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

Module 2.5: Humans as a Resource

Division For Public Institutions and Digital Government

UNDRR Global Education & Training Institute *With the support of*

Ministry of the Interior and Safety

Incheon Metropolitan City

1

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.

- **Social Media**
- **Crowdsourcing**
- **Citizen Science**
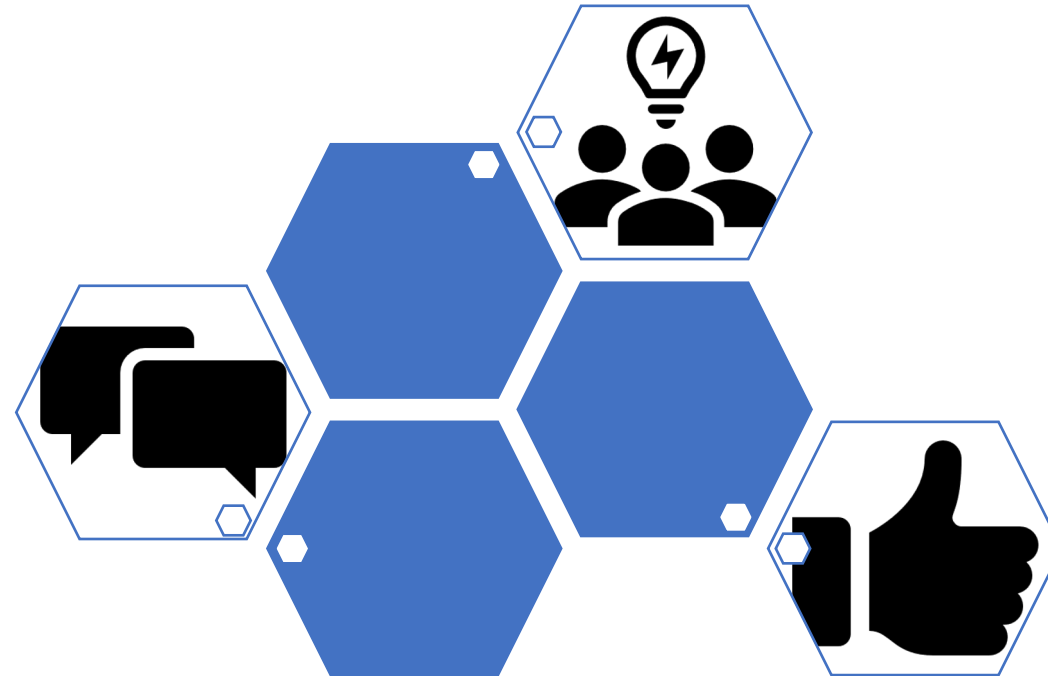
- **Indirect and Direct Engagement**

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
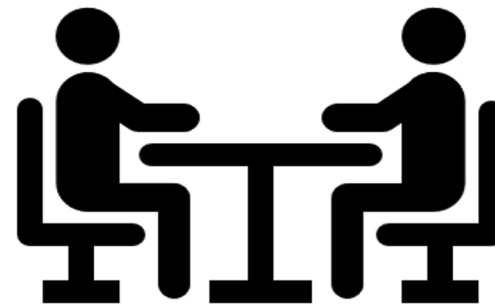
- **Types of Engagement**

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)

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

|	
*"**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)

Image Source: https://images.app.goo.gl/deh9j6ruraftGZsBA

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Categories of Social Media Outlets

- Social Networks
- Blogs
- Microblogs
- Podcasts
- Forums
- Video Sharing and Hosting
- Photo Sharing and Hosting
- Wikis
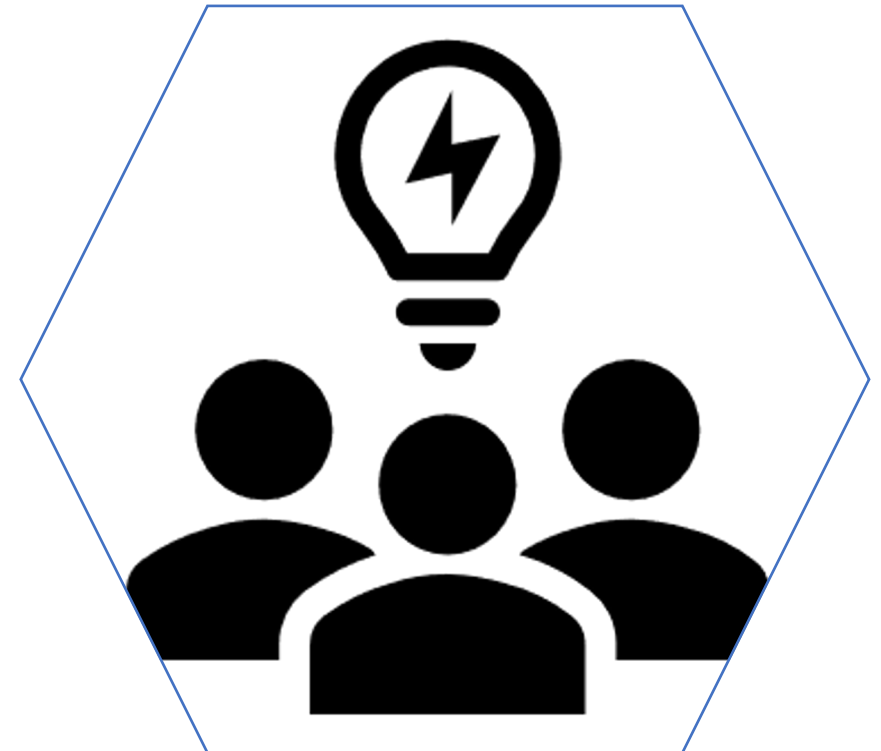
Facebook

- 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/

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
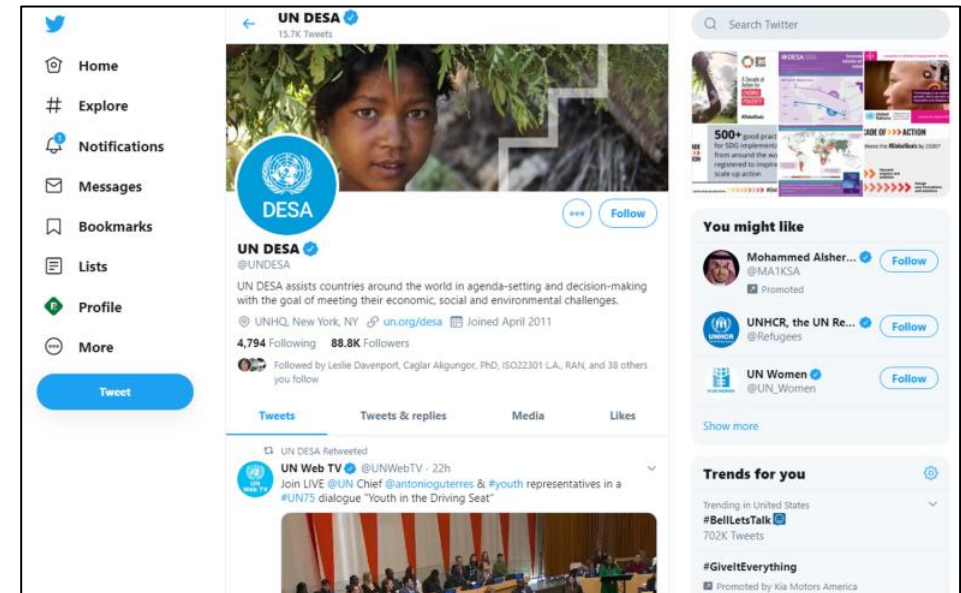 - Posts are fully open to the public

Image source: https://twitter.com/UNDESA

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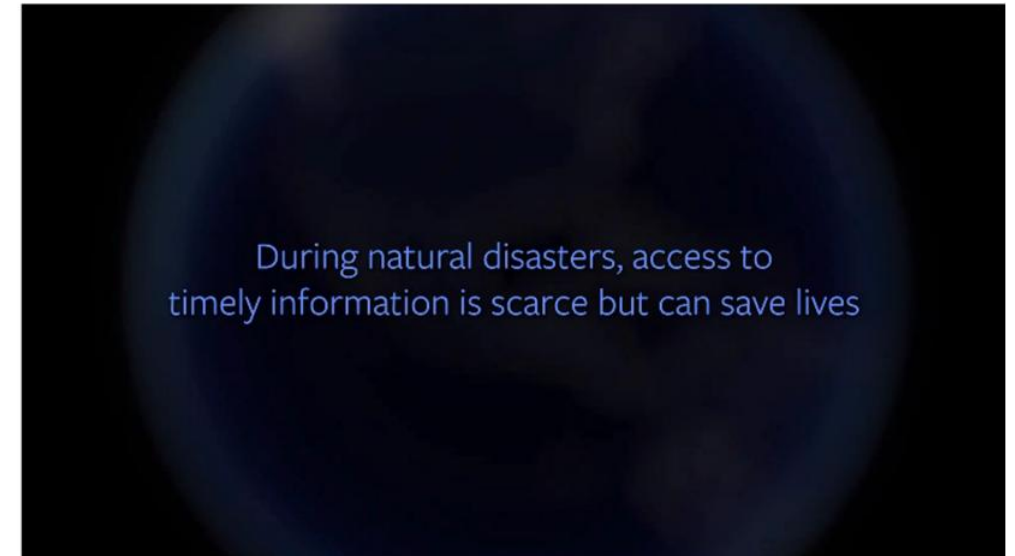
Video: Facebook Disaster Maps
Source: https://research.fb.com/blog/2017/06/facebook-disaster-maps-methodology/

Social Media Data Mining

- Keyword / hashtag searches
- Done to discover patterns / draw inferences
- Especially useful for crises, emergencies, and disasters
- Location specific tools exist
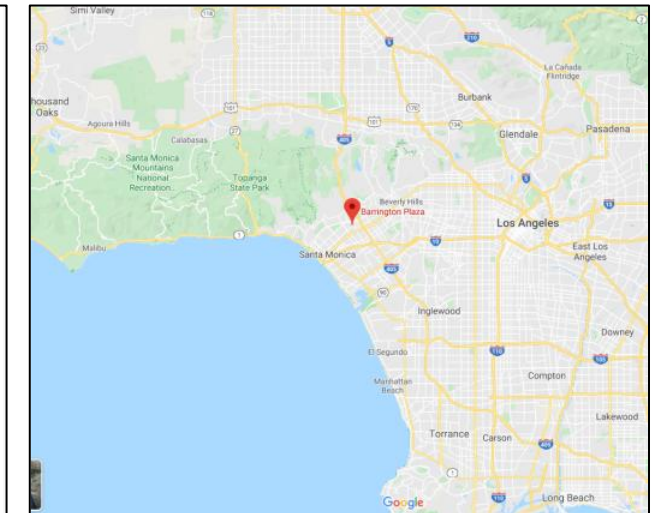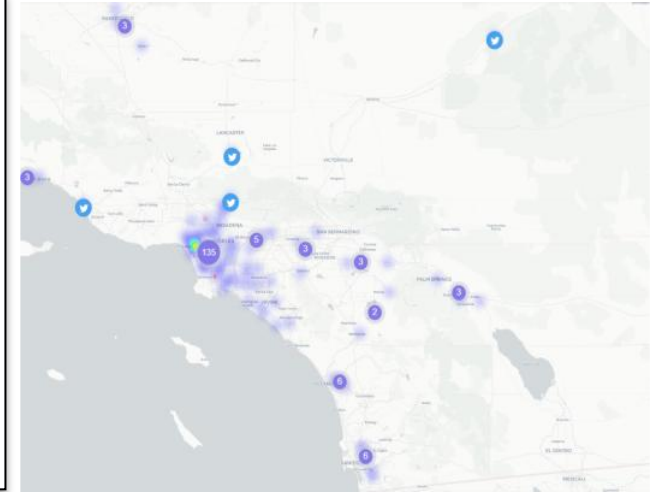
Group Work and Activities
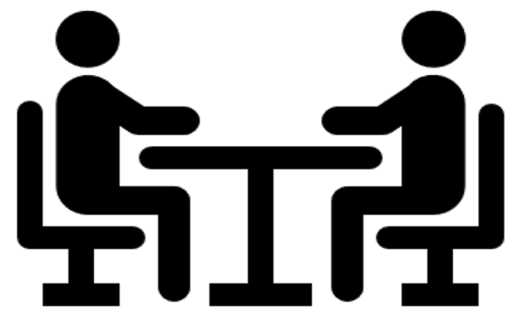
▪ **Activity 2: Social Media Data Mining**

▪ 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.

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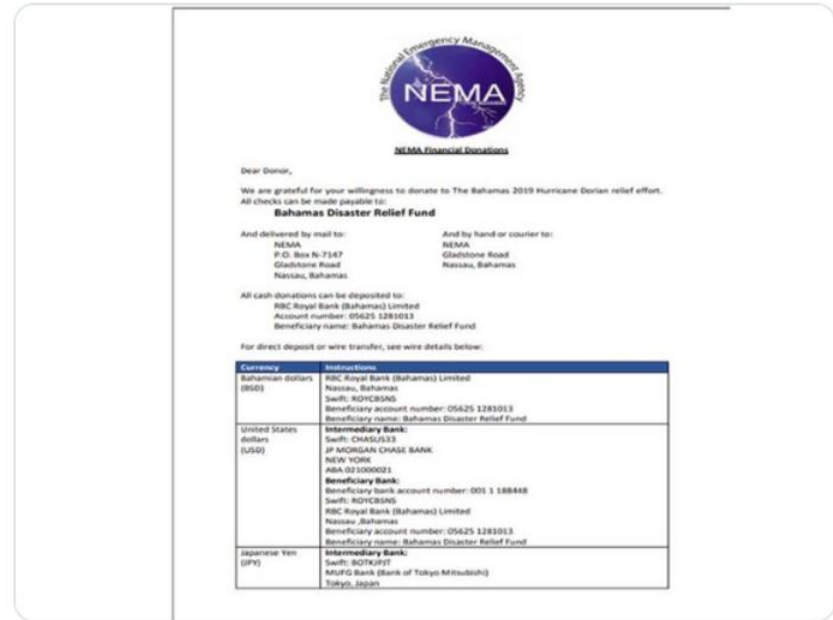
Image Source: https://twitter.com/search?q=NEMA%20Barhamas&src=typed_query

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.
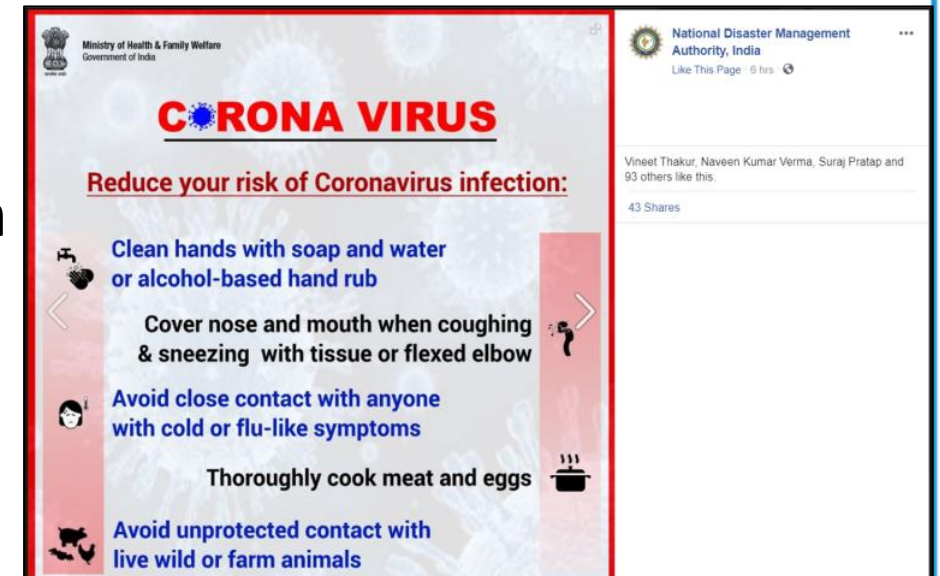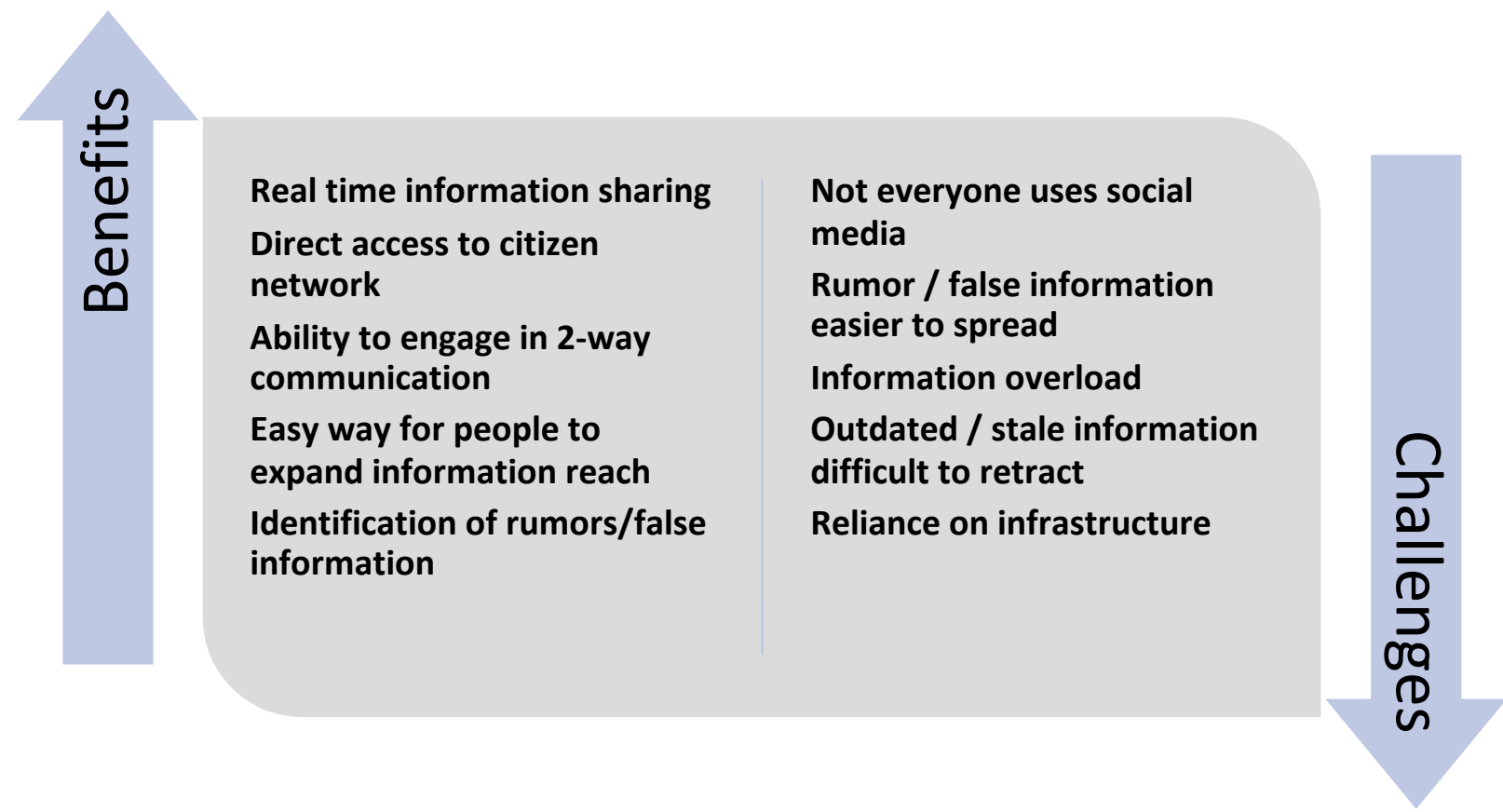

Image: Screenshot of the India NDMA Facebook Page. Source: NDMA India, 2020.

Benefits and Challenges of Social Media Engagement

Benefits

Benefits	Challenges
Real time information sharing	Not everyone uses social media
Direct access to citizen network	Rumor / false information easier to spread
Ability to engage in 2-way communication	Information overload
Easy way for people to expand information reach	Outdated / stale information difficult to retract
Identification of rumors/false information	Reliance on infrastructure

Challenges

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20

Case Study: Countering Rumors and Misinformation

- **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.

Image: Screenshots of public sector and citizen Twitter accounts following the 2014 Napa Earthquake. Source: Twitter, 2014.

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
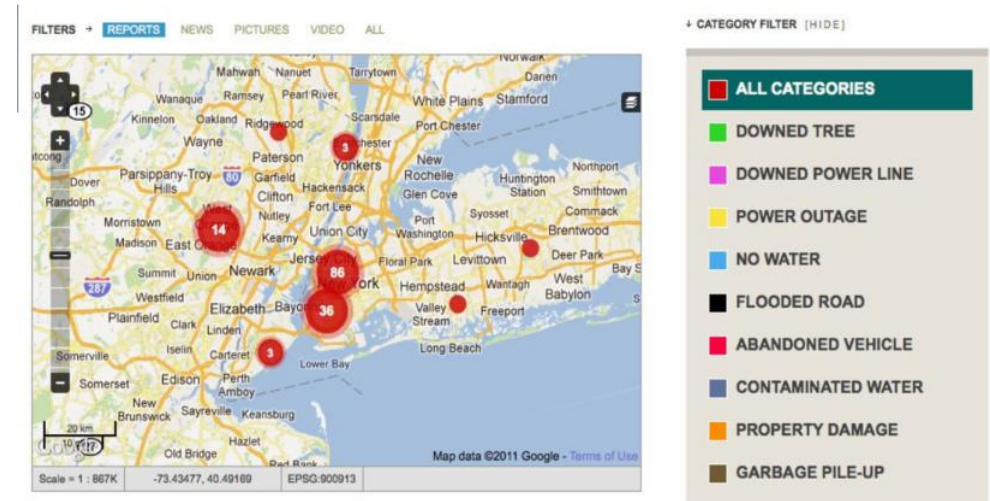 - Designing products
  - Strategic planning

Image: Screenshot of the NYCSevereWeather Crowdsource Mapping Platform that allows New York City residents to report disaster damages by location and type.
Source: NBC News, 2011.

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**: Crowdsource the effort by creating an easy-to-use platform that distributes satellite imagery to volunteers.
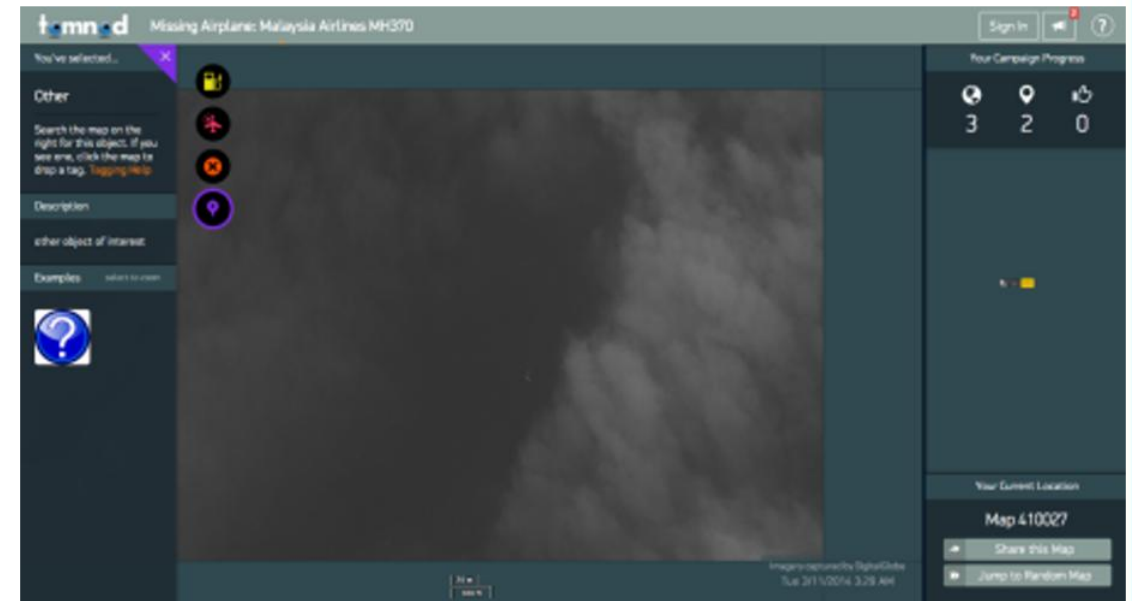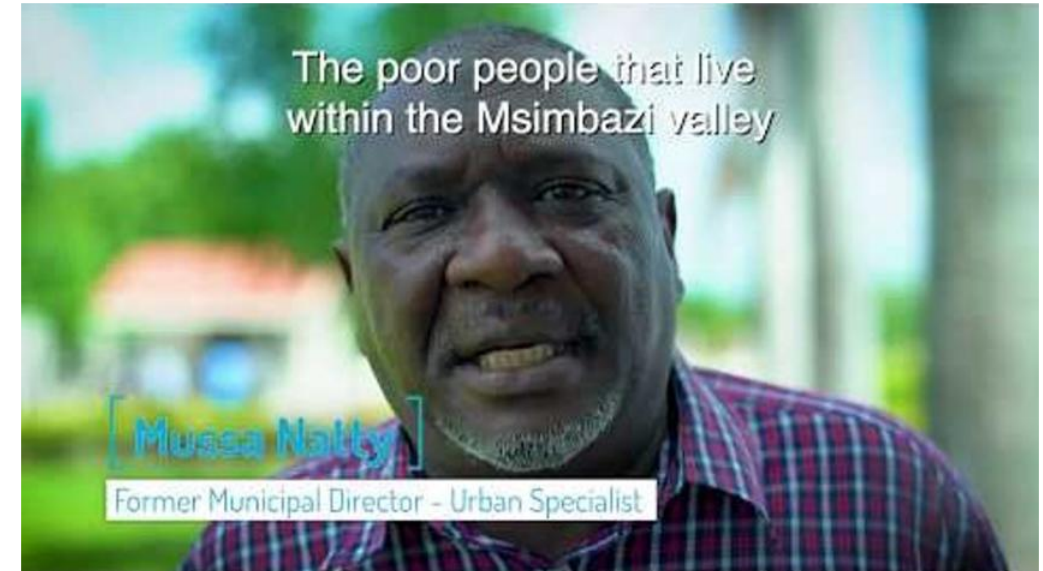

Image: Screenshot of the Tomnod MH370 search platform. Source: Tomnod, 2014.

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.

The poor people that live within the Msimbazi valley

[Mussa Natty]
Former Municipal Director – Urban Specialist

Video: In Tanzania, Citizen Scientists Help Reduce Flood Risk with Soil Sampling.
Source: World Bank, 2019.

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.
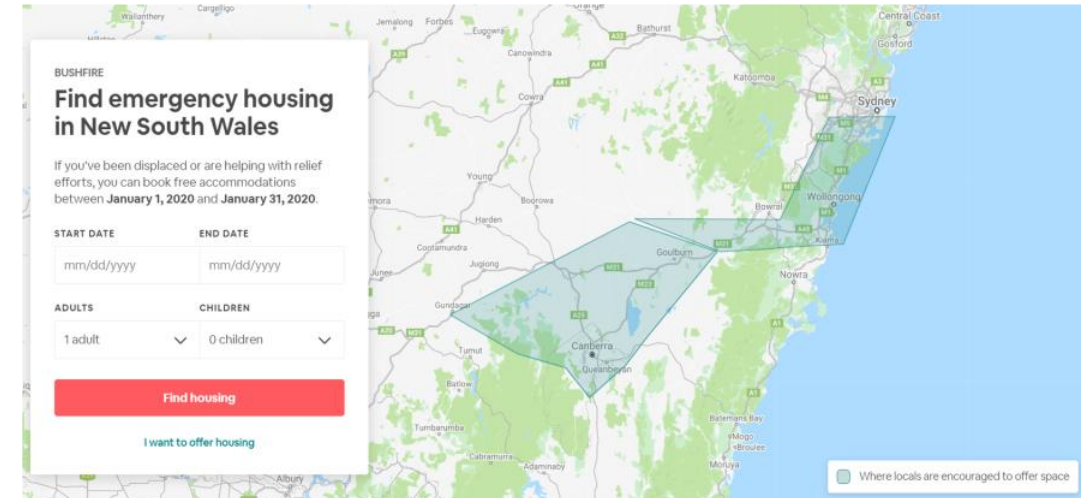

BUSHFIRE
Find emergency housing in New South Wales

If you've been displaced or are helping with relief efforts, you can book free accommodations between **January 1, 2020** and **January 31, 2020**.

START DATE   END DATE
mm/dd/yyyy   mm/dd/yyyy

ADULTS   CHILDREN
1 adult   0 children

Find housing

I want to offer housing

Where locals are encouraged to offer space

Image: Screenshot of the AirBNB Open Homes website during the 2019/2020 Australia Wildfires. Source: AirBNB, 2020.

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.
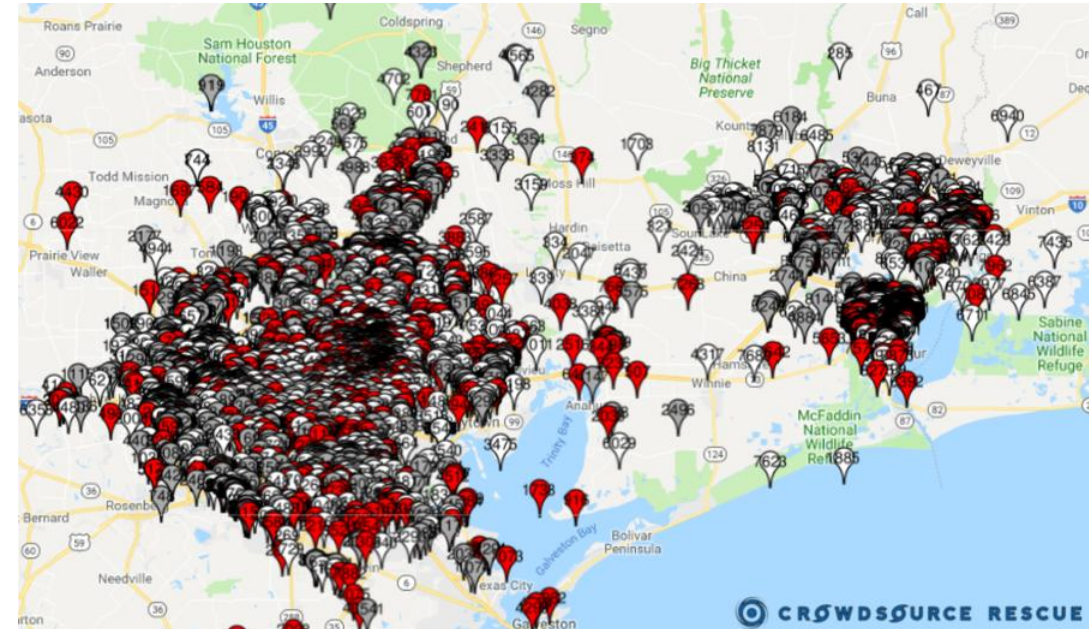

Image: Screenshot of the Crowdsource Rescue volunteers and rescue requests during Hurricane Irma, 2017. Source: Crowdsource Rescue, 2020.

Crowdsourcing Models

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

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.
Source: Humanitarian OpenStreetMap, 2015.

- ## **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.

Crowdfunding

- Crowdsourcing money
- Enhanced greatly by:
  - Internet technologies
  - Social media
- Represents a growing portion of disaster philanthropy
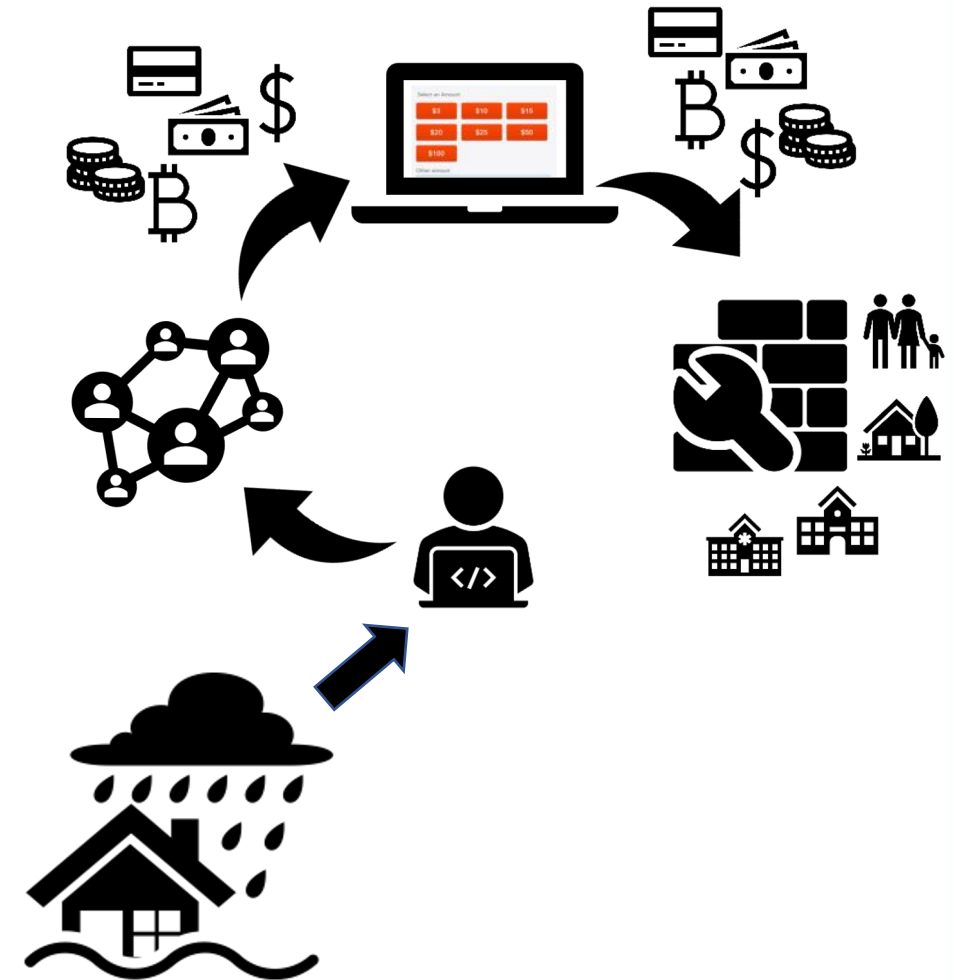
Case Study: Crowdfunding Disaster Relief

- **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.
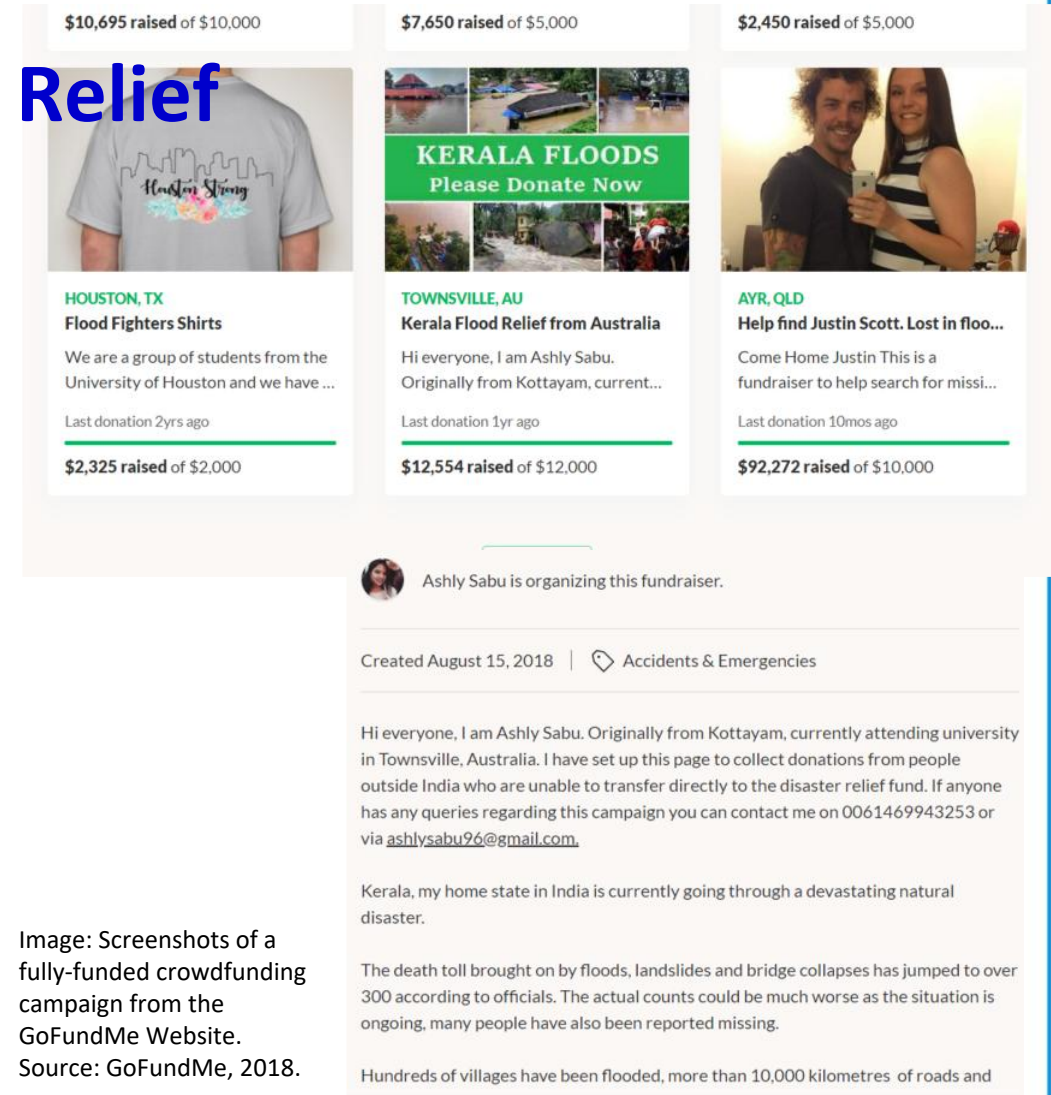- **Solution**: User-friendly crowdfunding platform.

Image: Screenshots of a fully-funded crowdfunding campaign from the GoFundMe Website. Source: GoFundMe, 2018.

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)
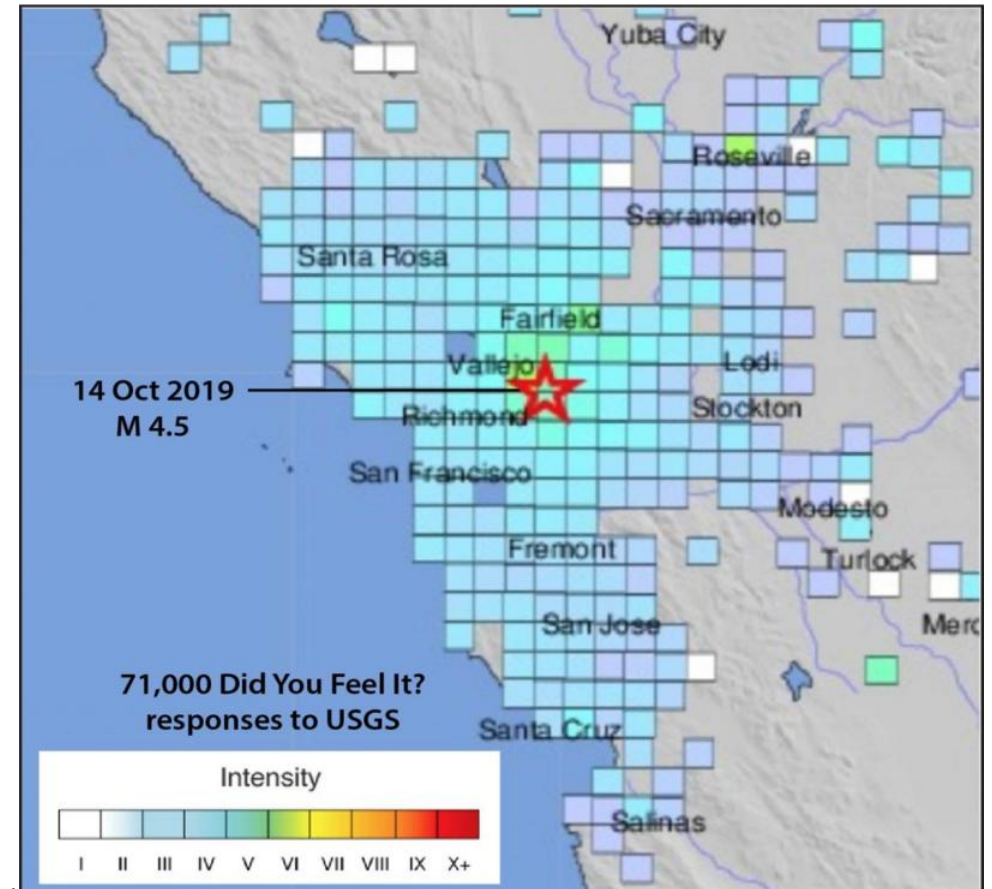- Advantages and disadvantages

Image: Shakemap of a small earthquake in the California Bay Area, USA, generated using VGI.
Source: USGS, 2019.

VGI Applications
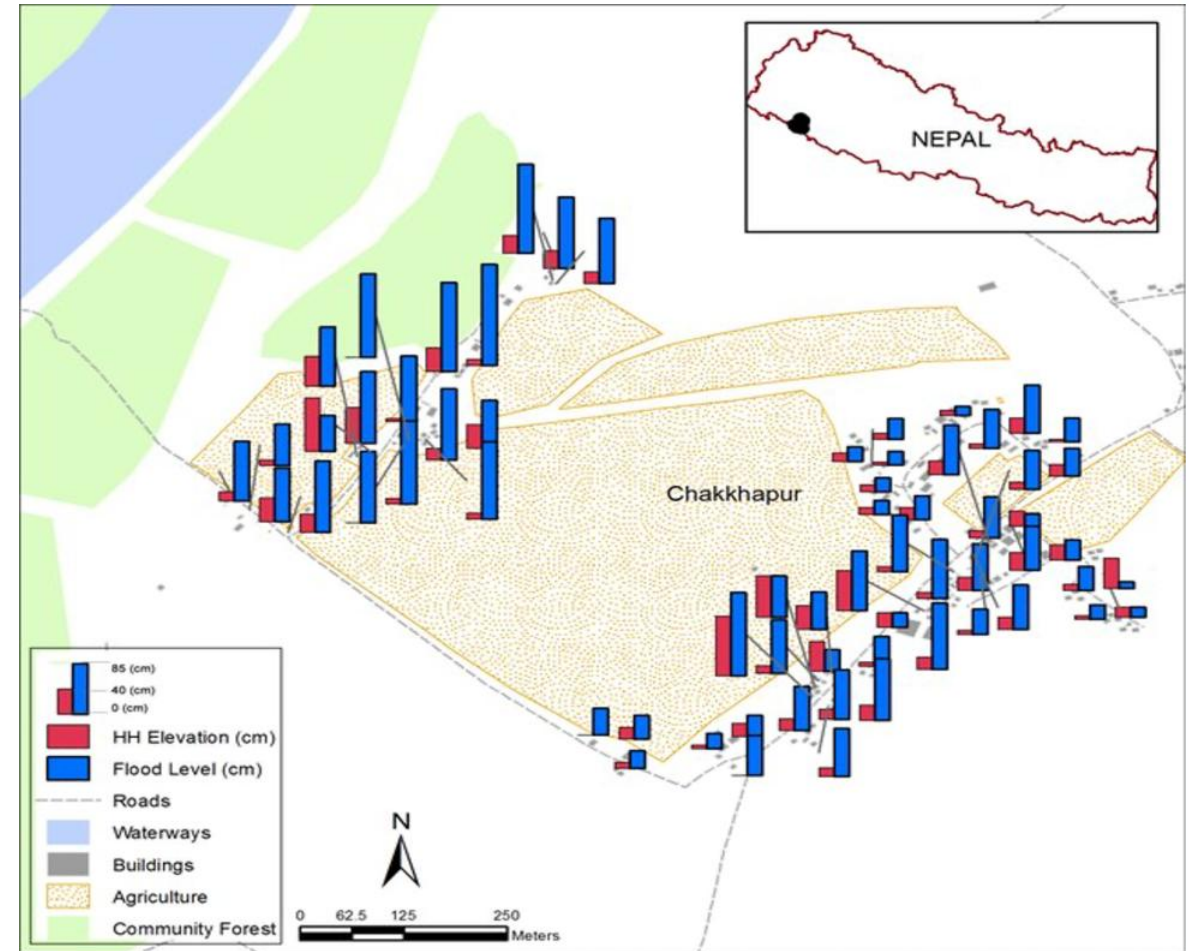
- Emerging threats
- Trends
- Exposure
- Vulnerability

Image: Flood vulnerability map of a community in Nepal showing flood levels in a recent flood (in blue) and elevation of homes (in red). Source: Liu, Wei, Sumit Dugar, Ian McCallum, and Puja Sakya. 2018. Integrated Participatory and Collaborative Risk Mapping for Enhanced Disaster Resilience. International Journal of Geo-Information. February. No.7, V.2.

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.
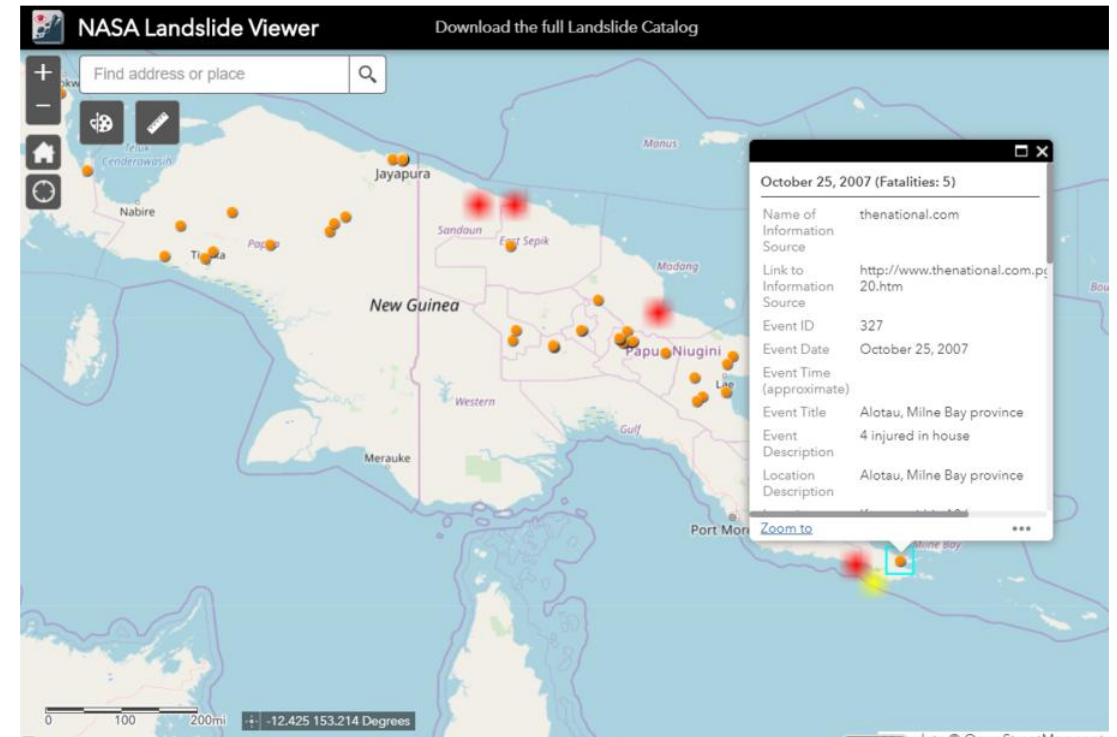- **Solution**: Provide a platform to crowdsource VGI of landslide incidents.

Image: Screenshot of the NASA Landslide Reporter map
Source: NASA, 2020.

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.
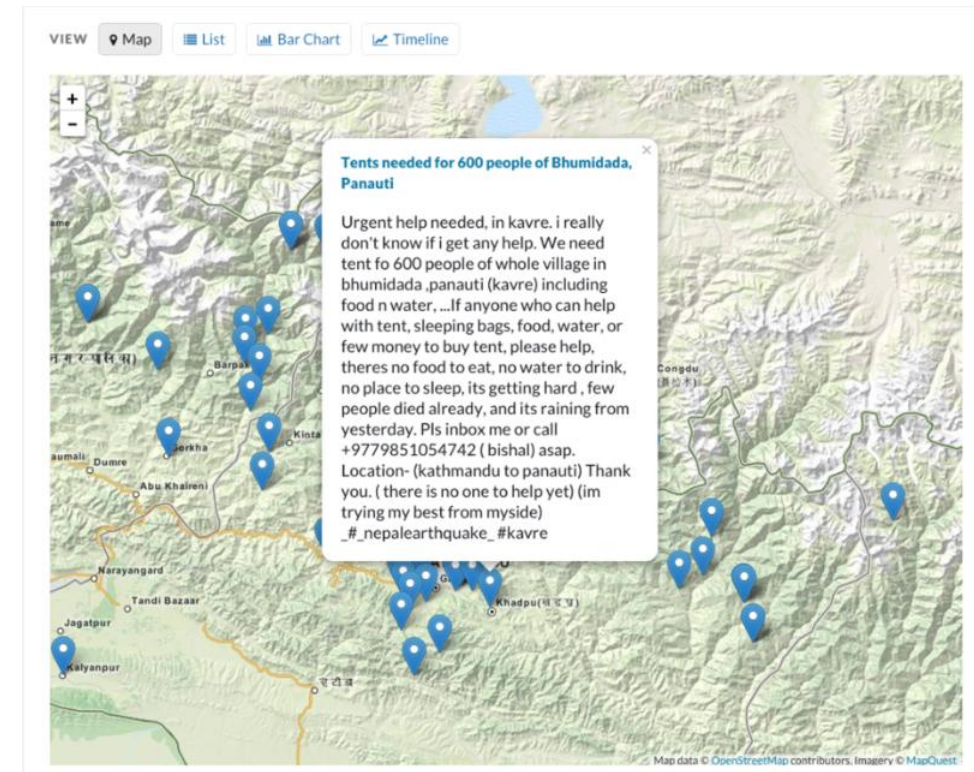

Tents needed for 600 people of Bhumidada, Panauti

Urgent help needed, in kavre. i really don't know if i get any help. We need tent fo 600 people of whole village in bhumidada ,panauti (kavre) including food n water, ...If anyone who can help with tent, sleeping bags, food, water, or few money to buy tent, please help, theres no food to eat, no water to drink, no place to sleep, its getting hard , few people died already, and its raining from yesterday. Pls inbox me or call +9779851054742 (bishal) asap. Location- (kathmandu to panauti) Thank you. (there is no one to help yet) (im trying my best from myside) _#_nepalearthquake_ #kavre

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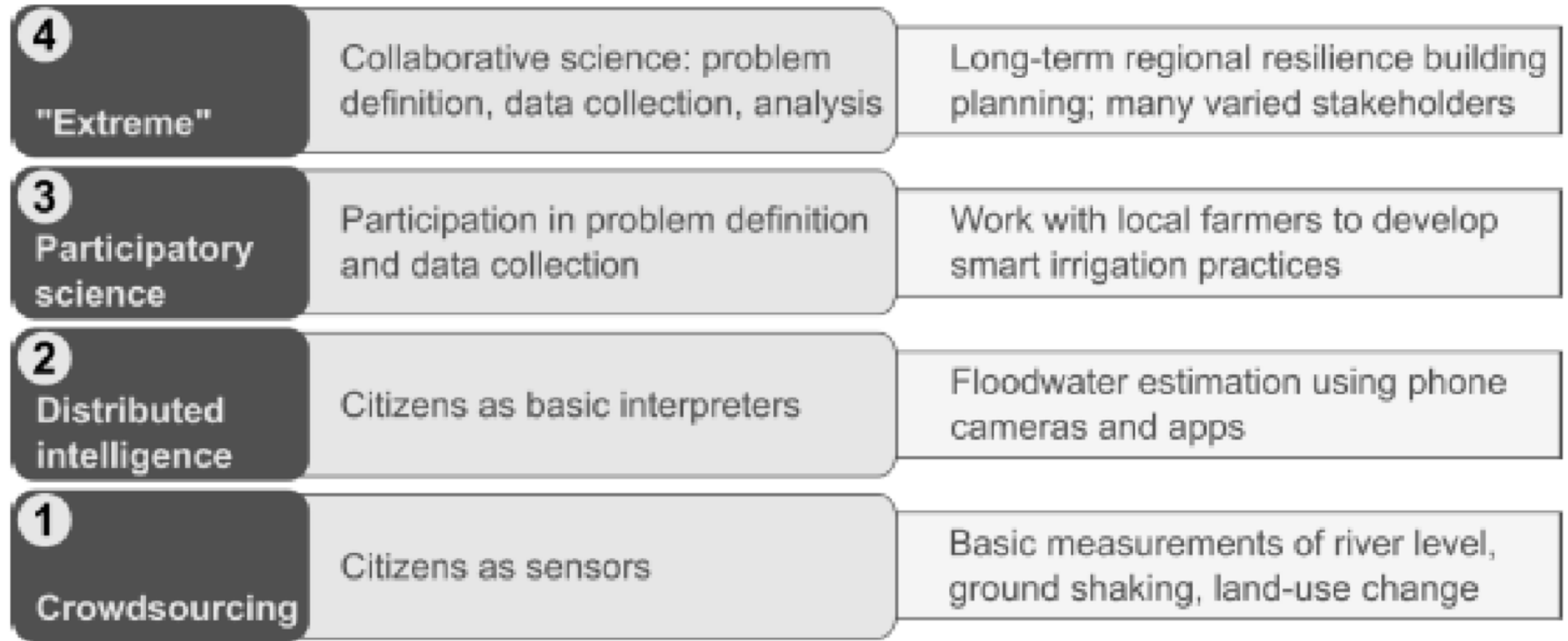
Citizen Science

- **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.
Source: NASA, 2016.

- ## **Levels of Citizen Science Engagement**

Based on Haklay, M. (2012). Citizen science and volunteered geographic information – overview and typology of participation. In: Sui D.Z., Elwood S. and Goodchild M.F. (eds.), Volunteered Geographic Information, Public Participation, and Crowdsourced Production of Geographic Knowledge. Berlin: Springer; 2012.

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

Image: Various photographs and maps from the "Nosy Person" project in Belgium. Source: Nature, 2018.

■ **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 positon 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.
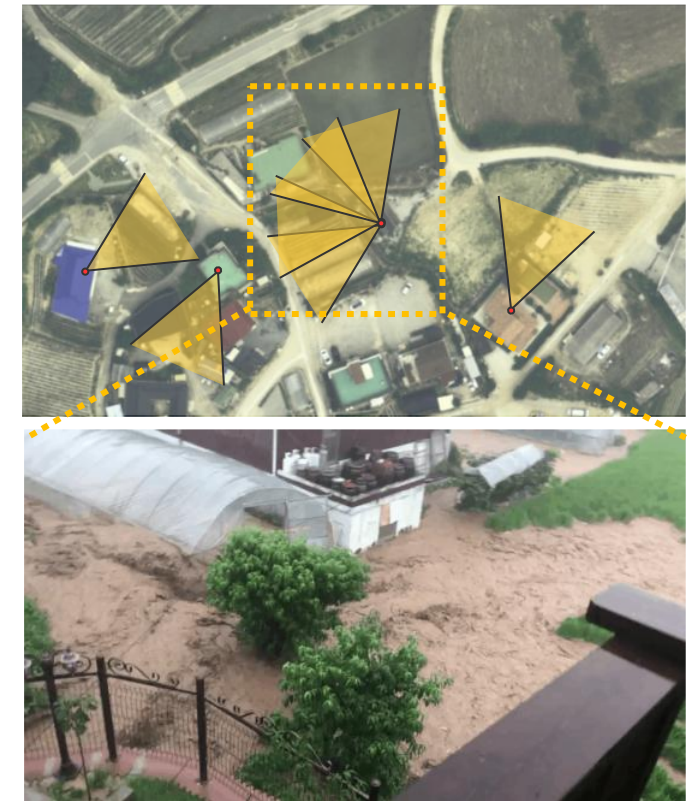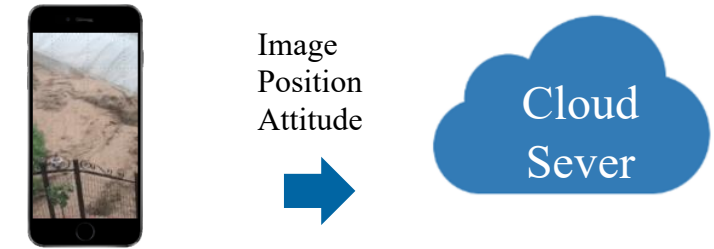
Image Position Attitude

Cloud Sever

Image: Displaying image acquisition Position and Attitude on the map
Source: Upper image, Yonsei University, Lower image: Korea JoongAng Daily, 2020

- ## **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
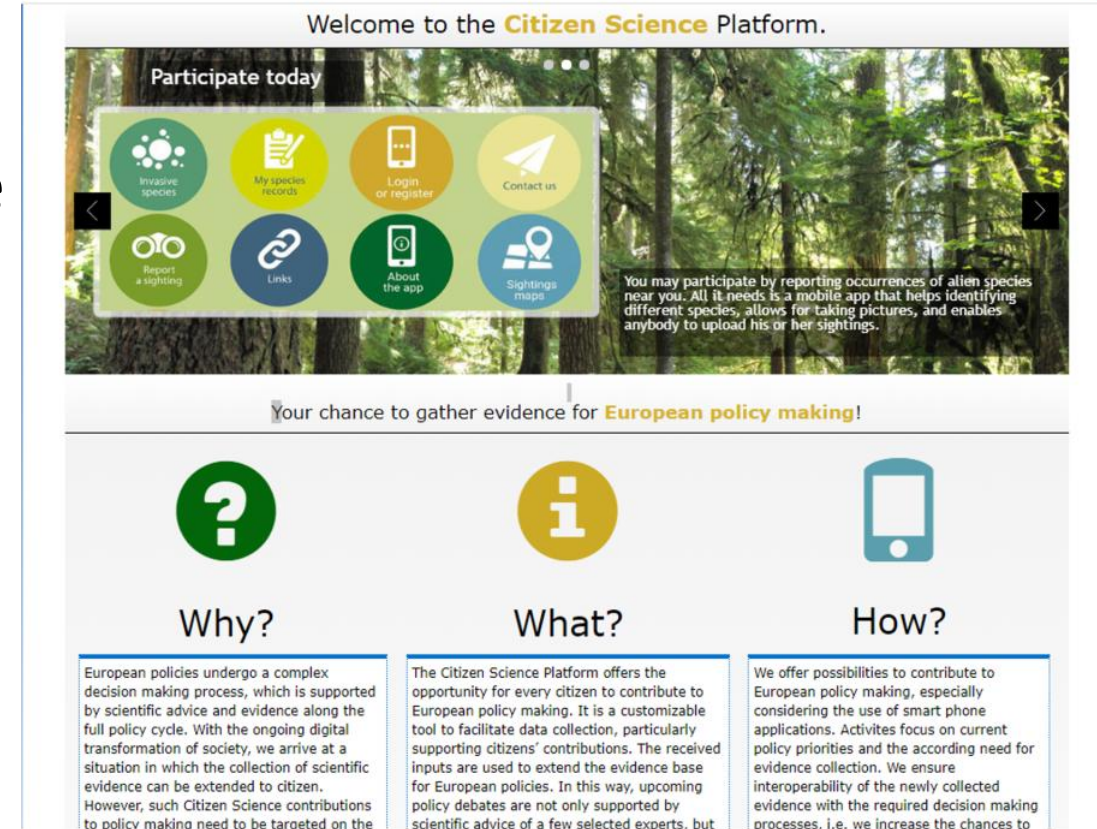- Online Citizen Science (OCS)

Image: Screenshot of the EU citizen Science Online Platform
Source: Digital Earth Lab, 2020.

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

Left Image: World weather watch coverage by Weather Underground's network of 250,000 citizen scientists. Right Image: Citizen Scientists installing weather monitoring equipment. Source: Weather Underground, 2020.

Citizen Science Challenges

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

Image: Old phones lacking many of the sensors that come standard in newer smart phone models.
Source: Close the Gap, 2018.

▪ ## 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
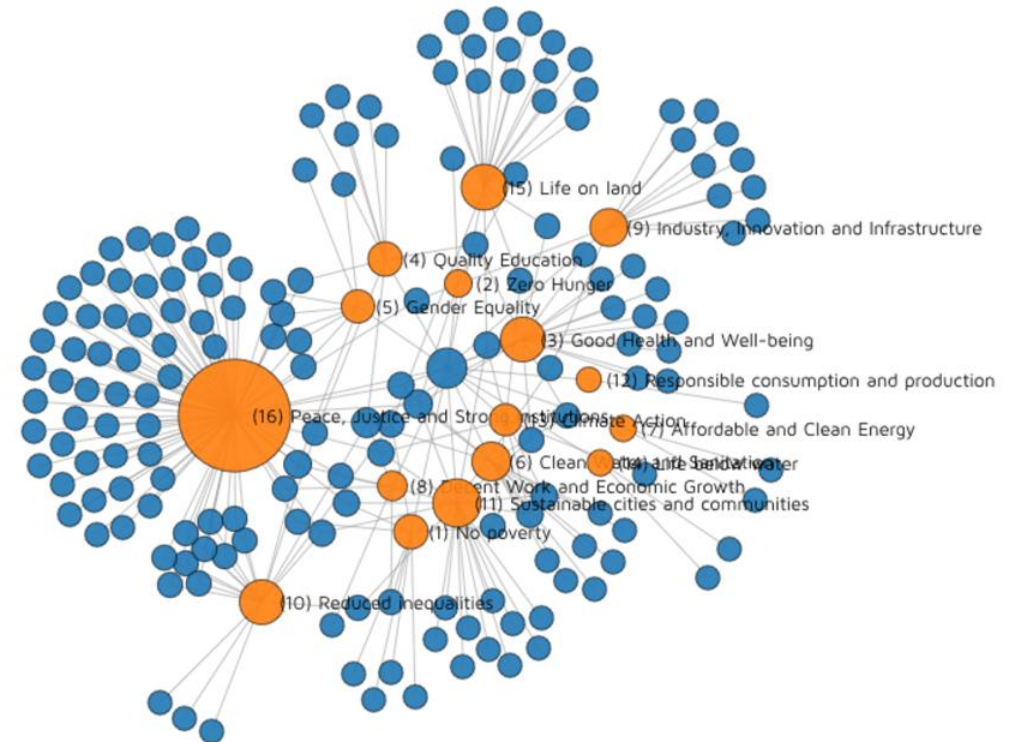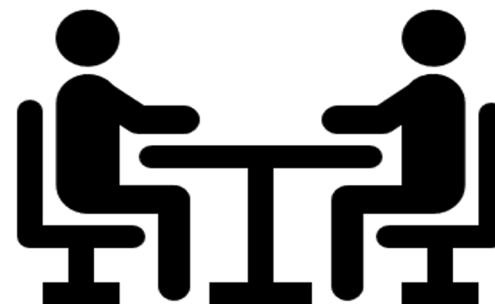

Image: Diagram of Citizen Generated Data initiatives in the DataShift database mapped to the Sustainable Development Goals (SDGs).
Source: CIVICUS, 2020.

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**?

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45

Key Readings	· Studies on Participatory Early Warning Systems (P-EWS): Pathways to Support Citizen Science Initiatives. Frontiers in Earth Science. November 6. http://bit.ly/2JOkfPn. · UN Asian and Pacific Training Centre for Information and Communication Technology for Development and the Asian Disaster Preparedness Center. 2018. Reference Document on Social Media for Disaster Risk Management. http://bit.ly/2v07nRn.

Thank you