Report on the Third Advanced Seminar for Forensic Investigations of Disasters (FORIN)

Held at first IUGG GRC Conference on "Extreme Natural Hazards and Their Impacts"
Chapman University, Orange, California, USA
8-11 December 2012

Introduction

The third Advanced Seminar on Forensic Investigations of Disasters (FORIN) was held during the first International Union of Geodesy and Geophysics (IUGG) Georisk Commission (GRC) conference on "Extreme Natural Hazards and Their Impacts," 8-11 December 2012, at Chapman University in California, USA. The Advanced Seminar was sponsored by the IUGG in partnership with the International Association of Hydrological Sciences (IAHS) and the Integrated Research on Disaster Risk (IRDR).

The third seminar provided an opportunity for reporting and commentary on FORIN research underway and proposed. Consideration was also given to the future development of FORIN research. It was agreed that further research, seminars and workshops should be encouraged and promoted, and that those involved be invited to join a Community of Practice (CoP) and remain in contact through a listserv on the IRDR website and managed by the IRDR's International Programme Office (IPO). Contributions to the listserv can include reports about past and planned future events, information about publications, news and exchanges of ideas.

The Sessions

The seminar took place in two sessions, on December 10 and 11, and involved the presentation of and extensive discussions on 11 papers, and included a plenary discussion on the future work of FORIN. The list of papers together with their authors and abstracts follows.

Session 1 (10 December):

- Ian Burton - "Forensic Disaster Investigations and the Epidemiology of Disasters"
- Anthony Oliver-Smith - "Longitudinal Analysis in the Forensic Investigations of Disasters (FORIN)"
- Djillali Benouar - "A Preliminary FORIN Study of the 2001 Algiers (Algeria) Flood and Debris Flow"
- Kuniyoshi Takeuchi - "Summary and Findings of ICHARM/CTI Quick Forensic Investigation of

GEJET"

- Roberto Barrios - "Post-disaster Community Resettlement and Reconstruction in Southern Honduras after Hurricane Mitch: Testing FORIN's Utility in a Central American Context"
- Emily Wilkinson - "From forensic analysis to action research: Using FORIN to strengthen resilience in volcanic areas"
- Luke Bowman - "Forensic Insight into the Root Causes of the 2009 Lahar Disaster at San Vicente Volcano, El Salvador"

Session 2 (11 December):

- Sálvano Briceño - Summary of the topic the previous day and preview of today's
- Anthony Oliver-Smith - "Case study: Haiti Earthquake"
- Ulrich Kamp - "The 2005 Kashmir Earthquake: Lessons Learned"
- Tina Kunz-Plapp - "CEDIM Forensic Disaster Analysis in Near-real Time: Methodological Challenges and Chances Applying FORIN Questions"
- Guido Lemoine - "Towards a common data collection framework in support to FORIN"
- Plenary Discussion: Prospects to Improve Theoretical FORIN Approach
- Discussion on the way forward (chairs: Ian Burton and Anthony Oliver-Smith)

Abstracts

- Ian Burton (University of Toronto, Canada, ian.burton@ec.gc.ca):
  Large scale disasters seem to be occurring more frequently and there is evidence that economic (insured and uninsured) and indirect losses are growing rapidly. The project "Forensic investigations of Disaster" has been launched within the ICSU-IRDR programme to probe more deeply into the underlying causes of disasters, in order that disaster risk management may learn more from experience and improve in effectiveness.

  This presentation outlines the methodology of forensic investigations that has been developed and which is available for use and testing. While all disasters have their unique stories it is expected that more general explanations will emerge from a meta-analysis of multiple case studies. Is it possible that such research could help to explain why disasters are growing and spreading like a disease? If many diverse disasters are found to have some common underlying causes it may be legitimate to speak of "an epidemiology of disasters" and to use the understandings developed to improve prescriptions for action.

- Anthony Oliver-Smith (University of Florida, USA, aros@ufl.edu):
  Since the main premise of the FORIN project is that the main causes of disasters are systemic, any examination of a specific disaster must be based on a close analysis of societal

structures and relations, including human-environment relations, both as they have developed over time and in the contemporary context. One of the principle methodologies of the FORIN approach is longitudinal analysis, which emphasises tracing through time the origins of the forces at work in the growth of vulnerability in the historical development of the context. This form of analysis should broaden and deepen the spatial and temporal scales in which disaster causation is understood. In some cases, where appropriate, even archaeological evidence may point to development trajectories that lead to greater exposure and/or vulnerability. The FORIN analysis will highlight the developmental reasons for the evolution of vulnerability and the expansion of exposure of population. Examples of the application of such a methodology will be drawn from a variety of cases including events in Peru, Honduras, Haiti, and the United States.

- Djillali Benouar (University of Science and Technology Houri Boumendiene, Algeria, dbenouar@usthb.dz):
  Disasters are increasingly being understood as "processes" and not discreet "events." Moreover, the causes of disasters are driven by complex engineering, socio-economic, socio-cultural, and various geophysical factors. Such interacting driving factors, occurring across a range of temporal and spatial scales, combine in numerous ways to configure disaster risks. The 2001 Algiers (Algeria) flood and debris flow will be explored using a new approach and methodology, namely Forensic Disaster Investigations (also called FORIN studies). The forensic task is perhaps similar to solving a picture of a disaster puzzle. Initially there are dozens or even hundreds of apparently disorganised pieces piled. When examined individually, each piece may not provide much information. Methodically, the various pieces are sorted and patiently fitted together in a logical context taking into account all the parameters. Slowly an overall picture of the disaster emerges. When a significant portion of the disaster puzzle has been solved, then it becomes easier to see where the remaining pieces fit. The Integrated Research on Disaster Risk (IRDR) programme is proposing new methodologies to examine the root issues surrounding the increase in disaster cost both human and economic. This paper attempts, as a case study, to investigate the Algiers (Algeria) flood and debris flows of November 10, 2001, which caused the loss of more than 714 human lives, injured more than 312, made missing about 116 and about 10,000 were homeless damaging more than 1500 housing units and scores of schools, bridges and public works.

- Kuniyoshi Takeuchi, International Centre for Water Hazard and Risk Management (ICHARM), Public Works Research Institute, Tsukuba, Japan, kuni.t@pwri.go.jp):
  A joint FORIN study team of ICHARM and CTO (Construction Technology Institute), Co. Ltd. conducted a quick forensic investigation of GEJET (Great East Japan Earthquake and

Tsunami) according to the templates given in Forensic Investigations of Disasters: The FORIN Project (IRDR FORIN Publication No.1 The work limited to the information sources mainly for the official documents by the governments, professional associations and academia with some additional investigations by the team in order to avoid unconfirmed data. The investigation revealed various difficulties in applying the current set of templates for such a large disaster as the GEJET. The summary of the quick FORIN study will be presented.

- Roberto Barrios, Department of Anthropology, Southern Illinois University, USA, rbarrios@siu.edu):
  Disasters are long-standing processes that are engendered in the ways people engage their environments and structure their social relationships. Moreover, disasters are not discreet events that come and go with the passing of storms, earthquakes or chemical spills, but are processes that can extend temporally well past the occurrence of a catastrophe. Furthermore, the social impacts of a disaster can be exacerbated by the distribution of disaster aid that is not suited to the environmental and cultural particularities of disaster affected sites. This paper reviews the case of two post-Hurricane Mitch community resettlement sites in Southern Honduras to show how disaster aid can either perpetuate conditions of community crisis or can help disaster survivors make important strides towards mitigation. These case studies show how disaster reconstruction policies on the part of international NGOs can articulate implicit assumptions about the nature of social wellbeing and community that are not shared by disaster survivors, and how rigid application of such policies can enhance the social impacts of disasters. Additionally, these case studies also show how "epistemological flexibility" on the part of NGO project managers is also a critical principle of adapting reconstruction aid to the particularities of disaster affected communities. These two case studies will be used to test the relevance of FORIN methodologies in post-disaster contexts.

- Emily Wilkinson, Climate Change, Environment and Forests, Overseas Development Institute, London, UK, e.wilkinson@odi.org.uk):
  Strengthening Resilience in Volcanic Areas (STREVA) is a four-year interdisciplinary research project funded by the UK NERC/ESRC Increasing Resilience to Natural Hazards Programme. It examines the interaction of dynamic factors contributing to disaster risk, including the volcanic hazard processes, scientific knowledge and monitoring methods, the exposure and vulnerability of people and their assets, the institutional capacities in place to reduce, prepare for and recover from the impact, and levels of communication between different stakeholders. Research will apply learning from three well studied volcanoes with recent eruption, known as "forensic volcanoes," to three high risk "trial volcanoes" that show signs

of unrest but are less well understood. The project aims to improve knowledge of the ways in which risk factors interact and can be characterised, analysed and monitored. A longitudinal approach is used to analyse the forensic volcanoes because their characteristic and effects make them "long-wave disasters." This analysis is divided in four specialised risk layers: volcanic processes and scientific uncertainty; hazard analysis and monitoring; vulnerability and community responses; and risk management and governance. Key events and changers in resilience within each layer are then identified along a common timeline.

This presentation on the use of FORIN to study and build resilience in volcanic areas will outline the forensic-to-trial volcano approach adopted by STREVA, including the critical cause analysis method that will be used to explain interactions and causal relationships between different layers of volcanic risk. The presenter will also discuss the ethical and intellectual challenges of translating findings from the forensic volcano to the trial volcano settings through action research.

- Luke Bowman (Michigan Technological University, USA, ljbowman@mtu.edu):
Paper prepared with Kari Henquinet and John Gierke also of Michigan Technological University, and Fredy Cruz of the University of El Salvador.

  El Salvador's location on the Pacific ring of Fire at the juncture of the Caribbean and Cocos plates exposes its population to various natural hazards, including volcanic eruptions, and slides, and flooding due to tropical rainfall events. This research was carried out over a 14-month-long period beginning in April 2011, one and a half years after an extreme rainfall event triggered landslides and lahars killing over 200 people on the northern flank of St. Vincent volcano in November 2009. This research investigates circumstances, causes and consequences of disaster losses and investigates the application and communication of scientific knowledge of disaster risk using social science methodologies. The 2009 landslide scarps and lahar deposits were mapped in the field and using satellite imagery with participation from affected townspeople, non-governmental organisation technicians, municipal government and Civil Protection employees, and University of El Salvador faculty. The mapping exercises, along with ethnographic and participatory methods, provide a clearer understanding of the circumstances and root causes of the 2009 disaster, including a colonial history marked by ethnic discrimination and laws prohibiting land ownership, lack of access to desirable land in an agrarian society, a poor education system, relatively young government institutions charged with predicting hazards and addressing risk, global economic policies that result in drastic inequalities, political marginalisation, unregulated construction of sub-standard dwellings in precarious locations, a long and bloody civil conflict, widespread violence and criminality, and a population that seemed to be unaware

of the risk. The project's post-disaster preparedness efforts were enhanced by the communication of scientific knowledge using participatory strategies that promoted stakeholder involvement in data gathering and technologically appropriate slope-monitoring techniques. The formation of volunteer-based, community-led, hazard-monitoring groups has been the most important outcome. These groups now lead data gathering field trips, actively collect rainfall-rate data, and use two-way radios to communicate information about volcano and weather conditions to the proper contacts with the hopes of improving warnings in the towns at the base of the volcano. The effectiveness of these efforts and advancements were tested during the Tropical Depression 12E emergency in October 2011, during which several strengths and weaknesses were identified. Modifications to the emergency response strategy were suggested by NGO and University of El Salvador practitioners; however, it remains to be seen whether these will be adopted. Continued collaboration with agencies and the University of El Salvador will facilitate future effectiveness of the disaster risk reduction interventions at San Vicente volcano, with the intent of developing a practical risk model for other similar risk situations.

- Anthony Oliver-Smith. Case Study: Haiti Earthquake. (Abstract to be supplied.)

- Ulrich Kamp (University of Montana, USA, ulrich.kamp@mso.umt.edu):
  The October 8, 2005 Kashmir 7.6 magnitude earthquake is illustrative of the intensity and scope associated with catastrophic earthquake disasters in mountainous regions. Several thousand landslides, mainly rock falls and debris falls, were triggered throughout the Himalaya of northern Pakistan and India during and shortly after the quake. The failures were highly concentrated and associated with six different geomorphic-geologic-anthropogenic settings. Several event-controlling parameters such as lithology and proximity to faults, rivers or roads had a strong influence on landsliding. Early prognoses stated that the extensive fissuring throughout the earthquake-affected region, together with freshly mobilised landslide debris, constitutes a potential ongoing hazard. Shrubland, grassland, and agricultural land were seen to be highly susceptible to future failures, while forest cover would increase slope stability. However, if the study area is still highly susceptible to an increasing landsliding is controversial. Instead results showed that the landscape returned to its equilibrium within only some years. Nevertheless, an understanding of the physical environment and physical processes is critical for reconstruction efforts in this earthquake-prone region. There is a need for planning and mitigation strategies that are sensitive to the mountain context and that focus on reducing earthquake vulnerability across the population, especially among high risk groups (e.g. women, children, elderly, and low-income households). Attempts to increase community

resilience, while fostering feasible interventions to reduce disaster risk across the population are assessed. This assessment underscores the apparent need to (re-)establish a seismic culture of prevention in northern Pakistan.

- Tina Kunz-Plapp (Karlsruhe Institute of Technology, Germany, tina-kunz-plapp@kit.edu):
  The Center for Disaster Management and Risk Reduction Technology (CEDIM, www.cedim.de) – an interdisciplinary research center founded by the German Research centre for Geoscience (GFZ) and the Karlsruhe Institute of Technology (KIT) – has embarked on a new style of disaster research known as Forensic Disaster Analysis. The notion of forensic disaster Investigations (FORIN) has been coined by the Integrated Research on Disaster Risk initiative (IRDR, www.irdrinternational.org) launched by ICSU in 2010. FORIN has been defined as an approach to studying natural disasters that aims at uncovering the root causes of disasters through in-depth investigations that go beyond the reconnaissance reports and case studies typically conducted after disasters. In adopting this comprehensive understanding of disasters, CEDIM adds a near-real time component to the assessment and evaluation process. By comprehensive is meant that most if not all, relevant aspects of disasters are considered and jointly analyzed. This includes the impact (human, economy and infrastructure), comparisons with recent historic events, social vulnerability, reconstruction and long-term impacts on livelihood issues. The forensic disaster analysis is thus best characterized as event-based research" through systematic investigation of critical issues after a disaster across various inter-related areas. The main scientific questions bein g addressed in CEDIM's forensic Disaster analyses are: What are critical factors that control loss of life, of infrastructure' and of economy? What are the critical interactions between hazard – socio-economic systems – technological systems? What were the protective measures and to what extend did they work? Can we predict patter of losses and socio-economic implications for future extreme events from simple parameters: hazard parameters, historic evidence, socio-economic conditions? Can we predict implications for reconstruction from these parameters? Implementing the forensic approach in near-real time requires (a) availability of global data bases regarding previous disaster losses, socio-economic parameters, building stock information, etc.; (b) leveraging platforms such as Earthquake Report, EERI clearing house, OCHA ReliefWeb and the many sources of local and international sources where information is organized; and 9c) rapid access to critical information (e.g., crowd sourcing techniques) to improve our understanding of the complex dynamics of disasters. The real-time approach additionally brings along methodological challenges and chances for applying the proposed FORIN research methods. Based on pilot forensic disaster analyses carried out in CEDIM, we explore how the FORIN methods are used in the near-real-time approach and how results of the near-real-time analyses could serve as an integral part of the FORIN approach.

- Guido Lemoine (European Commission, Joint Research Centre, Ispra, Italy, guido.lemoine@ec.europa.eu):

  Forensic investigations of disasters (FORIN) require a, still untested, comprehensive analysis framework, which combines information and data collected from diverse technical and socio-economic sources. Post-disaster needs assessments (PDNA) aim to combine economic damage and damage and loss enumeration with human and social impact analysis as input to a recovery plan. In a way, PDNA methodology can be considered as a sub-framework of FORIN, without the forensic analysis component dealing with the history and causal effects of pre-disaster state and circumstances. One of the key problems in PDNA is the consolidation of the damage and loss methodology with the humanitarian impact assessment. Historically, the damage and loss methodology was furthest developed, (GFDRR, 2012), and benefitted from its multi-year practical applications in many different disaster contexts. Humanitarian impact assessment to be less formalized, but has recently started to integrate information collection strategies and quantitative analysis methods in an effort to harmonize PDNA methodology across the various sectors and expert domains. Novel information sources, such satellite imagery, information from crowd-mapping and social media and knowledge capturing at local community level provide important inputs into FORIN (and PDNA) analysis activities. A key constraint in the effective use of traditional reference data sources and novel information sets in FORIN contexts remains the consolidation of such sources in a common data collection framework. These constraints exist in the planning, acquisition and analysis stages and relate to formalization of collection methods (how), quantification of the measured parameters (what) and statistical sampling and aggregation (where). This is particularly difficult for parameters that are not easily captured as “hard” measurables, many of which relate to the explanatory potential of FORIN analysis (e.g., community perception, relations between social elements and effective disaster reduction etc. We present some initial ideas derived on the basis of our involvement with PDNA, for discussion at the forum. In particular we show how spatial data sets, including very high resolution image time series, can play a role in stratification of sampling set-up to support different sectorial needs of the FORIN analysis.