities defined below have the common goal of increasing resilience throughout all phases of the risk management cycle, i.e., before the occurrence of a hazardous event, during the event, and during the response and recovery phase after the event. Increased awareness of geohazards that can occur and impact a given location is considered a key step towards mitigation and preparedness. The interface between data providers and researchers on the one side and the mandated authorities and the public on the other side deserves specific attention in order to ensure that information about geohazards is available where and when needed.

The different phases of the risk management cycle share a number of cross-cutting issues associated with the various elements of the value-added chain from observations to end users in authorities and

society. Comprehensive observations are crucial for the understanding and characterization of geohazards, and the development of appropriate observation systems, sensors, and information systems is required for all phases. The integration of ground-based systems with air-borne and space-borne systems and the provision of ground truth for remote sensing are challenging issues particularly in the context of a rapid development of sensors and observational infrastructure.

Scientific advances in our understanding of the temporal and spatial characteristics of geohazards and the driving processes benefit all phases.

Intellectual property rights require attention, and limitations in data access hamper the full exploitation of available observations for research and applications.

Reaching out to scientists and research groups and connecting them to end users and mandated agencies is relevant along the temporal progression of the risk management cycle. In many geographical areas, promotion of evidence and knowledge-based policy making is urgently needed. Likewise, capacity building in all parts of the value chain from observations to end-applications, including the observations, research, and policy and decision making based on scientific knowledge is an important issue during all phases of the risk management cycle. Finally, sufficient human and financial resources for the network of the broad community involved in risk management and disaster reduction are mandatory to achieve the demanding goal of a significant disaster reduction.

Activity 1: Mitigation and preparedness

The overarching goal of this activity is to provide the information basis for mitigation and disaster reduction. Activities focusing on this phase of the risk management cycle contribute to building resilience before hazard occurrence. A GHCP focus is on decision support and information for society. Implementation of the activities will focus, though not exclusively, on the global network of core sites.

1.1 Identifying stakeholders

The GHCP aims to utilize Earth observation and research results in support of risk management. In order to achieve this, those involved in mitigation, response, and recovery need to be linked to those providing observations and research results relevant to geohazards. The GHCP will identify those end users who determine risk management actions in society and will link these to research groups addressing the origin and spatio-temporal characteristics of geohazards. The GHCP will identify gaps in its membership and make an effort to fill these gaps through outreach to relevant groups not represented in the GHCP.

1.2 Understanding geohazards and mitigation measures

Although there are a number of scientific projects and programs focusing on understanding the processes creating geohazards, the rapid progress in observation technologies and scientific understanding creates new problems and raises new questions. The GHCP will continuously identify relevant science issues and foster research and development that addresses these issues. Open access to all relevant observations for the core sites will be crucial in order to enable the necessary research. The activities will include the measuring, mapping, modeling, and monitoring of hazards, particularly for the global network of core sites. The goal of these activities is a comprehensive description of the spatio-temporal characteristics of the hazards. An overview of adaptation and mitigation approaches and measures will also be compiled.

1.3 Informing policy and decision makers and society

Already today considerable information about geohazards and their characteristics is available for many regions, but often this information does not reach the policy and decision makers in a timely manner. The GHCP will aim to improve the information flow to society at large and specifically to relevant policy and decision makers. Information products will include but not be limited to hazard, exposure and vulnerability maps, and risk assessments. Initially, comprehensive information products will be made available for the global network of core sites.

1.4 Creating awareness

A key factor limiting preparedness and reducing resilience is the lack of awareness of geohazards in a broad part of society ranging from the layman and public media to the policy and decision makers. The GHCP will initiate and support activities that create awareness of geohazards, their nature and characteristics, and the potential hazardous events that can be expected in a given region. The goal of these activities is to deliver relevant information to the 'right' people and the public, to integrate information on geohazards in the environmental information channels, and to ensure integration of geohazards into education at all levels from primary schools to universities and public education.

Activity 2: Early Warning

With this activity, the GHCP aims to foster connections between the data/product providers and the end users making information-based decision. For this, the GHCP takes and end-to-end approach. This activity contributes to building resilience before and during an hazardous event. The goal is to inform and support decisions on different levels, including decisions made by the public and individuals, through appropriate and timely information. However, issuing public warnings is outside the mandate of the GHCP and GEO, and the mandate of authorized bodies and the agreed-upon chain of commands will be respected. The implementation of the activities will initially focus, although not exclusively, on the global network of core sites, in particularly those where early warning is of urgent concern.

2.1 Improving models and forecasts/predictions

Early warning depends on timely detection and/or reliable forecasting and/or prediction of hazardous events. In many cases, the necessary algorithms and/or models are currently not available or not sufficiently tested in an operational environment. Where necessary, the GHCP will foster and, where possible, facilitate the development of models and forecasting and prediction algorithms. The GHCP will work with mandated authorities to ensure that the algorithms are tested and, if suitable, implemented in early warning systems.

2.2 Monitoring and detecting hazards

Timely detection and forecasting of hazardous events requires dedicated monitoring in carefully selected locations. The GHCP will aim to identify areas to be monitored. An effort will be made to understand the requirements for monitoring and to identify indicators, precursors, and thresholds for early detection. The goal of these activities is to enable a timely detection of hazardous events. The GHCP will work with GEO member countries and Participating organizations to ensure the implementation of ground-based networks and space-borne infrastructure required for the monitoring, data processing and early detection of hazardous events. The main focus will be on the global network

of core sites.

2.3 Informing (early) warning systems

Early warning systems informing public warnings issued by mandated authorities have specific requirements in terms of products and their characteristics. The GHCP will work with the relevant authorities to specify observation-based products for warning system and will link data and product providers to these warning authorities. Potential synergies between observing and warning infrastructure will be explored. Together with the Architecture and Data Committee (ADC), the GHCP will initiate demonstration of product delivery through GEOSS channels, for example, the delivery of hazard data via GeoNetCast.

2.4 Integrating geohazards into public environmental information systems

Geohazards are in principle not different from other hazards such as storm surges, hurricanes, tornadoes, floods, etc. For these latter hazards, information including early warnings are today integral part of the environmental information made available to the public through internet or other public media. The GHCP will consider how information on geohazards, including information on impeding hazardous events and early warnings, can be integrated in public information provision in way comparable to information on other hazardous events. The potential function of the GEO Portal for dissemination of such information will be considered, and dissemination channels for the global network of core sites will be developed. It will be important to clarify information and warning mandates with relevant mandated authorities.

Activity 3: Response

During the response phase of the risk management cycle, the GHCP can provide important links and connections to the Disaster Charter. By taking an end-to-end and multi-hazard approach, the GHCP can support the preparation of complex response actions and thus contribute to building resilience during and after events. A key goal of the activity is to provide decision support and to contribute to capacity building.

3.1 Characterizing the event/Assessing the disaster

Earth observations are crucial for the characterization of hazardous events and their impact on environment, infrastructure, and human population. However, the full potential of available and expected future Earth observations has not been fully exploited for timely disaster assessments, and too often response is hampered by a lack of sufficient information on the impacts of an hazardous event. The GHCP will initiate activities to increase the usage of Earth observations for the assessment hazardous events and their impacts as a support for immediate response activities. Information to be extracted from observations includes type of event, magnitude, extent, mechanism, impacts, damage assessment, and the detection and description of secondary hazards. Initially, the algorithms will be implemented and demonstrated for the global network of core sites.

3.2 Providing an EO clearinghouse for major international disasters

For recent disasters, a large amount of observation-based information was available shortly after the hazardous event, but not widely distributed through media, in particular the world wide web. Value and utilization of this information would be greatly improved if it was accessible through a single

clearinghouse. The GHCP will work with the ADC to explore options for an Earth observation clearinghouse for major (international) disasters. This clearinghouse would give access the relevant observations, products, modeling results, and assessments. The clearinghouse would also support immediate scientific in situ studies by providing comprehensive information on available useful observation infrastructure in the disaster area, and by maintaining an overview on experienced science response teams.

Activity 4: Recovery

The main goal of this activity is to ensure that recovery is informed about future hazards and thus enabled to strengthen resilience after the event. Here, too, an end-to-end and multi-hazard approach is necessary, and a key focus has to be on decision support and capacity building.

4.1 Informing the Recovery Phase

The crisis caused by disasters often presents an opportunity to learn about the hazards and their potential impacts and thus to strengthen resilience after the event. The GHCP will engage in the assessment of lessons learned from specific hazardous events and their impacts and will provide feedback to Activities 1 and 2. Of immediate importance in the early recovery phase is the assessment of safety of areas, infrastructure, and access to the areas. Revised hazard assessment are required to plan recovery that will lead to increased resilience.

IMPLEMENTATION OF THE ROADMAP

These Activities will be implemented through linking GEO Tasks with other actions.

The GEO Work Plan Tasks

The GEO Work Plan 2009-2011 (Version 20091119) includes a number of Tasks that would benefit from support by the GHCP. In fact, a number of Tasks list the GHCP as Task Team supporter. These Tasks include:

- Task DI-06-09 *Use of Satellites for Risk Management*;
- Task DI-09-01 *Systematic Monitoring for Geohazards Risk Assessment*; for this task, the following Sub-Tasks are supported by the GHCP:
    - DI-09-01a *Vulnerability Mapping and Risk Assessment* (former DI-06-03 and DI-06-07);
    - DI-09-01b *Seismographic Networks Improvement and Coordination* (former DI-06-02);
- Task DI-09-02 *Multi-Risk Management and Regional Applications*; for this task, the following Sub-Tasks are supported by the GHCP:
    - DI-09-02a *Implementation of a Multi-Risk Management Approach* (former DI-06-08);
    - DI-09-02b *Regional End-to-End Disaster Management Applications* (former DI-07-01);
- Task DI-09-03 *Warning Systems for Disasters*; for this task, the following Sub-Task is supported by the GHCP:
    - DI-09-03a *Tsunami Early Warning System of Systems* (former DI-06-04).

The GHCP will interact with the Task Teams of these tasks and assess to what extent the activities discussed above are already covered by these Tasks. The GHCP will engage in supporting these Tasks. As part of this, an initial assessment will be made of the above GEO Tasks during the Disasters SBA Review of the GEO Science and Technology Committee during March 2010.

Global Network of Core Sites

The activities of this roadmap are necessary to achieve the Strategic Target of the GHCP. Many of the monitoring activities, in particular the space-borne ones, will be of global nature. However, the end-to-end approach implicit in these activities and the full coverage of the risk management cycle will have to be implemented and demonstrated in a regional approach. For this, the GHCP proposes the establishment of a global network of core sites, for which the end-to-end and multi-hazards approach can be applied to all relevant phases of the risk management cycle. These core sites can be considered as pillars linking together and integrating the various part of the monitoring and processing infrastructure to end-to-end and multi-hazards systems.

Core sites should by regional centers for large geographical regions (e.g., North America, South America, Africa, Europe, Asia, Australia), which provide focal points for the regions in many hazard and risk management related aspects. Therefore, these sites should be agreed upon by the countries in a region.

The core sites would have several functions:

- They would act as natural laboratories for geohazards. As such, core sites would be in location where the occurrence of hazardous events is likely. In these locations, comprehensive monitoring would take place, and free data access to in situ data and observations from air-borne and space-borne sensors would be granted.
- They would provide a test field for the end-to-end multi-hazard approach. Thus, links between data providers, research teams, policy and decision makers and the general public would be established, and channels for information flow from observations to end applications would be created.
- They would in principle allow consideration of the full risk management cycle from mitigation and preparedness, early warning, to response and recovery. Thus, activities in support of all four phases would have to be initiated.
- They would provide centers for capacity building (in monitoring, processing, science, applications) in the region by being open for participation from other countries in a region.
- Where they qualified as Super Sites, they would contribute to the relevant GEO Task by providing a focus for the dissemination of space agency datasets of use for geohazard studies to the research community and ultimately more operational scientists.

In order to ensure the regional character of these core sites, a call for proposals of such sites should be issued through GEO. The proposals should be submitted by each region. Regions could be defined to be consistent with the GEO caucuses.

Networking of the global community

The successful implementation of this roadmap requires a sustainable networking of the global geohazards community bringing together actors involved along the relevant value chains from observations to applications. Partially, this networking can be developed in the frame of existing GEO elements.

For the more science-related part of the community and the relevant activities, the European COST Program may offer an option to establish a COST Action as an initially European nucleus with a potential of a global extension. Considerations for submission of a COST proposal are underway and

the intention is to submit a COST proposal during 2010 as part of Roadmap implementation.

Regional Offices

The concept of a global network of core sites representing the large regions/GEO caucuses should be supported through regional offices. These offices would take a lead in organizing the core sites as regional pillars truly integrating the monitoring infrastructure and data processing into an end-to-end multi-hazards approach covering all relevant phases of the risk management cycle. The offices would support the regional geohazards communities of practice and link these to the global GHCP.

Assessing geohazards

Considering the enormous impact disasters caused by geohazards have on human lives and property, it appears timely to assess the current state of knowledge concerning geohazards. Looking further ahead, the GHCP will therefore consider whether a body for such an assessment should be established. The Intergovernmental Panel on Climate Change will be considered as a potential model. A United Nations Convention on Geohazards could provide a basis for the creation of a geohazards assessment body comparable to the IPCC.