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FORENSIC DISASTER INVESTIGATIONS

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A new set of international disaster case studies is proposed under the term "Forensic Disaster Investigations". The proposal for such studies is set out in the report of an ad-hoc Working Group[1] established under a new international consortium of science organizations made up of the International Council for Science (ICSU), the International Social Sciences Council (ISSC), and the UN International Strategy for Disaster Reduction (ISDR). (ICSU-SSC-UN ISDR, 2010). The Forensic Disaster Investigations will form part of the programme Integrated Research on Disaster Risk (IRDR)[2] now established under the consortium with its International Programme Office located in Beijing, China*

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The main purpose of this Report on Reports is to outline the central concepts and rationale for the Forensic Disaster Investigations (FDIs), in the context of IRDR and to invite comments, suggestions and contributions. It is planned that the investigations will differ in at least three important ways from most previous disaster case studies.

First, they will endeavour to penetrate more deeply into the fundamental causes of disasters in a broad, multidisciplinary and comprehensive manner, engaging specialists from any and all relevant fields. This approach should enable recommendations to be developed which will facilitate "...more informed and insightful decisions on actions to reduce their impacts, such that in ten years, when comparable events occur, there will be a reduction in loss of life, fewer people adversely impacted, and wiser investments and choices made by governments, the private sector, and civil society." (ICSU, 2008, p.6)

Second, while they will be carried out independently and at arms-length from governments, they will also require public authority, support and promotion. In order to be truly investigative and forensic in spirit the studies must be empowered to pursue the

evidence wherever it leads in order to be able to report fully on the train and ensemble of events, responsibilities and actions that account for the losses. FDIs are not designed to be "witch hunts" or searches for guilt or culpability, although findings of such a kind cannot be ruled out *ab initio*. In almost all cases, responsibility for disaster losses is widely spread over institutions and over place and time. Thus, the target of FDIs is the disaster risk management process in its entirety.

Third, for the foregoing reasons, the intended outcome is to help bring about a paradigm or cultural shift in the ways in which disasters are understood and managed. As long ago as 1945, Gilbert White wrote, "Floods are 'acts of God' but flood losses are largely acts of man." (White, 1945). More recently, the second national reassessment of natural hazards in the United States was entitled "Disasters by Design" (Miletti, 1999). Yet recognition and acceptance of these conclusions has not resulted in sufficient advance in practice or understanding such that significant reductions in disaster losses have been achieved in the developed or developing countries. It is the intent of FDIs therefore to ask "what acts of man?" and "what designs?" The flaws in disaster risk management must be identified in a manner and with an authority that can help to bring about a fundamental improvement. The first step in this process is the willingness to accept that disaster risk management stands in need of radical change.

It is hoped that FDIs informed by these ideas will be able to move on from disaster case studies which have tended to be organized into discipline-based and relatively watertight "stovepipes" of enquiry with insufficient integration into a more systemic approach. A related and intended innovation is a move away from an orientation and a mind-set that focuses on the disaster event and its initiating causal mechanism in geophysical terms and its aftermath, towards a recognition that the consequences of "natural disaster events" are bound up in the patterns and decisions of everyday life (Hewitt, 1983, 1997).

With these ambitions in mind, the ad-hoc Working Group went on to describe four complementary modes of analysis for a suggested research methodology, and to elaborate upon five important problem dimensions for FDIs.

Research methodology

1. Critical cause analysis

This is a class of investigative method that seeks to identify the root causes of the disaster events, and is premised on the belief that problems are best solved by attempting to correct or eliminate root causes, as opposed to merely addressing the immediately obvious symptoms. The approach would be multi-disciplinary and should aim to integrate social, environmental and technical assessments. This is partly because of the complex range and interaction of factors in disasters but also the need to remain open to pursue whatever explanations or safety conditions may offer best opportunities for improvement. The factors that are of particular importance are the following:

a. Causal analysis of hazards and the processes involved in human and asset losses

with a view to identifying critical factors in the pre-disaster, impact and post-disaster recovery phases. Also, identification of preventive measures that did or could apply to avoid, control, or limit the losses, and for each process in the disaster risk sequence recognition of those that caused harm or failed to offset it. If possible, engage, or consult, a relevant range of professional, technical, local assistance in events.

b. Identification of the thresholds for failure or success points where damage occurred that could be prevented, eliminated or reduced to an acceptable level in the face of a particular type of hazard.

c. Defining critical limits – maximum or minimum values for factors in relation to warnings, evacuations, building safety, etc. to prevent, eliminate or reduce loss to an acceptable level.

d. Establishing monitoring requirements necessary to ensure that the community, item or process is constantly aware and protected at critical failure points.

e. Corrective actions that are appropriate to conditions and funding in given contexts, and that can be taken when monitoring indicates a deviation from an established critical limit. This will require a plan to identify corrective action if a safety limit is not met, and to reduce exposure and vulnerability to potentially damaging physical events.

f. Identification of proactive actions that could have been taken and enacted in order to guarantee that less risk was constructed in reality – such as land use planning, enactment and enforcement of building norms and the like.

2. Meta-analysis

Meta-analyses are systematic reviews of the available literature to identify and assess consistent findings across diverse studies. This analytical method offers potential for systematic investigation of disaster events where the findings of the case studies or research observations are coded and then statistically analyzed to look for causal linkages, the strength of relationships among factors (dependent or independent variables) and the effectiveness of interventions. The focus of such analysis may vary from a specific event or a hazard to the thematic attributes of disaster risk such as the role of insurance in loss prevention or the differential impact of disaster loss on the poor. So, Rudel (2007) did multivariate statistically-based meta-analysis of 268 empirical studies of deforestation, looking at causal factors used to explain forest loss. Meta-analysis is often used as a procedure for synthesizing the results of similar studies based on a consistent research design. This approach may be considered as the ex-post assessment, where the archival literature approach is the ex-ante. Examples of the ex-post meta-analysis include White's (1976) pioneering work on hazard case studies ranging from local to global, and the comparative analyses of hazards in the world's megacities (Mitchell, 1999a, b).

3. Longitudinal analysis

Longitudinal reconstruction allows repeated observations of the same items. In the context of disaster studies, these are detailed, place-based re-analyses of particular disaster events and are used to more fully understand the contexts and processes that expose people and their assets at risk. These reconstructions could be comparative geographically (e.g. two different but essentially comparable places with similar event characteristics where the sequence of actions, decisions, policies, etc. leading to disaster risk and particular effects are cross-examined in comparative fashion) or comparative *in-situ* (same place, two temporally different events, repeat events; or the same place with two different perils). Among the better known disaster reconstructions are studies of the Buffalo Creek flood disaster (Erickson, 1976); and the Yungay earthquake in Peru(Oliver-Smith and Hoffman, 1999).

The value of longitudinal reconstructions is in providing in-depth understanding of the causes and consequences of disasters and the evolution of mitigation and/or risk reduction strategies. In the case of paired comparisons of a single place with multiple disasters, this approach permits an analysis of which mitigation strategies worked, which could have worked if implemented, the lessons learned, and the lessons not learned.

4. Scenarios of disaster

This method retrospectively re-constructs and specifies the conditions, causes and responses involved in particular destructive events. These are "forensic" in the sense that the process maintains a wider coverage to trace out and assign causal explanation of losses, and intervening conditions that increased or reduced losses.

It is inevitable that a major cyclone will eventually strike again in Southeast Asia, or the Caribbean; an earthquake will strike again in China, Turkey, Pakistan, Haiti, Japan, the United States or South America; and there will be catastrophic flooding again in Mozambique, China or Europe. The scenario should be science-based, selected on the basis of a known hazard that represents a realistic and possibly inevitable future event. Potential scenarios may assess a historic disaster event if it were to reoccur in the near future, assessment of a hazard experienced elsewhere relocated to the study community, or the impact of a natural hazard viewed to be realistic for the study area.

This type of "forensic" work could possibly be referred to as "projective or predictive forensic", given it projects loss and its causes into the future, as opposed to examining and explain real loss in the past. The ShakeOut Scenario is an example of this form of forensic investigation. More than 300 experts from academia, industry and the public sector assessed the impact of the potential 7.8 magnitude earthquake on the San Andreas Fault near Los Angeles California. The ShakeOut study estimates that the earthquake may cause 1,800 deaths and US$213 billion of economic losses [reference to be added].

Elaboration of problem dimensions

The variety of research approaches and methods described above help to establish a medium and a mechanism for developing better comparative understandings of the root causes and underlying process that lead to disaster risk in diverse socio-economic, cultural, national, regional and local settings. In addition, the methods promise to achieve an understanding of the processes by which risk reduction policies and instruments are, or are not, laid out on the ground in specific but comparable disaster risk contexts. Beyond this lies a series of groups of fundamental probing and critical questions that should be clarified and in part resolved through the integration of results. Expressed in summary form, the questions relate to (i) disasters in the context of everyday life; (ii) knowledge creation, communication and relationships with decision-making; (iii) responsibilities and governance; (iv) measurement of outcomes and differential impacts; and (v) attribution of cause and effect by social actors.

Next steps

The report of the ad-hoc Working Group was accepted by the Scientific Committee for the IRDR in April 2010. Steps are underway to establish a more formal Working Group. An initial meeting is planned to be held in Geneva in October 2010 and subsequent meetings are foreseen in Japan and China. Among the tasks for these meetings will be (a) the preparation of an agreed template or study design for FDIs; (b) specification of minimal criteria by which any proposed FDI can be accepted as part of the family of initial FDIs within the context of IRDR; and (c) advancement of plans for the selection, management, reporting, financial and logistic support and formal authority for the initial set of FDIs.

For these objectives to be realized in timely fashion will require the participation of many hands and minds – and pockets. Interested parties are directed to the …[IRDR Secretariat in Beijing, the ISCU headquarters in Paris, the other consortium members - ISSC and ISDR, and the web sites for all of them to be inserted]
The idea for Forensic Disaster Investigations as laid out in the ad-hoc Working Group report is ambitious, even visionary. In accepting the report, the IRDR Scientific Committee stated its view that the whole IRDR programme is based on the idea of a fresh and innovative approach to disaster risk research. This is required by the continued growth in impacts of disasters despite substantial growth in geophysical science knowledge and greatly enhanced forecasting and warning capacity in some instances, as well as major improvements and potentials in materials science and infrastructure design (White, Kates and Burton, 2001). The growing integration of the global economy and communications also means that the consequences of disasters are less and less confined and have more impacts at places far removed from the disaster "site". The social context of disaster events is also changing. Economic development continues to fall short of the goals of sustainability. Population growth, inequality and settlement expansion mean that more people and communities are at risk. The nature of societal-hazards interactions is increasing in complexity. Added to these changes is the challenge of climate change, with its combination of changes in the character of acute and extreme climatic events, as well as the slower and incremental changes in climate regimes and sea-level rise.

The timing of the planning for FDIs is therefore both opportune and necessary. Disasters are emblematic of both the troubles and opportunities of the era in which we live. Only if disaster risk management is substantially improved will there be renewed hope across the wider spectrum of risks.

Notes

1. Participants in the meeting of the ad-hoc Working Group were as follows:

Ian Burton (Chair)
Susan Cutter
Ken Hewitt
Paul Kovacs
Allan Lavell
Gordon McBean (Chair, SC IRDR)
Brian Mills
Caroline Rodgers
Tarik Islam
Dan Sandink

2. Membership of the Scientific Committee for the International Research on Disaster Risk (IRDR)programme (as at 1 June 2010) is as follows:

1. CARDONA, Omar Darío (Professor of Integrated Disaster Risk Management, Institute of Environmental Studies, National University of Colombia, Manizales, Colombia – earthquake engineering, disaster prevention and risk mitigation)
2. CHAN Kin Sek, Raymond (Head, Geotechnical Engineering Office of Hong Kong, China – geotechnical engineering, landslide mitigation)
3. CUTTER, Susan L. (Carolina Distinguished Professor; Director, Hazards & Vulnerability Research Institute, University of South Carolina, USA – geography, post-event field studies)
4. EISER, Richard (Professor of Psychology, University of Sheffield, UK – perception of risk)

5. JOHNSTON, David (Director, Joint Centre for Disaster Research, Massey University, New Zealand – vulcanology, disaster management)
6. LAVELL, Allan (Coordinator, Programme for the Social Study of Risk and Disaster, FLACSO, Costa Rica – social and developmental aspects of risk and disasters)
7. McBEAN, Gordon (former Assistant Deputy Minister, Meteorological Service of Environment Canada; Director, Policy Studies, Institute for Catastrophic Loss Reduction, University of Western Ontario, Canada – climate change, meteorology) CHAIR
8. MODARESSI, Hormoz (Director, Geohazards Bureau, BRGM, Orléans, France – geohazards, coastal protection, remote sensing)
9. PATEK, Maria (Fed. Ministry of Agriculture, Forestry, Environment and Water Management, Vienna, Austria – avalanches, torrents)
10. RENN, Ortwin (Professor, Institute for Social Science, University of Stuttgart, Germany – environmental sociology)
11. TAKEUCHI, Kuniyoshi (Director, Int. Centre for Water Hazard and Risk Management (ICHARM), Tsukuba, Japan – hydrology, civil engineering)
12. VOGEL, Coleen (BMW Professor of Sustainability, University of the Witswatersrand, South Africa – geography, environmental studies)
13. WIRTZ, Angelika (Head of NatCatSERVICE, Geo Risks Research, Munich Re, Germany – economic data on disasters)

Ex-officio members:

GUO, Huadong (Director-General, Center for Earth Observation and Digital Earth, CAS, Beijing)

HACKMANN, Heide (Executive Secretary, International Social Science Council)

MASKREY, Andrew (UN International Strategy for Disaster Reduction Secretariat)

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