

# INTEGRATION OF THE SCIENCE OF HIGH PROBABILITY UNPREDICTABLE HAZARDS INTO DISASTER REDUCTION PROGRAMMES: LESSONS FROM WEST SUMATRA



## Problem Statement

The first decade of the Twenty-First Century has witnessed some of the most devastating natural disasters in history, and as human vulnerability to these events continues to multiply, the trend continues to worsen. Research has shown that in disaster prone areas public education and awareness about a hazard is a fundamental prerequisite to the establishment of disaster resilient communities. However, as earthquake and tsunami of 24<sup>th</sup> December 2004 demonstrated, exposed communities are often unaware of hazards with a long recurrence interval (such as great subduction zone earthquakes and tsunamis), and thus alertness to future potential hazards is often absent. Similarly, humanitarian practitioners - who typically employ community-based participatory approaches to assessing risk - are not always fully aware of the potential threat posed by these hazards. This lack of awareness compromises their ability to develop effective community-based DRR initiatives and can leave their operations vulnerable, so affecting their capacity to respond to an emergency, as was seen in Haiti.

The scientific community can play a key role in helping the humanitarian community overcome some of these problems through an effective exchange of hazard related information. This was emphasised during the World Conference on Disaster Reduction in 2005, where calls to strengthen information management and exchange networks between disaster experts, managers and planners across sectors were made (UNISDR, 2005). Positive impacts of science-humanitarian interaction were demonstrated following the 2004 tsunami, when satellite imagery and maps provided by the USGS helped emergency responders coordinate more effectively. However, while some practitioners benefited from access to technical and scientific information, others were left frustrated through lack of data, the unwillingness (of private scientific agencies) to share data, and slow communication (ESRI, 2006).

Such impediments to effective working relations between the two communities can only be overcome through an identification and characterisation of barriers, and learning from examples of good practice. However, to date there have been few investigations of the relationship between the scientific and humanitarian communities. In recognition of this need the University of Ulster, with Concern Worldwide and the British Geological Survey, recently undertook a one year collaborative research project, on the humanitarian community in the tsunami-threatened city of Padang, West Sumatra, and of the ways in which science is being used to inform their DRR (Disaster Risk Reduction) activities. The project focused on the foremost DRR NGO for earthquake and tsunami hazard in Padang, KOGAMI, and its relationships with other actors engaged in DRR in the city. From this case study more generic lessons were drawn on how science is used by the humanitarian sector and how the scientific and humanitarian communities can better interact with each other.

## Project Audience

Throughout the project findings have been presented to a range of humanitarian practitioners involved in disaster risk reduction and emergency response activities at global, national and local levels, and to a number of earth and social scientists whose research has implications for DRR. This was done through meetings and workshops, and helped to ensure the development of robust project outcomes. One of the project's key outcomes (the proposed development of a humanitarian-scientific committee for geo-hazards) was presented to humanitarian practitioners at a workshop in early September in University College London which was organised by the project partners. Through press releases and publication in academic journals, the project's findings and outcomes will be disseminated to a wider academic audience.

## Rationale for Collaborative Partnership

This collaborative learning and research project brings together The University of Ulster's Geophysics Research Group (UUGeophys), Concern Worldwide and the British Geological Survey.

UUGeophys is involved in a number of international collaborations concerning the threat faced by Indian Ocean countries and western Sumatra from future great earthquakes and tsunamis (McCloskey *et al.*, 2005; Nalbant *et al.*, 2005; McCloskey *et al.*, 2008; Main *et al.*, 2008; McCloskey and Nalbant 2009; McCloskey *et al.*, 2010). The group's leader, Professor John McCloskey, has, over the last 6 years, worked almost exclusively on Sumatran earthquakes and regularly comments on earth science issues for the national and international media where he argues for a stronger dialogue between earth science and the humanitarian community. UUGeophys has made a commitment in recent years to promote the effective dissemination of this science in ways that are useful to the humanitarian and local community in western Sumatra. This commitment has involved not only engaging with local communities in western Sumatra, but also networking and collaborating with non-governmental organisations and government bodies involved in DRR there.

UUGeophys provided the project with an international scientific perspective on the nature, provision and communication of earthquake and tsunami hazard science for DRR. UUGeophys used their contacts within the international scientific community to provide feedback on the projects findings. By using UUGeophys links with DRR practitioners in Padang, the field team were able to fulfil their objectives within the required time. UUGeophys previous experience of conducting both earth and social science based research in Sumatra ensured that the fieldtrip ran smoothly and was cost effective.

Established in 1968, Concern Worldwide is a non-governmental, international, humanitarian organisation dedicated to the reduction of suffering and working towards the ultimate elimination of extreme poverty in the world's poorest countries. Working currently in 29 of the world's poorest countries, Concern's activities involve delivering emergency and long-term development interventions in areas such as livelihoods, health, HIV/AIDS, and education. Concern has made a strategic commitment to DRR and has vast experience of integrating DRR into their programmes. By drawing on this experience, Concern provided the project with an international humanitarian perspective on the application of science within DRR and wider development programmes.

The British Geological Survey (BGS) is a world-leading supplier of objective, authoritative and current geoscientific expertise and information. This supports decision-making for government, commerce and the public, both nationally and internationally. It collaborates with multidisciplinary partners on projects to facilitate knowledge

exchange and capacity building for international development and risk reduction. As part of the Earth Hazards science programme, BGS is responsible for earthquake monitoring in the UK. Its scientists therefore interact extensively with the public, media, industry, and government.

The collaborative partnership between these organisations has raised a number of examples of good practice and barriers that may hinder the effective absorption of science by NGOs. These findings are potentially transferable to other institutional and disaster prone contexts.

## Research Methodologies

### Padang Case Study

Scientists are in agreement that Padang is exposed to the threat of a major megathrust earthquake with the potential to generate strong ground shaking and a large tsunami. As this scientific consensus has developed momentum over recent years, so too has the level of tsunami and earthquake hazard DRR activities conducted by NGOs in Padang. Padang was therefore targeted as an appropriate case study site in which to understand how science is used for DRR by humanitarian practitioners, with specific emphasis placed on the identification of barriers and examples of good practice in this relationship.



*Figure 1: View of Padang city from Mt. Padang.*

The study focused on a small, locally run national NGO, based in Padang, KOGAMI. KOGAMI was chosen for specific examination for three reasons: UUGeophys had developed a working relationship with KOGAMI during previous research visits to Sumatra; KOGAMI are the predominant NGO orchestrating and executing mitigation and preparedness activities in Padang for earthquake and tsunami hazard; given the limited time scale of the project targeting an organisation with relatively few layers in their chain of command was deemed logical.

Representatives from the three partner organisations conducted a three week long field study in Padang in the spring of 2010 and employed a range of qualitative research methods to gather data. During analysis of the team's preliminary observations in the early stages of the field work it became clear that KOGAMI were part of a wider DRR network in Padang consisting of various stakeholders from all levels, including: national

governments, global humanitarian agencies, national NGOs and academic institutions. To fully appreciate the operations of KOGAMI, their influences and links to the scientific community, and to elicit generic learnings on the penetration of science into the humanitarian community in Padang, the field team engaged with a number of other key practitioners in this network. A brief pen-picture of each of these actors, including KOGAMI, is provided below:

### ***GITEWS (German-Indonesian Tsunami Early Warning System)***

A research consortium established between the German Federal Ministry of Education and Research (BMBF) and the Indonesian research ministry (RISTEK) in 2005 with the aim to develop a warning system that can widely disseminate reliable information to the public rapidly. GITEWS is operating in three pilot areas: West Sumatra, Bali and Java. The consortium will be handed over in its entirety to the Indonesian government in 2010.

### ***SurfAid International***

SurfAid have been operating health programmes in the Mentawai and Nias Island chain for the last ten years. More recently they have operated a successful multi-hazard emergency preparedness programme (E-Prep) in the islands. E-Prep is designed around three components: community awareness raising; community disaster contingency planning and capacity building; and disaster mitigation. SurfAid now hope to replicate the achievements of the Mentawai E-Prep programme in West Sumatra through their E-Prep road show. SurfAid has also responded to four large emergencies including the 2004 tsunami and the 30th September 2009 Padang earthquake.

### ***Mercy Corps***

Mercy Corps has worked in West Sumatra since 2005. They have permanent offices in the districts of Padang City, Padang Pariaman and Pesisir Selatan. Through the P3DM programme they are improving infrastructure and community relations between villages that are at high and low risk to tsunami hazard. This partnering scheme aims to encourage the prompt evacuation of people living in high risk to low risk areas, in the event of a tsunami warning. Mercy Corps promote community empowerment through their participatory approaches to hazard risk analysis and risk reduction.

### ***The Indonesian Red Cross (PMI)***

The Indonesian Red Cross (PMI) is legally recognized as the official disaster response agency in West Sumatra. They are protected and recognized under Indonesian law, and operate under government mandate. Each province in Indonesia has a PMI, and these receive funding from the budgets of their respective provincial governments. The West Sumatra PMI is a partner of BPBD. In West Sumatra the PMI has been involved in DRR programmes for a range of hazards since 2003.

### ***UNDP (United Nations Development Programme)***

After Indonesia became a signatory of the Hyogo Framework for Action (HFA) in January 2007, the UNDP channelled resources into Indonesia to implement the agreement at national, provincial and district level. One of their first roles was to facilitate the enactment of Indonesia's new Disaster Management Law. Since the law was passed in 2007, the UNDP has facilitated the government's implementation of a comprehensive legal and institutional framework for DRR in Indonesia. Some of this work has been undertaken as part of the Safer Communities through Disaster Risk Reduction (SC-DRR) programme.

### ***National and provincial government disaster management agencies (BNPB; BPBD)***

Major disasters in 2004 and 2006 provided momentum for the enactment of a new Disaster Management Law in 2007. The new law marked the beginnings of a shift in attitudes amongst the public, media and within Government as to the need to take a more integrated and hands-on approach to disaster management, and has resulted in the on-going evolution of the disaster management structure in Indonesia (OCHA).

As a result new permanent national, provincial and district disaster management agencies were formed. BNPB operates at national level and coordinates all contingency, preparedness, mitigation, training and prevention activities in the pre-disaster phase. In the response phase of a disaster BNPB will be given extraordinary powers, including the right to access financial and material resources from any government ministry, and has the command and control of the coordinated responses of all actors (government, international organisations and NGOs). BPBDs operate at provincial and district level, and are now responsible for anticipating and preparing for upcoming disasters.

### ***KOGAMI***

The Tsunami Alert Community (KOGAMI) is the most prominent disaster risk reduction NGO for earthquake and tsunami hazard in Padang. They were founded on 4th July 2005 following scientific recognition of Padang's exposure to tsunamigenic earthquake hazard, and heightened public apprehension towards tsunami and earthquake hazards in the aftermath of the Aceh-Andaman and Nias events. KOGAMI's current Executive Director (Patra Rina Dewi) is also a founding member of the organisation. Today, KOGAMI employs 15 members of staff and receives programme funding from both national and international partners including UNESCO, UNDP, Mercy Corps, SurfAid International, Andalas University and Trocaire. Their programmes are tailored to connect with all sectors of Padang society including schools, government, communities, the private sector and the media.

## Field Methods

The research methods used in this study included semi-structured interviews and naturally formed and selected focus groups. The founding member of KOGAMI and local Padang resident, Patra Rina Dewi was selected as a key informant for these interviews as she had served as KOGAMI's Executive Director for over 4 years, and has experience of engaging with international and national scientists on DRR issues in Padang. Focus group discussions were conducted with KOGAMI's beneficiaries during field visits to sub-districts of Padang City. These field visits were organised and led by KOGAMI's Public Relations Officer. The Public Relations Officer also acted as the group's translator during these discussions (Fig.2). Focus group participants included representatives from community Disaster Preparedness Teams (DPTs). The field team also conducted a focus group with a school DPT in the Tabing region of Padang. Following this meeting, the field team participated in an evacuation drill organised by leaders of the DPT.

KOGAMI are highly respected DRR practitioners in Padang, thus the field team's close association with KOGAMI helped them gain access to other key informants working for organisations involved in DRR activities in the city. Engagement with these stakeholders was also facilitated through the use of semi-structured interviews and focus groups.



*Figure 2: Fieldtrip participants meeting with a community DPT in the Tabing sub-district of Padang.*

Overall, twenty semi-structured interviews with DRR practitioners – each lasting for approximately two hours - were conducted during the fieldtrip. These interviews explored the following themes:

1. Nature of DRR activities conducted in Padang for earthquake and tsunami

- hazards
2. Key DRR messages disseminated to the public for earthquake and tsunami hazard
  3. Appropriate community behaviour expected in the event of a tsunamigenic earthquake
  4. Information used to inform DRR initiatives/ sources of this information/ routes used to access information
  5. Nature of relations with international and national scientists
  6. Interpretation of community and institutional response to the 30th September Padang earthquake
  7. Interpretation of government disaster management agencies

A further five semi-structured interviews were conducted with members of the community to understand their experience during the 30th September earthquake, and what factors influenced their response decisions.

All field activities were facilitated by a local research assistant and translator. In addition, secondary material in the form of donor and research reports proved an important means of eliciting background information on the DRR stakeholders and the Padang context.

## Principle Activities

### **Pre-Padang (23<sup>rd</sup> October 2009- 20<sup>th</sup> April 2010)**

Prior to the Padang field campaign three meetings were organised between the project partners. These were held at the University of Ulster's Coleraine Campus, the British Geological Survey and at Concern Worldwide's headquarters in Dublin. These meetings were used to:

- Introduce the group to the Padang case study and provide background to the project
- Develop the project's aims and objectives
- Outline roles and responsibilities
- Develop work plans
- Plan for the Padang field campaign
- Develop close working relationships

### **Padang Fieldwork (21<sup>st</sup> April-17<sup>th</sup> May)**

Representatives from each of the partner organisations including Rachel Shannon (UUGeophys), Susanne Sargeant (BGS), Peter Crichton (Concern Worldwide) and Max Hope (UUGeophys) participated in the fieldtrip. The leader of UUGeophys was due to travel to Padang also; however flight cancellations resulting from the volcanic ash cloud prevented this. Rachel spent three weeks in the field; Susanne and Peter two weeks; and Max one week.

UUGeophys was responsible for the overall management of fieldtrip. This role involved: organising meetings and focus groups with DRR practitioners; planning field trip excursions; arranging and coordinating transportation; hiring a local translator; and controlling and overseeing expenditure. The fieldtrip participants attended interviews and focus groups together, with each using their own perspective to tease out relevant information from the respondents. Three fieldtrips to the regions of Padang Pariaman and Taping were organised. Four focus groups were conducted during these fieldtrips with School and Community Disaster Preparedness Teams (DPTs). A total of twenty-five semi-structured interviews were conducted throughout the fieldtrip. During interviews and focus groups, members of the field team took notes documenting respondents' insights. These notes were then combined and typed-up into a document during group meetings held in the hotel foyer at the end of each day. These meetings were also used to re-cap on the project's aims and objectives, identify research gaps and plan future fieldtrip activities. The field team also held regular skype calls with the project leader based at UUGeophys, to provide updates on activities and to receive direction when needed.

## Post-Padang

### Teleconferences

Following the fieldtrip numerous teleconferences were held between the project partners. These teleconferences were used to:

- Provide an overview of activities undertaken in the Padang fieldtrip
- Analyse and disseminate observations made during the Padang fieldtrip
- Discuss aims and objectives of the Donegal DRR Workshop
- Outline roles and responsibilities for the group during the Donegal Workshop
- Discuss aims and objectives of the London DRR Workshop
- Discuss the date, venue and format of the London Workshop, and identify potential invitees.

Following each teleconference meeting notes and a work plan were typed-up and circulated to the group.

### Donegal Workshop (9-13<sup>th</sup> June 2010)

The Interdisciplinary Disaster Risk Reduction workshop in Donegal was organised by UUGeophys with the aim of bringing earth scientists and the ELRHA group together to share findings and discuss future funding opportunities. Approximately thirty participants with backgrounds in earth science, social science and humanitarian emergency preparedness and response, attended the workshop. The workshop was divided into seven sessions spanning over three days. ELRHA project representatives from UUGeophys and Concern Worldwide presented on the following themes:

- Background to science, society and disaster preparedness in western Sumatra
- Institutional and community response to 30<sup>th</sup> September 2009 earthquake
- Background to the ELRHA project
- Overview of the NGO Humanitarian Community and its understanding of DRR
- The role of science in DRR: some initial findings from Padang, West Sumatra

The ELRHA director chaired a breakout session designed to elicit feedback from the workshop participants on themes related to the ELRHA group's findings. Workshop participants were divided into four groups. Each group was chaired by an ELRHA group member. The breakout groups were asked to provide feedback on two key questions:

1. What are the obstacles to the take-up of science that you have either directly encountered or envisage?

## 2. How can these obstacles be cleared?

The feedback was then presented by the group chairs in a plenary session and documented.

### London Workshop (1<sup>st</sup> September 2010)

The group's Workshop on the Communication of Natural Hazards Science to the Humanitarian NGO Sector had three key aims:

- to present key learnings from the ELRHA project to a humanitarian audience
- to propose the formation of a science - humanitarian consultative committee for the formalising and systematising of information flow from natural hazards science to international development
- to receive critical feedback on this proposal and gauge levels of support from the humanitarian community

The workshop was held in University College London and attracted participants from key humanitarian agencies. The workshop was preceded by a planning meeting held between the ELRHA project partners in Save the Children's headquarters on 31<sup>st</sup> August.

The workshop was organised into three sessions:

1. Formal presentations: ELRHA project representatives and associates from UUGeophys, Concern Worldwide and KOGAMI drew on results from the Padang fieldtrip and their own experiences to evidence the importance of having a strong formal, systematic humanitarian-scientific interface to facilitate better communication and working relations between the two communities for DRR and development planning.
2. Presentation of committee idea: UUGeophys presented a draft outline of the nature, function and structure of the proposed committee.
3. Breakout and feedback session: The workshop participants were divided into groups and asked to provide feedback on three questions:
  - i. Identify 3 examples of where earth sciences have contributed to programming choices and prioritisation
  - ii. What are the major challenges in accessing and using earth science?

- iii. If the proposed committee is convened what would be the one thing you would want it to do for your organisation?

The groups were each chaired by a member of the ELRHA group. The chairs then provided feedback in a plenary session.

4. Panel Discussion: This session was chaired by the ELRHA Director and provided the workshop participants with an opportunity to critically assess and question the committee idea.



Figure 3: Executive Director of KOGAMI, Patra Rina Dewi, presenting at the ELRHA Workshop on the Communication of Natural Hazards Science to the Humanitarian NGO Sector on KOGAMI's development and their positive and negative experiences of working with the scientific community.

## Main Findings

### KOGAMI's Relationship with the Wider Scientific Community

Since 2005, KOGAMI have developed and maintained strong relations with the international scientific community. They communicate regularly with a number of scientists who are leading experts in their respective fields, including those based at institutions such as CALTECH, the National University of Singapore, United Nations University, the Franzius-Institute for Hydraulic, Waterways and Coastal Engineering, and the University of Ulster. However this is done in quite an informal way. There is no formal procedure that KOGAMI follows in its correspondence with this wider community of scientists; a friendly email is the most commonly used. Similarly, there is no systematic way for this scientific contact base to be enlarged or broadened. KOGAMI would like to form better relations with Indonesian scientists, however there is no formal, systematic way for this to be done.

KOGAMI's interactions with international scientists appear to have developed from an initial face-to-face meeting or encounter in Padang and in an *ad-hoc* way. For example in 2005, one of KOGAMI's Executive Director's former colleagues organised an informal meeting between KOGAMI and two palaeoseismologists who had been conducting a brief research visit to Padang. Upon meeting, the two scientists were able to confirm to the group (KOGAMI had not yet been established) that Padang was exposed to tsunamigenic earthquake hazard. This provided KOGAMI's current Executive Director with a further incentive to establish the organisation, and marked the beginning of a long and fruitful relationship between KOGAMI and scientists from CALTECH and the National University of Singapore. The relationship has been sustained through regular email contact, and visits from these scientists to KOGAMI's headquarters in Padang. KOGAMI's relationship with UUGeophys has developed in a similarly *ad-hoc*, informal way, and has been sustained through regular email contact and visits of representatives from UUGeophys to Padang. KOGAMI's links with scientists from Andalas University developed through the Executive Director's personal contacts, while KOGAMI's interaction with GITEWS came about through word-of-mouth. KOGAMI's relationship with GITEWS has been strengthened over the years following GITEWS's appointment of a former KOGAMI employee to its Padang office. The initiative, warm personality and strong communication skills of KOGAMI's Executive Director have helped develop and sustain these close bonds. In addition, the Executive Director's strong academic background and ability to speak fluent English has assisted the organisation's communication with international and national scientists. Informal and personal relationships are central to KOGAMI interaction with the wider scientific community.

KOGAMI's relations with scientists appear to be based on friendships rather than formal roles. The informal way in which the two communities were brought together helped initiate the evolution of these friendships. The nature of these relations, appears to

have enabled trust and mutual understanding to develop reasonably quickly. As a result the Executive Director of KOGAMI finds scientists approachable, and when contacting them directly is always assured of a quick response. Similarly, many scientists on the Executive Director's contact list will forward journal articles containing the most up-to-date research on the Sumatran subduction zone and subsequently offer to talk KOGAMI through the articles, which the organisation may otherwise *'find difficult to understand'* (Executive Director, KOGAMI). The scientists in question appear to be adhering to an unofficial code of conduct when dealing with KOGAMI. This underlying willingness to help and respond quickly to needs seems to have developed through their personal ties with KOGAMI's Executive Director and a strong association with Padang City.

### What Science?

The science that KOGAMI use for their community-based tsunami and earthquake hazard awareness and preparedness initiatives tends to be simple, non-technical and uncontested. For example, one of the key tools KOGAMI have used to inform their initiatives is the zonal map presented in figure 4a.

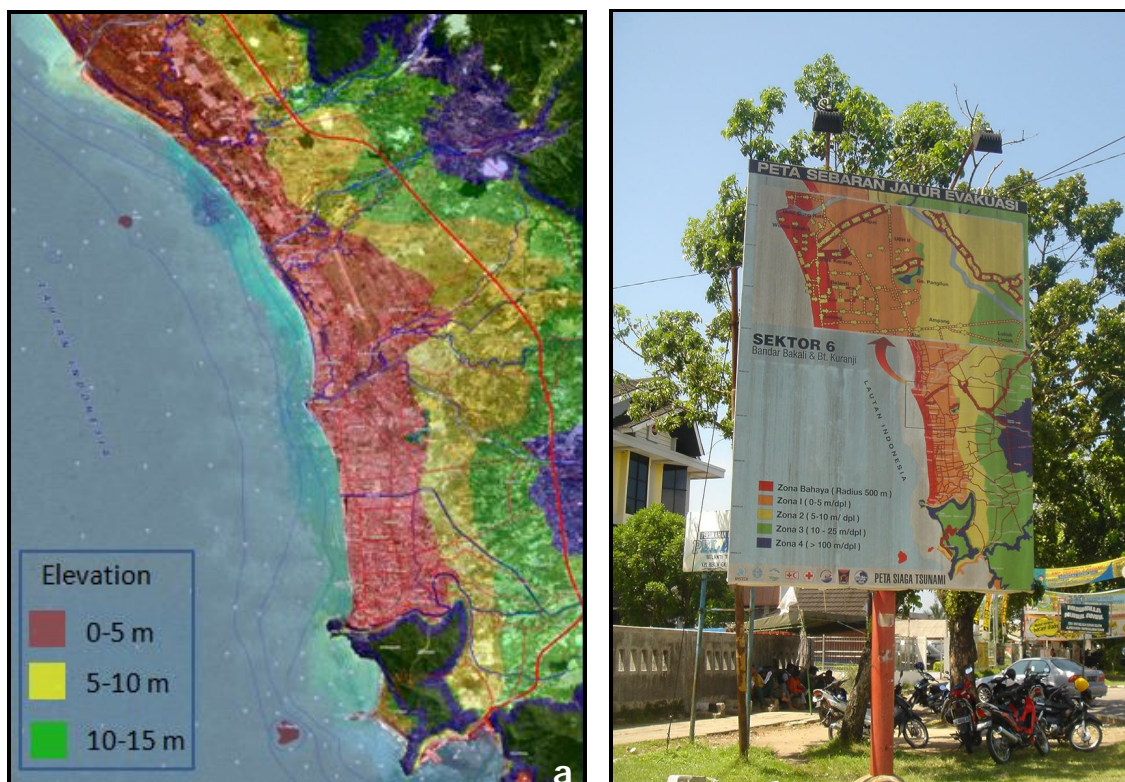


Figure 4a: Zonal map of Padang City; Figure 4b: Evacuation billboard at city centre junction.

The zonal map depicts evacuation routes over a shaded topographic digital elevation model of Padang City, with land elevations (metres above sea level) categorised and colour-coded using red (0-5m), yellow (5-10m), green (10-25) and blue (25-100m) shades. The map was used by joint KOGAMI and government initiatives as the basis for the development of simpler and more striking and practical evacuation maps. These maps were mounted onto billboards and positioned along the city's coastal road and at busy city centre road junctions (Fig. 4b). The maps served to heighten awareness of the threat of earthquakes and tsunami and implied that the risk of tsunami inundation decreased as elevation increased. Combined messages communicated in conjunction with the maps include: land lower than 5 m above sea level is dangerous; land between 5 and 10 m above sea level is relatively safe, but be alert; land above 10 metres is safe. Depending on the area inhabited, communities are encouraged to use the zonal map to plan an evacuation to an area 10 m above sea level, by either moving inland to high ground or moving up an evacuation structure, within 30 minutes of a tsunamigenic earthquake. The map is still used today to form the basis of community and school preparedness plans designed by KOGAMI's DPTs, and can be found in its raw or a slightly adapted form in hotels. Many larger scale evacuation drills are also designed with direct reference to the map.

Padang, like many localities at risk from earthquake hazard, is frequently subject to unsubstantiated rumour and scaremongering of the threat of an earthquake, and this can undermine legitimate DRR activities. In these instances, KOGAMI have drawn on their connections with the wider scientific community to help sustain the authority of their DRR work. For example, in the aftermath of the 30th September 2009 earthquake, a local scientist informed the press that Padang was no longer under threat from tsunami hazard. This statement contradicted UUGeophys' 2010 *Nature Geoscience* publication which warned that the threat of a great tsunamigenic earthquake on the Mentawai patch of the megathrust was unabated, and that the people of Padang must continue preparing for this event (McCloskey *et al.*, 2010). When the media contacted KOGAMI for comments on the opposing messages, the Executive Director, in need of scientific guidance, contacted UUGeophys to seek direct clarification on Padang's exposure to imminent tsunami hazard. Quick access to credible, clear messages from scientists enabled the Executive Director to confidently publicly reaffirm the importance of DRR activities for earthquake and tsunami hazard in Padang.

KOGAMI have also used other simple scientific outputs, such as photographs, to heighten awareness of Padang's exposure to tsunami hazard. For example, a group of Japanese scientists captured images of damage in Bengkulu following a destructive tsunamigenic earthquake in September 2007. KOGAMI subsequently used these images to persuade Padang residents that threat from a destructive tsunami was real, as the Executive Director commented:

*"the images really helped as communities started to take the threat of tsunamis more seriously.....they realized for themselves just how damaging a small tsunami could be"*

In April 2010, a new tsunami hazard map was produced for Padang. This map is based on more complex, contested forecasted scenarios of earthquake rupture and tsunami inundation. The map was produced by a consortium of both national and international research institutions, and took three years to develop. The 2010 map will prove important for KOGAMI in terms of programme planning and improving organisational capacity for emergency response. However, the Executive Director commented that the map: *“would not make much of a difference in terms of the community education KOGAMI provide.....the basic information that KOGAMI provide to communities will not change”*.

## Challenges

While KOGAMI are enjoying good relations with the scientific community, the field team identified some potential weaknesses in these arrangements, and wider humanitarian-scientific interactions.

- *Relations KOGAMI have developed with scientists cannot necessarily be replicated by other agencies*

KOGAMI's links with scientists have emerged from unplanned, informal and unsystematic interactions. While the nature of the formation of these partnerships does not appear to be having a detrimental impact on KOGAMI's initiatives at present, other organisations such as SurfAid, who have just launched their own DRR initiatives and who desire to have links with credible scientists, have no systematic framework to follow to effectively communicate with the scientific community in a fashion similar to KOGAMI.

- *KOGAMI's scientific capacity is potentially weak without its Executive Director*

While KOGAMI's capacity to access, understand and effectively harness scientific information appears good, the responsibility and skills required in developing and sustaining this capacity appears to lie solely with the organisation's Executive Director. Since KOGAMI's establishment, the Executive Director has engaged heavily with earthquake and tsunami scientists. As a result, KOGAMI have been given access to scientific papers and conferences and, to an extent, been mentored through scientific issues by some leading international researchers. The Executive Director has also received training from a Tsunami Science and Preparedness workshop at the University of Washington. If the Executive Director were to resign from KOGAMI it is unlikely that KOGAMI's strong scientific capacity could be sustained as so much of it is based and reliant upon the Executive Director's experience, passion and interpersonal skills. The Executive Director has commented that to increase KOGAMI's scientific capacity employees need to receive specialist disaster management training. However, there are no courses of this nature available in Sumatra, and KOGAMI do not have the resources to support such an initiative. There is an additional need to strengthen and develop the scientific capacity of other NGOs involved in DRR in Padang, as the Executive Director is currently being used by other DRR practitioners to 'translate' complex science into practical advice. This is putting an additional strain on KOGAMI's resources.

- *Tensions with political structures*

KOGAMI's close links with the scientific community have helped increase their public credibility, and provided them with the authority to act and comment on DRR issues. However, their status as experts means that they are often taken advantage of by the State, which frequently uses KOGAMI for training and publicity purposes. At the same

time the State provides KOGAMI with few resources and KOGAMI's financial sustainability remains relatively vulnerable and weak.

- *Tensions with the media*

KOGAMI are often approached by the media and asked to comment on DRR and scientific issues for earthquake and tsunami hazard. Due to misinterpretations by the media, KOGAMI's messages are often disseminated inaccurately. In the past this has created tension and distrust between the two groups. To combat this problem KOGAMI are taking steps towards training the media in how to interpret hazard related information accurately. In other contexts, relations between the media and scientists have been damaged due to the media's inability to communicate uncertainty. Unrealistic expectations from the media and wider public as to what scientists can provide, and poor scientific communication of uncertainties were deemed obstacles to the effective absorption of science by the public and humanitarian practitioners at the Donegal Workshop.

- *Timescales: long vs. short*

Scientists typically work on long timescales, whereas the humanitarian community sometimes must respond to challenges immediately. As witnessed in Padang, these opposing operating timescales can lead to frustrations and delays in important humanitarian work. For example, because of delays in the production of the new tsunami hazard map, KOGAMI were unable to plan certain programmes. Many of these delays occurred because the scientists were being overly protective of their data and refused to share it openly with project partners. Humanitarian practitioners felt largely helpless in quickening the development of the map as the researchers involved were all being funded externally. Furthermore, there was concern that if the production process was rushed, the quality of the map would diminish.

- *Abstract theory vs. Practical usefulness*

Scientific research on earthquake and tsunami hazard on the Sumatran subduction zone is disseminated through peer-reviewed scientific papers. These papers are designed to communicate with other scientists involved in that respective field, and are not always driven by practical application. They thus tend to be written in an abstract, technical way. As a result, it is difficult for people who are not specialists in that area to understand the value of scientific papers for DRR, and extract information from them that is both relevant and practical. Fortunately, practitioners like KOGAMI have more success in applying information from papers and conferences in their DRR work using their own scientific capacity, and close relations with scientists. However, not all DRR practitioners in Padang were in this position and thus were reluctant to engage with scientists and scientific papers because it was a confusing and time consuming process. Alternatively, scientists have found that end users can have 'unrealistic expectations' as to the practical usefulness of scientific papers. Meeting these expectations further

eludes the scientific community as they have difficulty in identifying end users and understanding their needs.

- *Specialised vs. holistic knowledge*

Scientists by nature tend to be specialists, with their focus often constrained to a very specific field. Humanitarian practitioners however have to engage in a wide array of economic, governmental, health and environmental issues on a daily basis, and thus are, by nature, often generalists. For humanitarian practitioners to engage more effectively with scientists they should not have to detract their attention from important development issues to search for appropriate and credible scientific contacts, and spend time piecing together technical information from specialist areas. Fortunately for KOGAMI, they communicate with individual scientists who can provide both a specialist and holistic perspective on threats from earthquake and tsunami hazard on the Sumatran subduction zone. However, not all scientists undertaking research in disaster prone regions are able to bring complex information together in a digestible way, nor do they necessarily have the skills to communicate with the humanitarian community in this manner. Without this ability, distance between two communities will remain.

- *Ongoing debate vs. Trust*

Science by definition is a questioning, sceptical, critical activity and when this is played out in front of practitioners it can be detrimental to relations and undermine trust. For example, during consensus meetings between scientists and DRR practitioners for the new tsunami hazard map, there was often disagreement and debate between the scientists. While many external scientists would interpret these encounters as an intrinsic component of scientific research, one humanitarian practitioner who observed a standoff between two scientists at a meeting noted that: *"my organisation does not need to know the specifics, we just need the basics"* (SurfAid, DRR advisor). SurfAid's opinion of the scientific community seemed to diminish slightly upon witnessing this encounter as the DRR advisor further commented that *"the problem with scientists is that they never agree"* and that these particular scientists were *"just showing off"*. Clearly, consideration needs to be given as to how the scientific and humanitarian communities can communicate with each other in a more neutral way, and how uncertainty can be communicated without compromising the trust of end users.

## Value of the Collaborative Partnership

### *Contribution from Partners*

The head of the University of Ulster's Geophysics Research Group led the initial project bid and the subsequent project. UUGeophys provided the ELRHA group with earth and social scientific background, and perspectives on the Padang case study. Using their contact base and drawing on their previous research experience in western Sumatra, UUGeophys made advanced logistical arrangements for the fieldtrip. UUGeophys hosted the first ELRHA group meeting on 23<sup>rd</sup> October 2009 and, in addition, arranged and hosted the visit of KOGAMI's Executive Director to the UK for the London Workshop on the Communication of Natural Hazards Science to the Humanitarian NGO Sector. UUGeophys organised, hosted, funded and chaired the Donegal Interdisciplinary Disaster Risk Reduction workshop. UUGeophys interdisciplinary contact base was used to invite participants to the Donegal and London workshops. Throughout the project, UUGeophys have been responsible for project reporting, and management of the project's financial budget. UUGeophys have also been responsible for maintaining frequent communication between the partners. Using their scientific contact base, UUGeophys discerned the level of scientific support for the scientific-humanitarian committee before proposing the idea to the humanitarian community at the London Workshop. This involved a visit to London for meetings with earth scientists prior to the Workshop. UUGeophys have also taken a lead on presenting on the project at workshops and seminars. UUGeophys will be leading the project's academic outputs.

Concern Worldwide have provided the project with a valuable humanitarian insight as to the actual nature and complexity of Disaster Risk Reduction and Emergency Response humanitarian work. Concern's experience of engaging with global, international, national and local humanitarian practitioners and communities, has helped the project partners understand more clearly the needs of user communities. Concern provided constructive input to the initial project bid. They have taken a proactive role in sustaining communication with the project partners, and hosted a project meeting in Dublin on 19<sup>th</sup> February 2010. They engaged heavily in the Padang fieldtrip. Concern played a vital role in drawing participants to the London Workshop. They also presented at this event and the Donegal Workshop.

BGS have provided scientific input and took a lead in exploring and submitting future funding opportunities that built on the project's achievements. They also hosted a meeting on 25<sup>th</sup> January 2010. They have contributed to the development of project reports and took an active role in the Padang fieldtrip. They also helped chair workshops and facilitate breakout groups.

### *What worked well?*

The Padang field campaign was a central component of the project and helped to focus the minds of the partners during early meetings and exchanges. It gave the partners a prolonged opportunity to become immersed in real-life issues and direct experiences surrounding the scientific-humanitarian interface in the Padang context. As the partners were all based in Padang during the fieldtrip, full attention was channelled on the field activities and wider project issues. The fieldtrip provided the partners with an opportunity to exchange experiences, knowledge and ideas relating to the project, and in addition facilitated team-building. Subsequently mutual understanding and stronger working relationships developed. During the fieldtrip the partners held meetings each night where findings were discussed, analysed and interpreted. The participants were thus in a good position to disseminate fieldtrip results at the Donegal Workshop, which was held shortly after the fieldtrip ended. The partners also had an opportunity during the fieldtrip to make preliminary plans for the London workshop. As representatives from each of the partner organisations participated in the field trip it helped to unite the project, and provided the partners with common ground.

The teleconferences enabled the partners to engage with each other irrespective of location, and were very cost and time effective. The face-to-face meetings and workshops were also important as these helped bring people from interdisciplinary fields together in a focused and bounded way.

### *What was difficult?*

In general, we consider that problems were relatively minor and did not really hinder the smooth progress of the project. Following the Padang fieldtrip it proved more difficult to maintain the group's focus on the project as individual partners were forced to respond to pressures from other aspects of their work, however this is hardly surprising given the busy schedules of all of the participants.

It proved more difficult for all the project's partners to meet face-to-face as the project progressed. This was mainly as a result of the partners' other work commitments, which required them to travel internationally at very short notice. However, these challenges were overcome effectively through the use of teleconferences.

As strong working relations between the projects partners had not been developed prior to the project, perhaps it took longer to settle into a comfortable working relationship during the project than might have been expected.

### *Lessons*

For many of the project's partners, it was the first project of this nature that they had been involved in. Some lessons can be drawn from the workings of the partnership that can be passed on to others who are interested in collaborating in this way:

1. Partnerships that bring together different sectors are valuable as they broaden minds and challenge conventional ways of thinking. They also open doors and enable knowledge exchange across disciplines, and encourage innovation.
2. Basing a partnership around a shared and 'time defined' activity helps to focus minds, channel thinking, develop mutual understanding and trust, and breed familiarity.
3. Roles and responsibilities of the various partners should be established early in project.
4. It is important to build in commitments and activities across the course of the partnership to sustain momentum, focus and communication.
5. When scientists and humanitarian practitioners meet, they should be sensitive to each other's 'language' and the differences in the terminology that they use. Systematic efforts must be made to facilitate communication in a neutral, useful way.

## The Impact on the Problem

The project:

- Produced an in-depth case-study of the ways in which science is used by a local NGO in Padang. This has allowed more general lessons to be drawn for other NGOs and for wider recommendations to be made.
- Enhanced the relationship that Concern Worldwide and KOGAMI have with the earth science community.
- Stimulated debate amongst the scientific and humanitarian communities in the UK (London and Donegal workshops).
- Resulted in an innovative recommendation to build on the strengths and eradicate the weaknesses on the scientific-humanitarian relations identified during the project. The ELRHA partners have proposed the formation of a science - humanitarian consultative committee to formalise and systematise information flow from natural hazards science to international development agencies. The idea was presented at the London Workshop on the Communication of Natural Hazards Science to the Humanitarian NGO Sector. The proposal was backed by representatives from: CAFOD, Christian Aid, Care International, Oxfam GB, Tearfund, Save the Children and Concern Worldwide. Meetings to define the parameters of progressing with the proposal will be conducted in the coming weeks.

## Long Term Plan

### *The International Science-Humanitarian Consultative Committee (ISHCC)*

The main practical outcome of the project is the formation of the ISHCC. Meetings are planned for the development of this idea and there is real commitment from a group of important international NGOs to ensure its establishment. We envisage these meetings producing a draft of the operational rules for the ISHCC before the end of November. Prof. McCloskey is arranging to meet with key international scientists at the American Geophysical Union Fall Meeting which is held in San Francisco in December. If all goes to plan, the first meeting of the ISHCC should happen early in 2011.

### *NERC-ESRC Natural Hazards programme*

Members of the ELRHA group are preparing a consortium bid for the NERC-ESRC Natural Hazards programme bid. The scoping proposal deadline is 7<sup>th</sup> October 2010. The proposal will focus on the integration of advances in earthquake science and the

prospective testing of the resulting methodologies on real earthquakes. In parallel with this scientific work, the proposal will extend the work of the ELRHA project in the analysis of operational environment of NGOs and government agencies leading to improvements in the operation of the ISHCC and the development of parallel systematic training and consultative bodies.

### *NERC Knowledge Exchange Fellowship*

The ELRHA project, and the relationships that have developed between the project partners as a result, have been key to the development of a successful NERC Knowledge Exchange Fellowship proposal. The aim of this two year project (due to commence in September 2010) is to enhance knowledge exchange between the humanitarian and earthquake science communities by implementing several initiatives. These include an earthquake information dossier to inform NGO programming and supplement community-based approaches to assessing risk, a code-of-conduct for scientists whose work has implications for disaster risk reduction, preparedness and response, and a partnering scheme to broker relationships between NGO staff and scientists working in the same geographic regions. The project will act as a bridge between the Padang project and future initiatives, capitalising on the momentum that has already been generated.

## Outputs

The key outputs of this project have been:

- Development of science - humanitarian consultative committee for earthquakes
- NERC-Knowledge Exchange Fellowship
- UUGeophys will take the lead on writing two academic papers; one targeting a social scientific journal, and the other targeting an environmental policy journal

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