Risk-informed Governance and Innovative Technology for Disaster Risk Reduction and Resilience

Module 2.5: Humans as a Resource
Contents

1. Social Media
2. Crowdsourcing and Crowdfunding
3. Volunteered Geographic Information (VGI)
4. Citizen Science
Learning Outcomes

At the conclusion of this Session, Participants will be able to:

- Navigate social media to gain insight on or awareness of issues affecting disaster risk management, including emerging threats, active crises, long-term recovery, capacity building needs, and other issues.
- Understand how crowdsourcing and citizen science supports risk-informed decision-making.
- Utilize social media as a new communications channel.
Introduction

- Social Media
- Crowdsourcing
- Citizen Science
Introduction - Engagement

- Indirect and Direct Engagement

**Direct Engagement**
Public is:
- A ‘citizen scientist’
- Conscious/Active Participant
- A partner in the effort
- Supporting the organization’s goals
- Using standardized data formats
- Contributor may socialize results / outcomes

**Indirect Engagement**
Public is:
- Issuing communications that are ‘discovered’ rather than ‘received’
- Engaging in a manner that is more ‘matter of fact’ than intent
- Generally unaware of how their communications support a particular effort
Introduction - Engagement

- **Types of Engagement**

  - **Social Media**
    - Social Media Data Mining
    - Direct Engagement

  - **Crowdsourcing**
    - Citizens as Sensors
    - Crowdfunding
    - Volunteered Geographic Information
    - Citizen Science
Group Work and Activities
Discussion 1: Engagement for Resilience

- Engagement with community stakeholders has always been a critical component of the disaster risk management process.
- From hazard mitigation planning to prevent future disasters, to rebuilding a community in the aftermath of a disaster, disaster risk managers must engage with community members to both transmit and receive information, and to work out common problems together in a way that ensures representation in the outcome and thus, buy-in.

The Facilitator can lead a discussion with participants about the types of engagement that they have led or participated in at either the national or local level in their country.

Participants should consider:
  - What was the purpose of the engagement (e.g., communicating disaster preparedness messages; engaging on new building codes or land use plans; receiving requests for assistance in emergencies and disasters; conducting assessments of damages or needs)
Group Work and Activities

- **Discussion 1: Engagement for Resilience (continued)**

- **Participants should consider:**
  - How was the engagement facilitated (e.g., door-to-door canvassing; mass media interviews, announcements, or advertisements; school curriculum; community town hall meetings)
  - What were the advantages of these methods of engagement?
  - What are the disadvantages of this method of engagement?
  - Could technology have improved your ability to engage with the public? How? Examples include:
    - Greater geographic reach
    - More people engaged
    - Better data collection
    - Logistical or administrative advantages (no need to have volunteers or employees physically present)
    - Cost reduction and time reduction
"Social media has allowed the landscape of public information to evolve from a one-way communications system -- designed solely for message dissemination purposes -- to an engaging two-way conversation.” (US Homeland Security Working Group, 2016)

“Social media is now a common tool emergency management and response organizations turn to in order to interact with the public before, during and after a disaster event.” (Stephens, 2015)
1. Social Media

- Categories of Social Media Outlets
  - Social Networks
  - Blogs
  - Microblogs
  - Podcasts
  - Forums
  - Video Sharing and Hosting
  - Photo Sharing and Hosting
  - Wikis
1. Social Media

- Facebook

- Social media networking
- 2.45 billion monthly users
- 1.62 billion daily users
- 136,000 photos per second / 300 million each day
- 293,000 posts each day
- How it works:
  - Users share content (personal stories, pictures, videos, links)
  - Other users interact
- 43% of adults use Facebook as primary news source

Image Source: https://www.facebook.com/joinundesa/
1. Social Media

- **Twitter**
  - Social media microblog
  - 330 million monthly users
  - 100 million daily users
  - 340 million ‘tweets’ each day
  - How it works:
    - Users make posts limited to 140/280 characters
    - Posts can include multimedia or weblinks
    - Other users can interact
    - Posts are fully open to the public

Image source: https://twitter.com/UNDESA
1. Social Media

**Case Study: Facebook Disaster Maps**

- **Problem**: Population location and movement data changes significantly in a disaster.
- **Need**: Accurate data on population movements and location.
- **Obstacle**: Emergency services agencies do not have access to real time population location data.
- **Solution**: Partnership with social media platforms that people are likely to engage with in order to gather location data.

During natural disasters, access to timely information is scarce but can save lives

Video: Facebook Disaster Maps
Source: https://research.fb.com/blog/2017/06/facebook-disaster-maps-methodology/
1. Social Media

- **Social Media Data Mining**
  - Keyword / hashtag searches
  - Done to discover patterns / draw inferences
  - Especially useful for crises, emergencies, and disasters
  - Location specific tools exist

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[Image: A map with data points and a tweet from @guardian about a high-rise fire in Los Angeles, with a tweet from @hydrasfleece mentioning fire alarms and sprinklers not working.]
Group Work and Activities
Group Work and Activities

• Activity 2: Social Media Data Mining

• To illustrate how social media data mining can be used to identify problems, the Facilitator can have the participants conduct a data mining activity.

• Begin by dividing the participants into groups of 3-4 students per group.

• Assign each group a hazard. Examples include:
  - Fire
  - Storm
  - Earthquake
  - Flood
  - Epidemic
  - Explosion
  - Disaster

• Participants can use the Twitter mapper “one million tweets map” for this exercise. The site is located at the following URL: https://www.gislounge.com/twitter-map-last-one-million-tweets/

• Participants can confirm using twitter and a news search (e.g., news.google.com) to determine what they have found using the social media hashtag map.
1. Social Media

- Social Media Engagement
  
  - 2-Way Communication
  - A common yet vital component of a risk and crisis communications strategy
  - Social media has made citizens gatekeepers of information

Image Source: https://twitter.com/search?q=NEMA%20Barhamas&src=typed_query
1. Social Media

- **Case Study: India NDMA Facebook Page**

  - **Problem**: During disasters, information needs become acute.
  - **Need**: Regularly-updated and relevant information from a trusted source.
  - **Obstacle**: The media as gatekeeper of information can be challenging in the disaster environment.
  - **Solution**: Utilize social media to communicate important information to the public and to promote direct engagement.

1. Social Media

Benefits and Challenges of Social Media Engagement

Benefits:
- Real time information sharing
- Direct access to citizen network
- Ability to engage in 2-way communication
- Easy way for people to expand information reach
- Identification of rumors/false information

Challenges:
- Not everyone uses social media
- Rumor / false information easier to spread
- Information overload
- Outdated / stale information difficult to retract
- Reliance on infrastructure
Problem: Disasters present an opportunity for those with sinister intentions to spread misinformation.

Need: The ability to identify and counter misinformation.

Obstacle: Misinformation efforts will follow communication trends.

Solution: Track, filter, and otherwise address rumors on popular social media outlets.
2. Crowdsourcing and Crowdfunding

- **Crowdsourcing**
  - The public is a resource
  - Old concept, new approaches
  - People are equipped to assist in a broad range of ways:
    - Labelling photographs
    - Sharing information
    - Reporting incidents
    - Providing sentiment
    - Voting / brainstorming
    - Providing distance work
    - Designing products
    - Strategic planning

2. Crowdsourcing and Crowdfunding

- **Case Study: MH370 Image Search**

  - **Problem**: In some types of disaster, people cannot be located easily.
  - **Need**: The ability to search large areas quickly and cost effectively.
  - **Obstacle**: In person searches are limited by manpower availability and are often cost or resource prohibitive.
  - **Solution**: Crowdsources the effort by creating an easy-to-use platform that distributes satellite imagery to volunteers.

  ![Image: Screenshot of the Tomnod MH370 search platform. Source: Tomnod, 2014.](image-url)
## Case Study: Crowdsourcing Flood Resilience

- **Problem**: Information to inform disaster risk reduction efforts is often outdated, and therefore irrelevant or inaccurate.
- **Need**: Up-to-date data.
- **Obstacle**: Technical surveying efforts can be very expensive.
- **Solution**: Crowdsourcing of soil data for the purpose of building a comprehensive soil map.

2. Crowdsourcing and Crowdfunding

- **Case Study: Crowdsourcing Shelter**

  - **Problem:** Disaster affected populations may be displaced by disasters or lose their homes to damage/destruction.
  - **Need:** Emergency shelter, either in or near the impacted area.
  - **Obstacle:** Emergency shelters may not be available or appropriate for all people.
  - **Solution:** Use an established online housing brokerage platform to crowdsource emergency shelter.

2. Crowdsourcing and Crowdfunding

• **Case Study: Crowdsourcing Rescue**

  • **Problem:** Disaster rescue and assistance needs, notably in the first hours and days of the event, often exceed resources.
  • **Need:** Rapid matching of volunteers with requests for assistance.
  • **Obstacle:** Social media platforms allow for requests, but they must be ‘discovered’.
  • **Solution:** Platform that matches registered volunteers with assistance requests by location.

## Crowdsourcing Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Uses</th>
<th>Ready Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crowd Collaboration</td>
<td>Tasks requiring ‘crowd wisdom’; generating outside ideas</td>
<td>99Designs; X Prize; Quirky</td>
</tr>
<tr>
<td>Crowd Competition</td>
<td>Creating actionable solutions; developing prototypes; building a sense of community; generating ideas</td>
<td>Kaggle; OnnoCentive; Applause</td>
</tr>
<tr>
<td>Crowd Labor (microtasks)</td>
<td>Well-defined, everyday tasks for individuals that require general skills; On-site manual work; large crowds</td>
<td>TaskRabbit; Gigwalk; Streetbees; Samasource</td>
</tr>
<tr>
<td>Crowd Labor (mesotasks)</td>
<td>Well-defined tasks requiring specialized skills; routine but time consuming activities (data entry, mapping)</td>
<td>Lionbridge; Crowdflower</td>
</tr>
<tr>
<td>Crowd Labor (macrotasks)</td>
<td>Poorly defined or unstructured tasks/problems (e.g., strategy development); tasks requiring subjective judgment or specialized skills</td>
<td>10EQS; Wikistrat; OnFrontiers; Applause</td>
</tr>
<tr>
<td>Crowdfunding</td>
<td>Fundraising, Start-ups; High-transparency</td>
<td>Indiegogo, YouCaring; GoFundMe, MobileCause</td>
</tr>
<tr>
<td>Crowd Curation</td>
<td>Building and sharing knowledge</td>
<td>Wikipedia</td>
</tr>
<tr>
<td>User Generated Content</td>
<td>Building large content repositories</td>
<td>YouTube, Flickr, Wikipedia</td>
</tr>
</tbody>
</table>
2. Crowdsourcing and Crowdfunding

- **Case Study: Crowdsourcing Maps**
  - **Problem**: Disaster response operations are dispersed throughout large geographic areas, which influence those operations.
  - **Need**: Accurate maps.
  - **Obstacle**: In vulnerable places where disasters are most likely, accurate maps are least likely to exist.
  - **Solution**: Crowdsource mapping efforts using global and local volunteers.

Video: Maps Program Description.
2. Crowdsourcing and Crowdfunding

- **Case Study: FEMA Crowdsourcing Unit**

  - **Problem**: National emergency management organizations, and those at the subnational and local levels, may not have high enough information granularity to support accurate needs assessment.
  - **Need**: Information supported by on-the-ground volunteers / the public.
  - **Obstacle**: Capturing information in this manner requires standardization and an organized, funded effort.
  - **Solution**: Dedicated crowdsourcing unit at the national level to support crowdsourcing information collection and processing.

Video: Series of crowdsourced map created by the FEMA Crowdsourcing Unit during Hurricane Michael. Source: Sophia Liu, 2019.
2. Crowdsourcing and Crowdfunding

- **Crowdfunding**
  - Crowdsourcing money
  - Enhanced greatly by:
    - Internet technologies
    - Social media
  - Represents a growing portion of disaster philanthropy
2. Crowdsourcing and Crowdfunding

Case Study: Crowdfunding Disaster Relief

- **Problem**: While fundraising efforts of major NGOs garners billions of dollars annually, individual fundraising efforts can further support response and recovery.
- **Need**: An ability for individuals to fundraise beyond immediate friends and family.
- **Obstacle**: Individuals do not typically have access to resource development expertise.
- **Solution**: User-friendly crowdfunding platform.

The image shows screenshots of a fully-funded crowdfunding campaign from the GoFundMe Website. Source: GoFundMe, 2018.
3. Volunteered Geographic Information (VGI)

- **Volunteered Geographic Information (VGI)**

  - Crowdsourced data that contains a geospatial component
  - Results in the generation of a map
  - User interface may include a mapping interface (user enters data into a map), or the location data may be autogenerated by a sensor device (e.g., a mobile phone or cell tower)
  - Advantages and disadvantages
3. Volunteered Geographic Information (VGI)

VGI Applications

• Emerging threats
• Trends
• Exposure
• Vulnerability

3. Volunteered Geographic Information (VGI)

- **Case Study: VGI for Exposure Mapping**

  - **Problem:** Planning, mitigation and preparedness must be informed by accurate hazard exposure information.
  - **Need:** Accurate exposure maps.
  - **Obstacle:** For some hazards, like landslides, there is very little information about historical events to validate exposure assessments.
  - **Solution:** Provide a platform to crowdsource VGI of landslide incidents.

Image: Screenshot of the NASA Landslide Reporter map
3. Volunteered Geographic Information (VGI)

**Case Study: VGI for Situation Assessment**

- **Problem**: The disaster information that is actually known is almost always just a fraction of what needs to be known.
- **Need**: A platform that allows citizens to report needs.
- **Obstacle**: Individuals will have a range of capabilities or preferences for reporting their needs.
- **Solution**: Common platform to allow geo-located reports from multiple reporting methods.

Image: Screenshot of the Ushahidi ‘QuakeMap’ created by Kathmandu Living Labs
Source: Ushahidi, n/d.
4. Citizen Science

- Citizen Science

- Public enlisted to take an active role in scientific activity

- May include:
  - Data collection
  - Data processing
  - Data analysis/interpretation
  - Dissemination of results

- Crowdsourcing tech has expanded the reach/impact of citizen science

Image: Image of citizen scientist using the NASA GLOBE Observer Citizen Science app. The initial release of the app allows users to collect observations of clouds, which are a critical part of the global climate system. Additional types of observations are planned for GLOBE Observer, including land cover and the identification of mosquito larvae. The observations encourage the public to be more keenly observant of their outdoor environment and make their own field investigations.

4. Citizen Science

Levels of Citizen Science Engagement

- **Crowdsourcing**
  - Citizens as sensors
  - Basic measurements of river level, ground shaking, land-use change

- **Distributed intelligence**
  - Citizens as basic interpreters
  - Floodwater estimation using phone cameras and apps

- **Participatory science**
  - Participation in problem definition and data collection
  - Work with local farmers to develop smart irrigation practices

- **"Extreme"**
  - Collaborative science: problem definition, data collection, analysis
  - Long-term regional resilience building planning; many varied stakeholders

4. Citizen Science

- **Case Study: Citizen Science to Support Exposure Mapping**

  - **Problem**: Hyper-local exposure maps can better support planning and response
  - **Need**: Mapping on a hyperlocal level
  - **Obstacle**: Local mapping is expensive and can be logistically impossible across large areas
  - **Solution**: Distributed sensor network installed and submitted by citizen scientists
4. Citizen Science

- **Case Study: Flooding Information Using Citizen-Provided Data**

  - **Problem**: In order to be aware of an emergency accurately, image data must be collected immediately.
  - **Need**: Data from citizens around the area where the damage occurred using a smartphone are needed.
  - **Obstacle**: Data acquired with a regular smartphone does not include position and attitude information.
  - **Solution**: By developing an app for smartphone that transmits information including position and attitude information to a cloud server when data is acquired, the location and shooting direction of the data provider can be displayed on a map.
4. Citizen Science

- **Use of Technology for Citizen Science**
  
  • Prevalence of smart phones and internet connectivity has increased citizen science opportunities
  
  • Past two decades have been a major expansion
  
  • Technology building new pathways for engagement
  
  • Online Citizen Science (OCS)

![Image: Screenshot of the EU citizen Science Online Platform](source: Digital Earth Lab, 2020.)
4. Citizen Science

- **Case Study: Weather Underground**

- **Problem:** Weather monitoring services tend to apply a single data point across a wide geographic area.
- **Need:** Widespread micro-area monitoring capabilities.
- **Obstacle:** Weather monitoring equipment to cover all populated areas is expensive, and it may not be possible to monitor in all areas due to land ownership.
- **Solution:** Network of citizen scientist weather watchers equipped with self-purchased weather monitoring equipment.

4. Citizen Science

- Citizen Science Challenges
  - Data Quality
  - Data Inconsistency
  - Data Bias
  - Public Fatigue
  - Ethics and Privacy
  - Technical Challenges
  - Resource Challenges

4. Citizen Science

- **Case Study: Citizen Science Capacity Development Support**
  
  - **Problem**: NGOs are playing a larger role in DRM, but do not always have the capacity to make risk-informed decisions
  
  - **Need**: Public participation through citizen science initiatives
  
  - **Obstacle**: Low capacity among NGO stakeholders to utilize citizen-generated data
  
  - **Solution**: Capacity development program to support civil society organizations’ use of data crowdsourcing, including citizen science

Image: Diagram of Citizen Generated Data initiatives in the DataShift database mapped to the Sustainable Development Goals (SDGs).
Group Work and Activities
Group Work and Activities

● **Discussion 3: Promoting Citizen Science for Community Resilience**

● Citizen science is best served when national and local policies are supportive.

● The Facilitator can ask Participants to discuss the following the questions as they apply to their own countries:
  • Can you provide **examples of policies/projects/initiatives aimed at using/promoting citizen science to build resilient communities**? Do these projects incorporate a gender approach?
  • What are the main challenges confronted in implementing citizen science in your country?
  • **How are new technologies** (e.g. ICTs, AI, drones, big data, internet of things) being used to facilitate or citizen science for resilience building in your country?
  • What are the **main barriers** (e.g. technical, regulation, culture) for implementation and scaling up citizen science efforts in your country?
  • **Which policies are needed to address these barriers**?
## Key Readings


Thank you