# INTEGRATED RESEARCH ON DISASTER RISK (IRDR)

Why is it that, despite the marked growth over recent decades in our knowledge and understanding of natural hazards, losses associated with environmental disasters have also risen during that same period at a seemingly exponential rate? The situation is particularly dramatic as regards weather-related events where, while death rates and numbers have dropped due to more extended and effective early-warning systems and preparedness plans, material and livelihood losses as well as numbers of affected persons have grown considerably.

**The response**

The response of ICSU, ISSC and ISDR to this conundrum has been to create a major new international programme – Integrated Research on Disaster Risk (IRDR) – that seeks to address the challenge of natural and human-induced environmental hazards.

The complexity of the task is such that it requires nothing less than the full integration of research expertise from the natural, socio-economic, health and engineering sciences, coupled with socio-economic analysis, understanding the role of communications, and public and political response to reduce the risk. Although the approaches in the sciences vary, IRDR will not only be multi-disciplinary but also approach the issues of natural and human-induced hazards and disasters from several perspectives – from the hazards to the disasters and also from the human exposures and vulnerabilities back to hazards. This coordinated approach takes IRDR beyond approaches that have traditionally been undertaken.

**Objectives**

The IRDR programme has three research objectives:

- characterization of hazards, vulnerability and risk
- understanding decision-making in complex and changing risk contexts
- reducing risk and curbing losses through knowledge-based actions.

Attainment of these three research objectives through successful projects will lead to a better understanding of hazards, vulnerability and risk and an enhanced capacity to model and project risk into the future; to the understanding of the decision-making choices that lead to risk and how they may be influenced; and how this knowledge can better lead to disaster risk reduction.

Three cross-cutting themes support these objectives:

- capacity building, including mapping capacity for disaster reduction and building self-sustaining capacity at various levels for different hazards;
- development of case studies and demonstration projects; and
- assessment, data management and monitoring of hazards, risks and disasters.

**The hazards covered**

IRDR will focus on natural and human-induced environmental hazards, including all hazards related to hydro-meteorological and geophysical trigger events, i.e., earthquakes; volcanoes; flooding; storms (hurricanes, typhoons, etc.); heat waves; droughts and fires; tsunamis; coastal erosion; landslides; aspects of climate change (increases in occurrence of extreme events); and space weather and impact by near-Earth objects. The effects of human activities on creating or enhancing hazards, including land-use practices, are also included.

**Building on, and complementing existing research – the Consultative Forum**

Arrangements are being actively sought with existing and planned programmes so as to undertake joint research with shared outcomes and responsibilities. Collaborating organizations and stakeholders will become significant actors in IRDR and, working through the periodically held Consultative Forum, will have the opportunity of contributing to the agenda-setting and overall programme of IRDR. These collaborating bodies may include the International Scientific Union members of ICSU, several of which have important hazards and disasters initiatives. One example of such a programme which will contribute towards the goals and objectives of IRDR – ENHANS – is briefly described in the Annex. This initiative is being led by IUGG and implemented by a consortium of Scientific Unions – IUGG, IGU, ISPRS, IUGS, IUSS, IUTAM – the ICSU Regional Offices, the Intergovernmental Oceanographic Commission (IOC) and associate partners AGU and AOGS.

**The IRDR research programme – the first years**

During its first three years, IRDR will focus on building partnerships and undertaking scientific analysis to put in place longer-term projects towards meeting its declared research objectives and overall vision, and contributing to the search for fundamental explanations for the current rise in disaster losses. It will seek to create a global IRDR community made up of scientists of all disciplines (natural, social, engineering and medical sciences), as well as practitioners in disaster risk reduction and management.

Three major research projects so far identified are:

**(a) FORIN – IRDR forensic investigations**

The IRDR Scientific Committee (IRDR-SC) will commission and encourage a series of case studies that will aim at analysis of crises or disasters caused by natural phenomena from which lessons can be learnt. The Science Plan proposed that these case studies be carried out in the form of forensic investigations, where the term 'forensic' was used to suggest the qualities of serious, all-encompassing, arms-length, careful and detailed analysis of past disaster events. The IRDR-SC has endorsed these principles and approaches and concluded that there is need to move ahead relatively quickly, to better define the scope and approaches of the case studies and forensic investigations.

The forensic investigations would be selected by the IRDR-SC, with invitations to individuals or groups to set up case study teams; there would also be invitations to the community to propose events to be studied in depth. The investigations will be carried out over the first three years of the IRDR programme and will be a key mechanism of identifying research to be carried over the ten-year programme.

An IRDR ad-hoc workshop has underlined the importance of having a common design for the studies – hence, the decision by the IRDR-SC that a permanent Working Group be set up to establish a common 'template' and be charged with the further development and implementation of the forensic investigations, under the Committee's overall control.

In the first phase of IRDR a series of in-depth post-disaster investigations will therefore be carried out. IRDR will be not only interested in disaster 'failures', or cases where mistakes were made; it is also important to conduct forensic investigations of success stories to help accumulate evidence of best practice.

For these selected forensic investigations, IRDR will bring together teams of experts and practitioners, including appropriate expertise in the relevant fields of natural and social sciences, as well as practitioners and decision-makers, to address the key questions.

The forensic investigations will involve a wide range of hazards, scales, geographical regions, and cultural and economic contexts, and investigate the effects of hazard events on social situations ranging from, for example, large mega-cities to rural communities in the most impoverished countries with limited resources to highly sophisticated communities in the developed world. The selection of investigations will include those where there is potential for arriving at objective views or assessments of responsibility.

In addition to the other criteria, it is proposed that in the next few years, forensic investigations be carried out to identify major research needs and gaps at the interface of natural and social sciences. These studies would also test methodologies and approaches in a systematic way.

### (b) AIR - Assessment and Interpretation of Risk

This project takes as its starting point the view expressed in the IRDR Science Plan that, in order to reduce disaster risk, there needs to be integrated risk analysis, including consideration of relevant human behaviour, its motivations, constraints and consequences, and decision-making processes in face of risks. The risk associated with environmental hazards depends not only on physical conditions and events but also on human actions, conditions (vulnerability factors, etc.), decisions and culture. The seriousness of the consequences of any disaster will depend also on how many people choose, or feel they have no choice but, to live and work in areas at higher risk.

Enhanced capacity for assessing the level of any hazard and forecasting when it may occur is thus an essential part of research to reduce disaster risk. It is essential to consider how risk – and risk information from various sources – will be interpreted and acted upon at all levels from the individual citizen through to government and international agencies.

The AIR project will require an integration of the methods and perspectives of different scientific disciplines.

For purposes of the project, *assessment* of risk would therefore need to comprise:

1. estimation of the likelihood, and likely magnitude, of a hazard event or set of interconnected events (from a physical science perspective);
2. evaluation of the vulnerability/resilience of the physical infrastructure in the area at immediate risk (although disasters in one region often have knock-on effects elsewhere, we do not propose to focus directly on these here);
3. consideration of social and behavioural factors that place the local population at greater or lesser risk, should a hazard event occur, including those that may constrain or facilitate appropriate protective action in response to such an event (or a warning thereof).

*Interpretation* of risk refers more specifically to how actors attempt to make sense of experience and information from various sources as a basis for decision. While the three facets of risk assessment above all involve some degree of interpretative or subjective

judgement, their endpoint is to provide as objective as possible an answer to the question "What is likely to happen?". Here, however, our focus shifts to the question "What do people (especially those at risk) *think* is likely to happen?", which in turn carries the rider "And what will they do about it?".

The contrast between these questions partly evokes a distinction in the research literature between so-called 'expert' and 'lay' perceptions of risk. Much evidence and everyday experience shows that people often differ markedly from one another in their estimations of particular risks, perhaps taking some too seriously and others not seriously enough.

Interpretations of disaster risk are not 'one-off' events but develop over time on the basis of (first-hand and indirect) experience of living with risk, where the association between prediction and occurrence is less than perfect. Risk perceptions, in other words, are not simply given, but are acquired or *learnt* over time.

Building on these conceptual issues, this project will take as its context *either*:

a) a comparison of (two or more) contrasting locations exposed (principally) to a single type of hazard; *and/or*
b) an in-depth case study of a single location exposed to multiple hazards.

Within this context, the project will seek:

- To identify the current state of knowledge, methods and assumptions in relation to assessment of the relevant risk(s).
- To consider how far economic and social costs and benefits have been taken into account in the assessment of such risk(s).
- To consider what kinds of historical evidence of previous hazard events have been used as a basis for such assessments.
- To compare such assessments with evidence of how such risks are interpreted by relevant actors and interest groups.
- To examine how far assessments provided by scientists are understood by, and satisfy the needs for information felt by, policy-makers and/or (sections of) the public.
- To relate such assessments and interpretations to recommendations for action from authorities and/or scientific researchers.
- To explore reasons why (sections of) the public may or may not follow such recommendations, including trust in authorities or scientists, perceptions affordability, costs and benefits of different actions (and how these perceptions may differ between groups and individuals), and personal experience of previous hazard events.

An AIR Working Group is being established by the IRDR-SC to draw up proposals for a research programme.

### (c) Long-term database, monitoring systems and tools

One of IRDR's fundamental goals is to both generate new information and data and to leave a legacy of coordinated and integrated global data and information sets across hazards and disciplines, with an unprecedented degree of access. One of the main contributions of the Programme will be to serve as a framework for the development of a range of modern information systems devoted to disaster risk reduction.

A global network of long-term hazard research sites will be developed to allow for enduring (decades-long) place-based, longitudinal studies of natural hazard risk, while leading to progressive building of resiliency across that same network. The network will provide a mechanism for reaching out to communities located in the most vulnerable areas and

engaging them in the science agenda, as well as providing a context for greater communication and comparative analysis.

To be able to achieve such a goal will require both long-term ground-based and remotely sensed monitoring, pre-determined methodologies for data presentation, and identification of the gaps in our ability to rapidly provide information to the disaster managers. There is, at present, very little capacity for monitoring the human condition, coupled with poor standardization of methods. IRDR can, and will, provide added value in this respect, and the IRDR-SC accordingly decided to establish an ad-hoc Working Group to make recommendations forthwith.

**National Committees for IRDR**

IRDR welcomes and encourages the creation of interdisciplinary National Committees dedicated to the support of IRDR's research initiatives, and the establishment or further development of vital links between national disaster risk reduction programmes and activities within an international framework. National Committees will make it possible to implement – extending or adapting where necessary – the IRDR Science Plan to address local and regional concerns.

The establishment of National Committees for an integrated research programme like IRDR will help foster the much-needed intergrated approach to disaster risk reduction within national scientific and policy-making communities; and each Committee can serve as an important focal point between national disciplinary scientific unions and associations, as well as promote cooperation between the research sector and practitioners.

**IRDR International Research Centres**

A limited number of IRDR-designated International Research Centres – centres of excellence – may be established in different parts of the world to support well-defined subject areas of IRDR and contribute to the mission of the programme. Such centres will be created under clear guidelines set down by the IRDR-SC, acting on behalf of the IRDR co-sponsors. Each will be located in, and financed by, an internationally recognized, national host organization, and will be overseen by an international advisory board appointed by the IRDR-SC in full consultation with the respective host institution.

**Regional Programmes**

The three ICSU Regional Committees serving Africa, Asia and the Pacific, and Latin America and the Caribbean have each identified disasters as being of priority for their respective offices for immediate future, and are at various stages of developing regionally based programmes. These initiatives provide an opportunity for the combined development of regional components for the IRDR research programme, and in particular its outreach activities. Close collaboration in both planning and execution of projects and programmes will be pursued.

**Capacity building**

Disaster risk management requires improved capacities at all levels: institutions, decision-makers, professionals and practitioners in national and local situations. It also involves multidisciplinary, inter-institutional and multi-sectoral perspectives as essential factors in socio-economic development. The IRDR capacity-building programme needs to cover the different phases of comprehensive and integrated disaster risk management. The topics for capacity activities, courses and training modules are to be developed in consultation with the

ISDR and other appropriate organizations, and initially modelled on the experiences of the Global Change System for Analysis Research and Training (START).

**The overall legacy of IRDR**

IRDR's main legacy will be an enhanced capacity around the world to address hazards and make informed decisions on actions to reduce their impacts. This will include a shift in focus from response–recovery towards prevention–mitigation strategies, and the building of resilience and reduction of risk through learning from experience and the avoidance of past mistakes. By way of this enhanced capacity and a shift in strategic approaches, there will be a reduction in loss of life, fewer people adversely impacted, and wiser investments and choices made by civil society, when comparable events occur.

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**Extreme Natural Hazards and Societal Implications (ENHANS)**

The principal goals of the ENHANS project are (i) to improve understanding of critical phenomena associated with extreme natural events and to analyse impacts of the natural hazards on sustainable development of society; (ii) to promote studies on prediction of extreme events reducing predictive uncertainty and on natural hazards mitigation; to bring the issues into the political and economical policies; (iii) to disseminate knowledge and data on natural hazards for the advancement of research and education in general and especially in developing countries; and (iv) to establish links and networks with the international organizations involved in research on extreme natural hazards and their societal implications setting up a consortium of experts of ICSU Unions and several intergovernmental and multi-national organizations (e.g. AGU, IOC-GOOS) involved in the project. The goals of ENHANS will be achieved via scientific meetings and open forums bringing together research experts, decision makers, and disaster management, insurance agency and mass media practitioners. The project will place a special emphasis on importance of research on extreme natural hazards and disaster risk mitigation in the most vulnerable regions of the world, particularly in Latin America and the Caribbean, in sub-Sahara Africa, and in Asia and the Pacific region.

Major scientific and outreach events of the ENHANS project will be (1) symposium “Natural Hazards and Disaster Risk in Latin America and the Caribbean” and associated events at the Scientific Assembly “Meeting of Americas” (August 2010, Foz do Iguassu, Brazil); (2) workshop on extreme hazards and disasters in Africa (January 2011, Pretoria, South Africa), and (3) symposium “Grand Challenges in Natural Hazards Research and Risk Analysis” and the Open Forum on Natural Hazards at the XXV IUGG General Assembly (July 2011, Melbourne, Australia). More information on the project will be available soon at the web page: http://www.ENHANS.org