Public Forum

Fifth Regional Platform for Disaster Risk Reduction in the Americas
March 7 - 9, 2017 | Montreal, Canada | #SendaiAmericas

Towards Risk Informed Sustainable Development

Transforming Lessons Learnt from Communicating 2015 Gorhka-Nepal Geohazards to the Canadian Context

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8 March 2017
Introduction

Interdisciplinary Literature

Context: April 2015 Gorkha-Nepal Earthquake Sequence

How Post Event Information Is Transmitted

  What is Crisis Mapping

  Why Does it Matter?

  Preliminary Research Results

Efficacy of Hazard Risk Communication

  View One: Innovations in Science Communication

  View Two: Framing Effective Risk Communication

  View Three: Barriers to Media Risk Communication

Summation

Lessons Learnt from 2015 Gorkha-Nepal EQ Sequence for the Canadian Context

What we Have Covered
Introduction

The April 2015 Gorkha-Nepal Earthquake Sequence provides an excellent case study to evaluate how geohazard risk specialists communicate the 2015 Gorkha-Nepal Earthquake Sequence geohazard risks.

**Purpose:** provide guidance for future initiatives that communicate geohazard risk for disaster relief and recovery efforts.

**Objectives:**
- Profile innovative science data collection systems, new technological applications, information exchange platforms and information products utilized during the geoscience research response to the 2015 Gorkha-Nepal Earthquake Sequence.
- Provide lessons learnt that could be applied to Canada

**Methods**

Literature and case study review; interviews with stakeholders (email, telephone and face to face); hazard event program document files and data review.
Informed by Interdisciplinary Literature

- volunteer geographic information,
- geospatial information for disaster risk management,
- participatory community development

Volunteer Geographic Information Literature

- 2015 Association of American Geographers Eye on Earth Initiative
- 2014 Association of American Geographers and Global Spatial Data Infrastructure
- 2010 Geomatica
- 2008 GeoJournal
The user’s potential to supply GI is promising enough that researchers are now exploring the role of citizens in augmenting the means of geospatial data collection. VGI is an online, distributed information production model in which citizens are considered to be a legitimate source of geographic information. Citizen-contributed [georeferenced hazard risk] ....information is promising, especially in situations in which other sources are costly or unavailable (Goodchild, 2007)”. Budhathoki 2011
Context

NEPAL EARTHQUAKE OVERVIEW
Last Updated 04/27/15

7.8 MAGNITUDE
DEPTH 15 KM
2015-04-25 9:11 UTC

EPICENTERS
By Magnitude
4 - 5
5 - 6
6 - 7
7.8
SOURCE: USGS

INTENSITY
The Modified Mercalli (MM) Intensity Scale*

SOURCE: USGS as of 4/27/2015
* MM is a measure of ground shaking and is different from overall earthquake magnitude as measured by the Richter Scale. The MM is based on a 1-12 class scale.

Active USAID/OFDA DRR Programs in Kathmandu Valley

PROGRAM KEY

Humanitarian Coordination and Information Management
Logistics and Relief Commodities
Natural and Technological Risks
Risk Management Policy and Practice
Shelter and Settlements
Water, Sanitation, and Hygiene
Past Aftershocks of the Gorkha Earthquake from April 25 to June 25, 2015

Explanation:
- **Main Shock**
  - Time (Since Main Shock):
    - 1 Day
    - 2 Days
    - 3 Days
    - 5 Days
    - 1 Week
    - 2 Weeks
    - 3 Weeks
    - 1 Month
    - 2 Months
- **Magnitude**
  - < 4.5
  - 4.5 - 5.0
  - 5.0 - 6.0
  - > 6.0
## Context

### Nepal is a Disaster Hotspot

Fragile geological conditions, extreme weather events, geographical and climatological conditions, steep and rugged topography, and also because of its landlocked position—bordered by China in the north, and India (east, south and west).

### 2008 Hazard Risk Profile - Nepal's 75 districts

- 64 of 75 districts are prone to natural hazards
  - 49 districts are prone to floods and/or landslides,
  - 23 districts to wild fires
- Natural hazards have caused an average of 938 deaths per year (timeline: 20 years)
- Floods, landslides and avalanches cause
  - 76 percent of economic losses,
  - 84 percent of adversely affected people
  - 25 percent of deaths (UN Report)

### The 1971-2006 Inventory: Past Disastrous Events

Epidemics takes the largest toll of life every year

Principle hazards (extent and frequency of occurrence)

- landslide,
- flood (including the flash floods)
- urban or rural fire

### 2015 Nepal Relief Operations and External Assistance

On 25 April and 12 May 2015, two major earthquakes struck Nepal. Nearly 9,000 lives and over a half a million homes have been destroyed.

Nepalese Mobilized:

- 22,500 civil servants,
- 65,059 staff (Nepal Army)
- 41,776 staff (Nepal Police)
- 24,775 staff (Armed Police Force)
- 4,000 government and private health workers

134 international Search and Rescue teams from 34 countries

- 4,236 helicopter flights
- 7,558 persons rescued by air
- 4,689 persons rescued by land

GEOSCIENCE FACTS:
KATHMANDU AREA/GORKHA FAULT ZONE

Risks posed by four major geophysical processes:
1. An active earthquake belt between Tibetan and Indian plates
2. Many active crisscrossing fault lines in The southern and western areas;
3. Kathmandu city is located ancient lakebed, prone to liquifaction
4. High probability of another large-scale earthquake event.
Context

EQ Hazard Risk Preparedness Initiatives

This project developed a new model for national-international project partner relationships.

- Key lessons learnt were flexibility of funding agency, awareness raising, low-tech approaches emphasis on community level work, and long-term process of developing institutions.
- Acknowledges the barriers to implementing a DRM program: Project implementation is helped and hindered by NGO status, transparency initiatives were difficult but valuable, and school earthquake safety drew criticism, http://www.iitk.ac.in/nicee/wcee/article/0788.pdf
EQ Hazard Impact Assessment

Figure 2: Share of Disaster Effects Across Sectors

Source: Estimations by PDNA Team
Crisis Mapping: How Post Event Information Is Transmitted

What is Crisis Mapping

• Post disaster primary and secondary sources of information is gathered by new technological applications during the international response to fulfill end users data needs
• Geoinformation is mapped to communicate real time hazards, risk and vulnerability

Why Does it Matter?

• In each disaster event, new response teams are deployed.
• These international teams develop new data management platforms for disaster relief efforts and find different ways of collaborating on big data projects, turning the data into insights for more users
• A number of end-users use these maps in the response phrase
• Enables better understanding of roads, damaged buildings and infrastructure so emergency services could get access to injured and buried people
• Eliminates hazard and high risk concerns for volunteers
How Post Event Information Is Transmitted

Crisis Map Process: Three Main Steps

- Gather info from direct sources, social media & professional media
- Reports are made to map & verified by CM team
- Verified reports are categorized & mapped

Innovative science data collection systems, new technological applications, information exchange platforms and information products
How Post Event Information Is Transmitted

Information Layers: Crisis Map Information Architecture
How Post Event Information Is Transmitted

Information Layers: Crisis Map Information Architecture

Innovative science data collection systems, new technological applications, information exchange platforms and information products.
How Post Event Information Is Transmitted: Crisis Map Information Architecture

Information viewpoint for the TweetComP1 Architecture Middleton et al 2014.
How Amateur Mappers Are Helping Recovery Efforts In Nepal

A crowdsourcing satellite-imagery site that made headlines when Malaysian Flight 370 disappeared last year is now being used to plot parts of Kathmandu in need of aid.

AARIAN MARSHALL | @AarianMarshall | Apr 28, 2015 | 1 Comment
Live Crisis Map of Pictures from both Twitter and Mainstream Media showing *Disaster Damage*
Live Crisis Map of *Urgent Needs, Damage and Response Efforts* posted on Twitter

http://maps.micromappers.org/2015/nepal/tweets/
Preliminary Research Results: Gorkha-Nepal Humanitarian Data Collection and Exchange Platforms

<table>
<thead>
<tr>
<th>Information Sources</th>
<th>Mobile Platforms</th>
<th>Outputs - Nepal Crisis Maps</th>
<th>End Users</th>
</tr>
</thead>
</table>

6 Information Sources
6 Mobile Platforms
17 Outputs
5 End Users

DigitalGlobe releases preliminary Nepal earthquake crowdsourcing results

New imagery now available for download via Amazon Web Services
Nepal 2015 Example ....over 16,500 volunteers have used the Tomnod platform to compare the new satellite images with the old, placing 74,000 tags on major destruction areas, damaged roads, and ravaged homes. Their crowdsourced data is plugged into an algorithm that identifies frequent tag agreements to discover which areas are in need of the most help. That information is then made available to relief groups, who can use the images to target survivors in need of food, water, tents, and medical supplies.
Innovative Science Data Collection/Distribution Systems

Information Management And Exchange Challenges

Data management. Natural hazard, risk and vulnerability assessments require long term database management systems. Because crisis mapping is focused on the response, crisis mapping response reporting tends to not be fully incorporated into recovery planning due to data interoperability standardization/ methodological challenges

Hazard and Risk Information: Geoscience information collection (USGS and others) not effectively communicating what the geoscience facts tell us about the risks posed by the Gorhka zone to decision makers and the public during the emergency/ early recovery phase

Mass Media: Journalists did not report how to overcome perceived hazard risks. Stated differently – reports did not expose the complex local/national land use planning, economic, political and social issues thwarting recovery planning. Nor did they suggest what actions could be taken by local decision makers to prepare for the risks posed by GH and other similar faults.
Efficacy of Hazard Risk Communication
View One: Documenting Innovations in Science Communication

Risky Ground
newsletter of the
Centre for Natural Hazard Research
Simon Fraser University

2015 June 21: Summer edition

http://www.sfu.ca/cnhr/newsletters/RiskyGround_Newsletter.pdf

1. Previous Earthquake/Tsunami Event Reporting
2. Earthquake Emergency and Earthquake Event
   • Does context add complexity?
   • Is response reporting undergoing a transition?
   • Is Natural Hazard Risk and Disaster Risk
     Readily Available?
   • Worst Disaster in 2015?

Information Innovations
   • A Review of the 2015 April and May 2015 Gorkha –Nepal Earthquake
     Sequence
   • Changes to Earthquake Research Response Teams
   • Recognizing a Variety of Hazard Risks associated with Earthquakes
   • Lessons that can be Drawn from the Gorkha-Nepal Earthquake Sequences
     for Canada
Sir Mark Walport
2015 UCL IRDR 5th Annual Conference – Keynote Address

Communicating risk and hazard to policy makers
Sir Mark Walport
Chief Scientific Adviser to HM Government

Communicating Risk in an Emergency: Nepal Earthquake

- **Risk Assessment** - What is the reasonable worst case scenario?
- Is there a risk of another earthquake?
- **Aftershocks** - How many, what magnitude, how long will they last and where might the occur?
- **Landslides** - Where have they occurred? What is the risk of further landslides?
- **Monsoon season** - What additional risks will this pose?
- **Geo-mapping** - What satellite data can we provide to aid the response?
Efficacy of Hazard Risk Communication
View Three: Barriers to Media Risk Communication

Experts call for innovative ways communicate disaster risks
07 Jun 2013

....Nepal is a disaster prone country, yet its inability to adequately communicate disaster risks in the media has resulted in little risk sensitization among general public—contributing to policy paralysis and slow improvement in the level of disaster preparedness.

....for the public, the risk remains masked in an abstract statistics...

UNDP Nepal Dialogue Series The Role of Media in Communicating Disaster Risks
Lessons Learnt

From Gorkha-Nepal EQ for the Canadian Context

Question: How To Harness New Data Management Platforms For Disaster Relief Efforts?

Range of Questions Accompanying Introduction of this Technology

Interpreters: Are there enough volunteer interpreters to interpret social media from multicultural networks of women, men and children?

Local Risk Mapping: Is there ongoing local stakeholder involvement in risk mapping during early recovery efforts?

Methodology: How compatible are Federal agencies’ post disaster assessments methodologies with the volunteer crisis mapping methodologies (what the key data interoperability standardization/ methodological challenges identified)?

Metadata: Is metadata in the digital field workflow being adequately managed?

Long Term: Do stakeholders acknowledge that natural hazard, risk and vulnerability assessments require long term database management systems?
From Gorkha-Nepal EQ for the Canadian Context

Question: How To Harness New Data Management Platforms For Disaster Relief Efforts?

Range of Questions Accompanying Introduction of this Technology

Risk Communication: What has been learnt about communicating geohazard risk in an emergency; and what has been learnt about communicating geohazard risk in early recovery planning while there are aftershocks?

Reporting Toolkit: Journalists need a reporting toolkit to expose the complex issues thwarting a large scale emergency response and recovery planning. More concretely, journalists require a reporting toolkit to provide accurate and strong coverage of:

• The geoscience facts of the natural hazards in the area that tell us about the risks posed by the hazard risk zones.
• Public policy: land use planning, economic, political and social implications
• Natural hazard risk basics that decision makers and the public must face
• What actions could be taken by local decision makers to prepare for the risks posed by natural hazards and other similar hazards?
Lessons Learnt

From Gorkha-Nepal EQ for the Canadian Context
How To Harness New Data Management Platforms For Disaster Relief Efforts?
What We Have Covered

Context: April 2015 Gorkha-Nepal Earthquake

How Post Event Information Is Transmitted

Preliminary Research Results
- innovative science data collection systems,
- new technological applications,
- information exchange platforms
- information product

Efficacy of Hazard Risk Communication

Innovations in Science Communication

Framing Effective Risk Communication

Barriers to Media Risk Communication

Lessons Learnt from 2015 Gorkha-Nepal EQ Sequence for the Canadian Context
Take Away Message

Lessons Learnt from Gorkha-Nepal EQ for the Canadian Context

• rapidly changing data management platforms for disaster relief and early recovery efforts
• range of questions accompanying introduction of new data management platforms for disaster relief efforts


Questions?

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