EMMA BEE BSC, MSC, CGEOG (GIS) FRGS
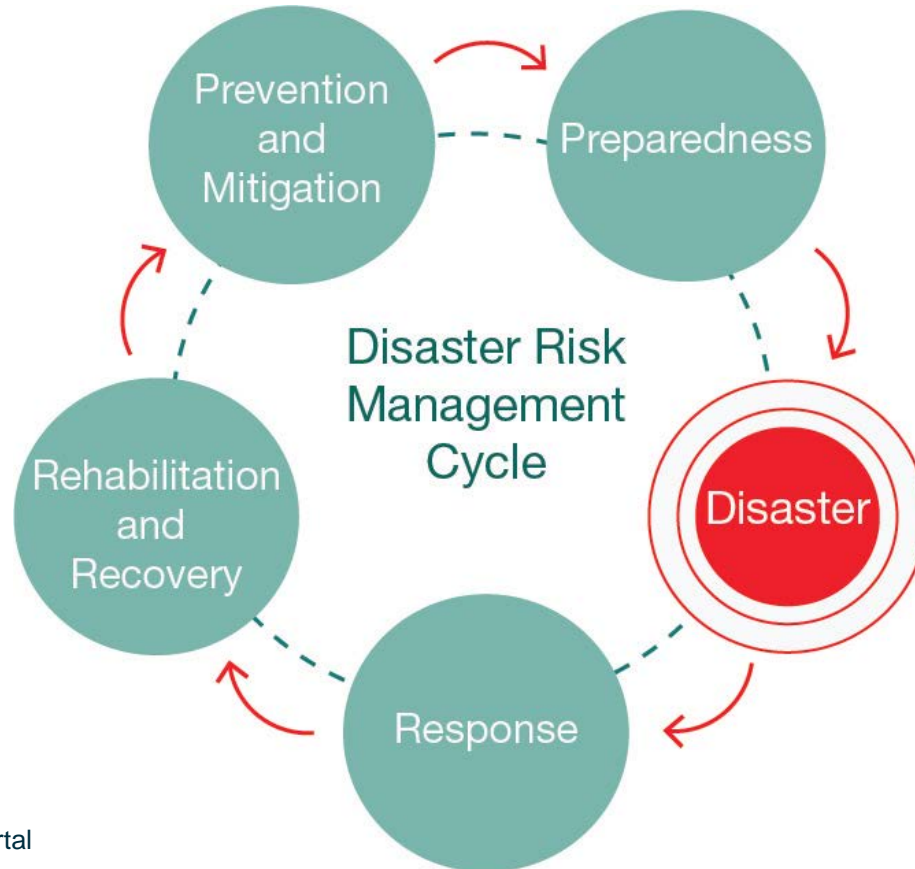
Exploring the use of social media in environmental science to support Disaster Risk Reduction

British Geological Survey

The elements of DRR

Disaster Risk Management Cycle

- Prevention and Mitigation
- Preparedness
- Disaster
- Response
- Rehabilitation and Recovery

My experience of applied hazard science in DRR

Hazard and Hazard Susceptibility maps

Process understanding

Hazard Information (to support risk management)

Hazard forecasts

Scientific observations and hazard inventories (data)
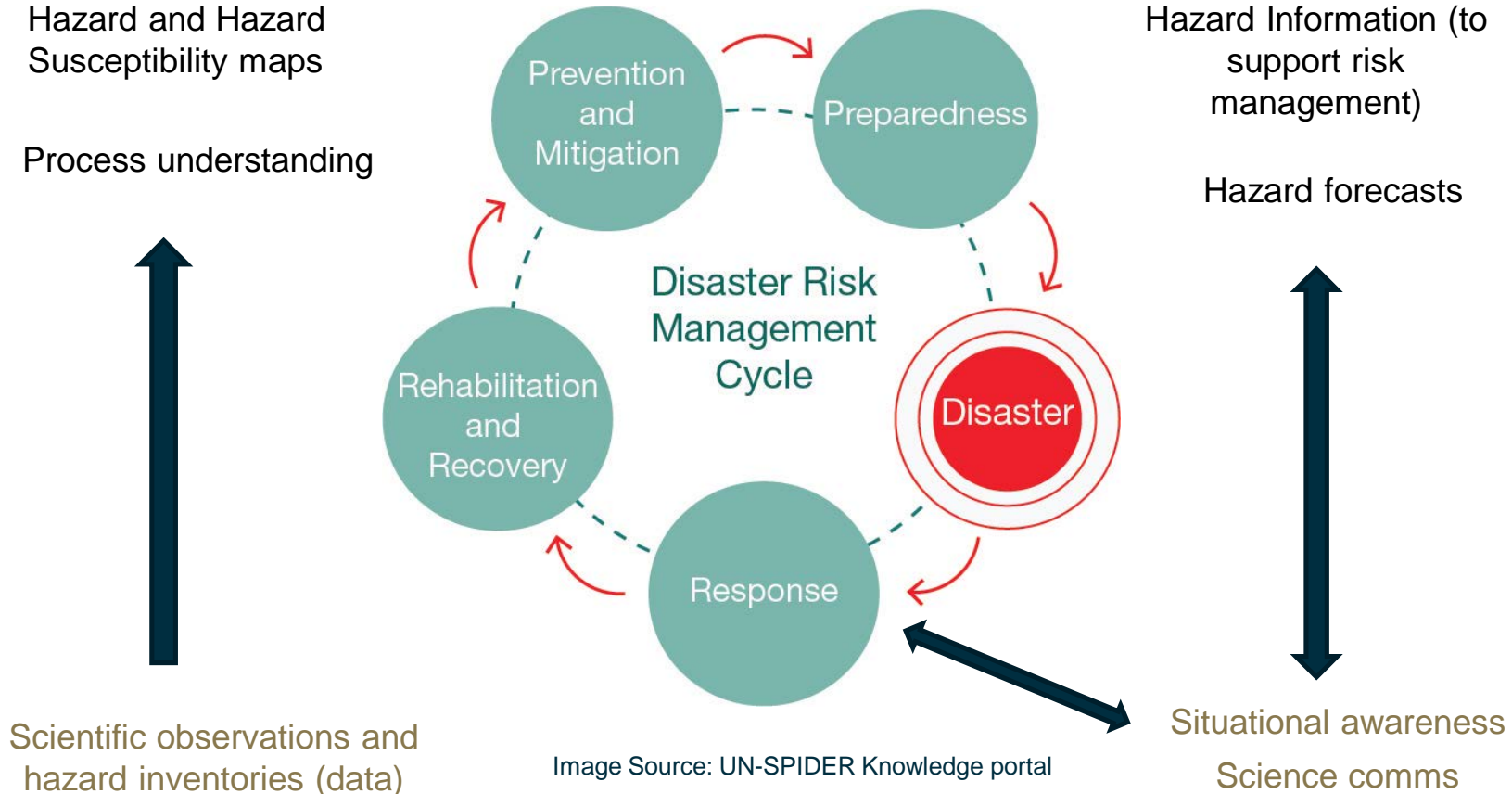
Image Source: UN-SPIDER Knowledge portal
https://un-spider.org/risks-and-disasters

Situational awareness

Science comms

Role of social media – situational awareness

Remote to impact area

Image source: gov.uk

Government(s)

Image source: Met Office UK

Operations Centre

Image source: British Geological Survey

Scientists

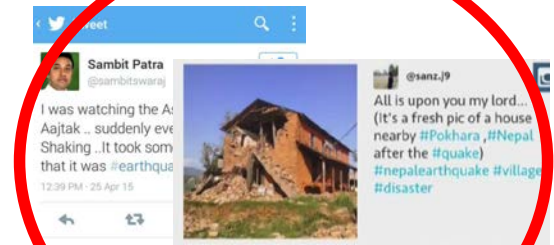**Impact area**

Image source: ICRC.org

Emergency/ Humanitarian Response

Image source: BGS

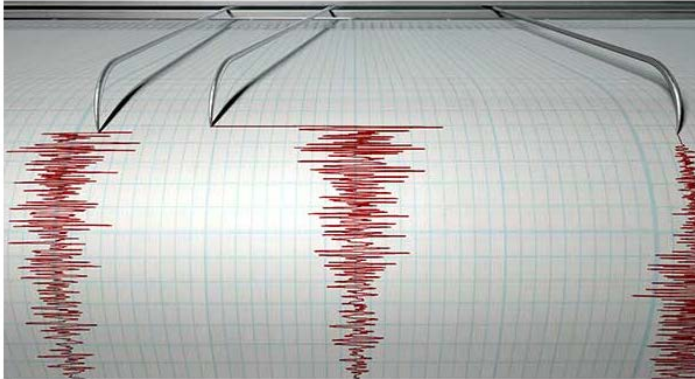

Earth Observation

Citizens and 'digital' humanitarians

Role of social media – citizens as sensors
USGS Twitter Earthquake Detection

Scientific observations and hazard inventories (data)

Image source: Digital.gov

Detection delay
(since July, 2013)

50% under 1 minute
90% under 2 minutes

Number of events
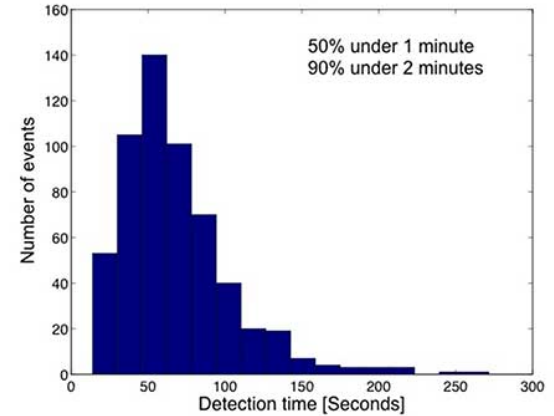
Detection time [Seconds]

Figure 5. Tweet Based Event Detection Delay.
The histogram was derived from the integrated social media detected and seismically derived events dataset and indicates that half of all the tweet detections occur is less than one minute after earthquake origin time and ninety percent of the tweet based detections occur with in two minutes of the earthquake origin time.

Image source: Digital.gov

"….. is much faster than traditional methods of earthquake detection which can take anywhere from 2-30 minutes in sparsely instrumented areas" USGS

But…..

Image source: gov.uk

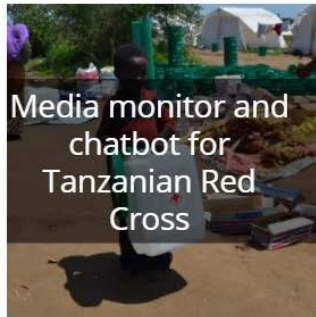# Applying AI to collate content from unstructured data e.g. social media

Image source: gov.uk

Chatbots

Semantic analysis

Image Analysis

Real time monitoring

Flood Index Insurance Myanmar and Lao PDR

Community Water Watch

Jipange Project

Real-time flood monitor at the Philippine Red Cross

Impact-Forecasting Tanzania

Real-time Flood Extent Mapping by Social Media and Elevation Data

Monitor for Nature-Based Solutions in Indonesia

Flood history of 13 African cities

Model validation EFAS, Spain Floods 2019

Media monitor and chatbot for Tanzanian Red Cross

Using media to monitor droughts in Mali and California

Impact-forecast for Water-Related Diseases Indonesia

Screen grab from Floodtags.com

FOCUS ON

Landslides

Landslides: a global phenomena

The distribution of global landslides. Data from Froude and Petley (2018).

The international Disaster Database (EM-DAT) suggests that landslides accounted for 4.9% of all natural disaster events between 1990 and 2015.

NB. Other databases exist e.g. NASA's Global Landslide Catalog

However, this is widely considered to be an underrepresentation.

Socio economic impacts of landslides

Annual totals showing number of globally recorded nonseismically triggered landslides and number of associated fatalities.
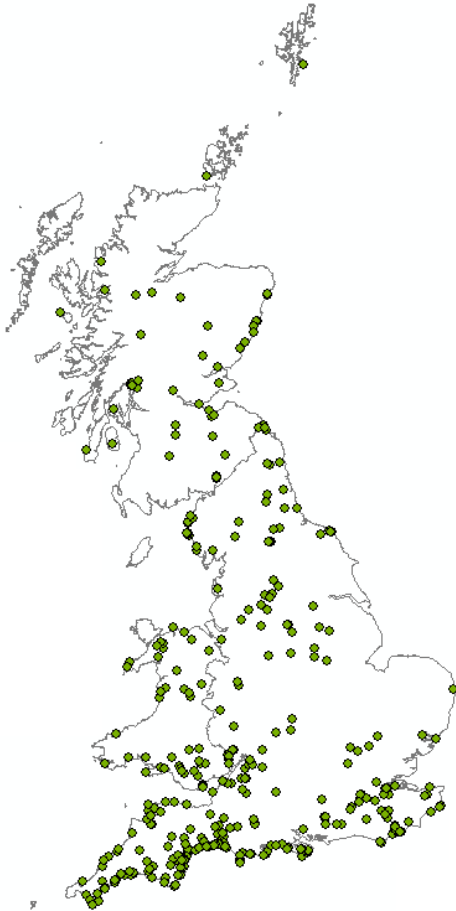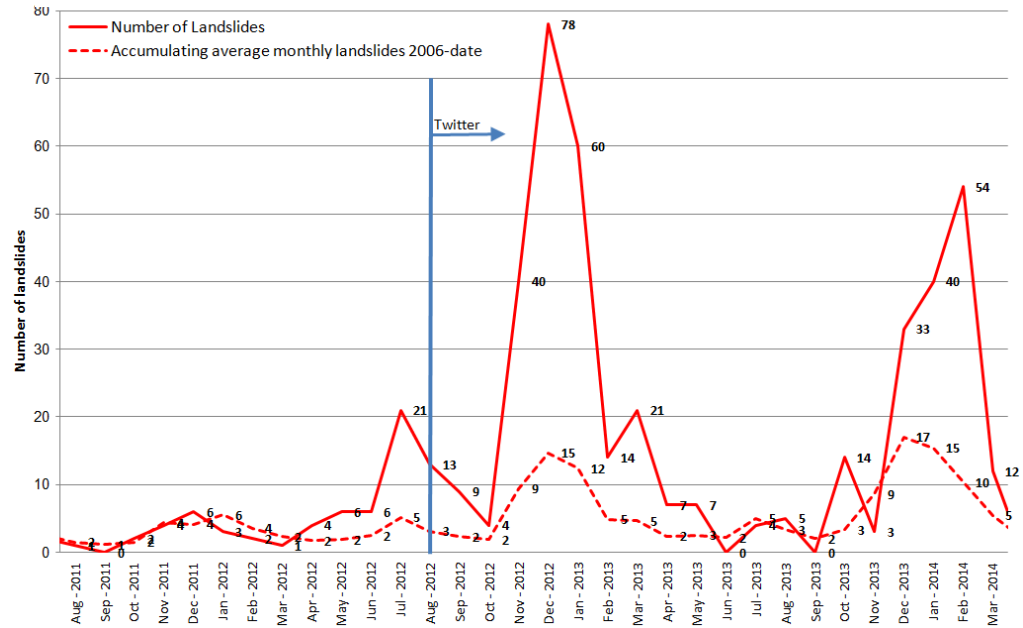

Source: Petley 2012. https://doi.org/10.1130/G33217.1
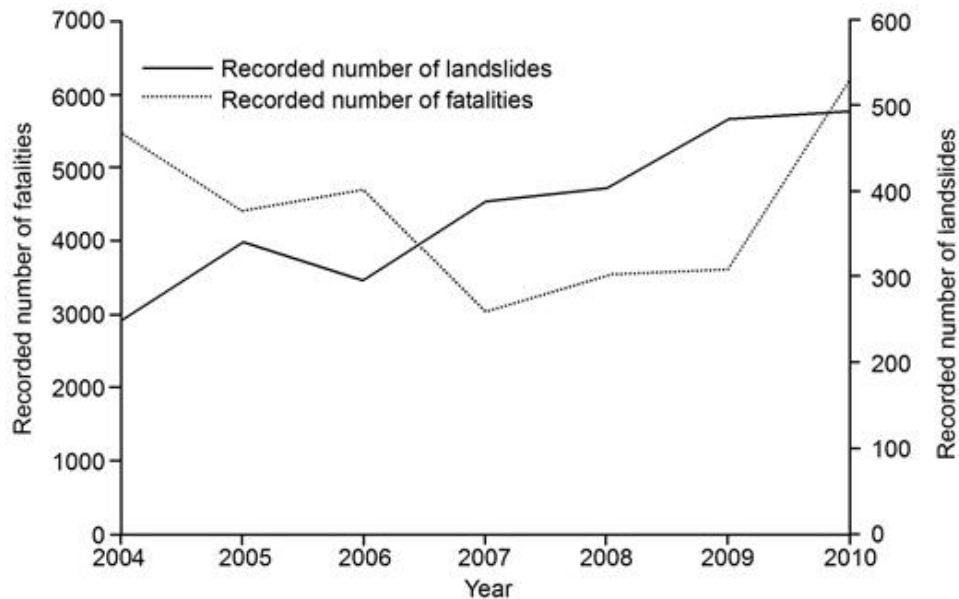
Photo taken in The Nilgiris, India courtesy of the LANDSLIP project

Observations to support hazard inventories (data)

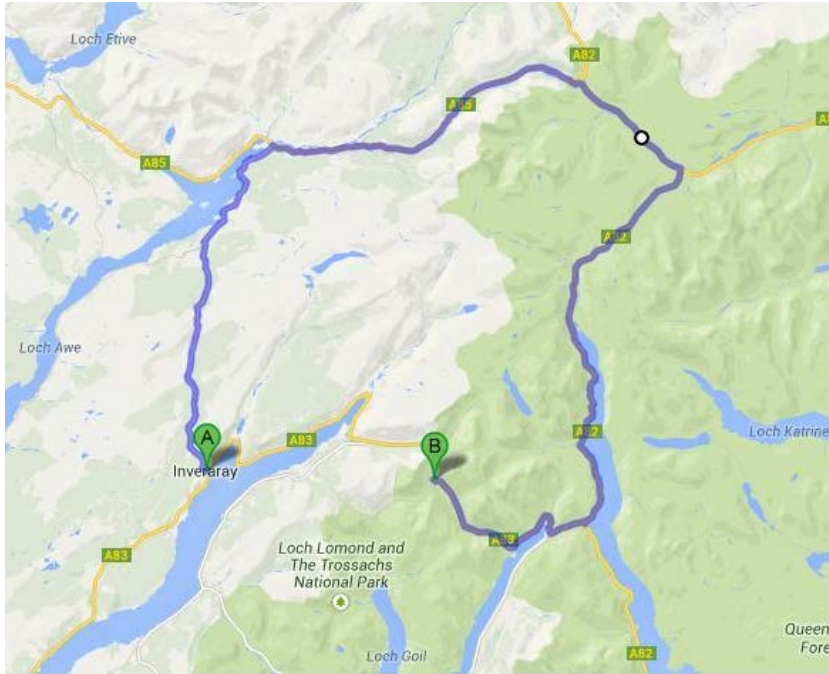# Observations to support hazard <u>impact</u> inventories (data) and situational awareness

Traffic Scotland @trafficscotland · Mar 5
Highlands: #A83 is CLOSED at Rest & Be Thankful due to a landslip. The diversion route is around 57 miles long: pic.twitter.com/kGPcHWAga2

← Reply   ⤨ Retweet   ★ Favorite   Flag media

Greater Anglia
@greateranglia   ⚙ ∨   +⅃ Follow

Some of the works that took place over the weekend to repair the landslip between Manningtree and Ipswich. JA
pic.twitter.com/IGE1vpRusp

← Reply   ⤨ Retweeted   ★ Favorite   ••• More

RETWEETS   FAVORITE
12   1

Observations to support hazard <u>impact</u> inventories (data) and situational awareness

Tweets by @BGSLandslides

CumbriaHighways
@CumbriaHighways

Due to recent weather events there has been a landslip off the #A685 at Bye Mill. Due to safety concerns for any potential users we have closed the footpath over Thrushgill Beck. Our Countryside team are speaking with the landowner to resolve the issue. #Cumbria #SafetyFirst

20h

OnTheWight @onthewight · Mar 5
Did you see unique Hexacopter footage we published yesterday of landslide at Headon Warren? wig.ht/2bFS pic.twitter.com/jxjhzp4041

↩ Reply ♺ Retweet ★ Favorite   Flag media

Observations to support hazard <u>impact</u> inventories (data) and situational awareness
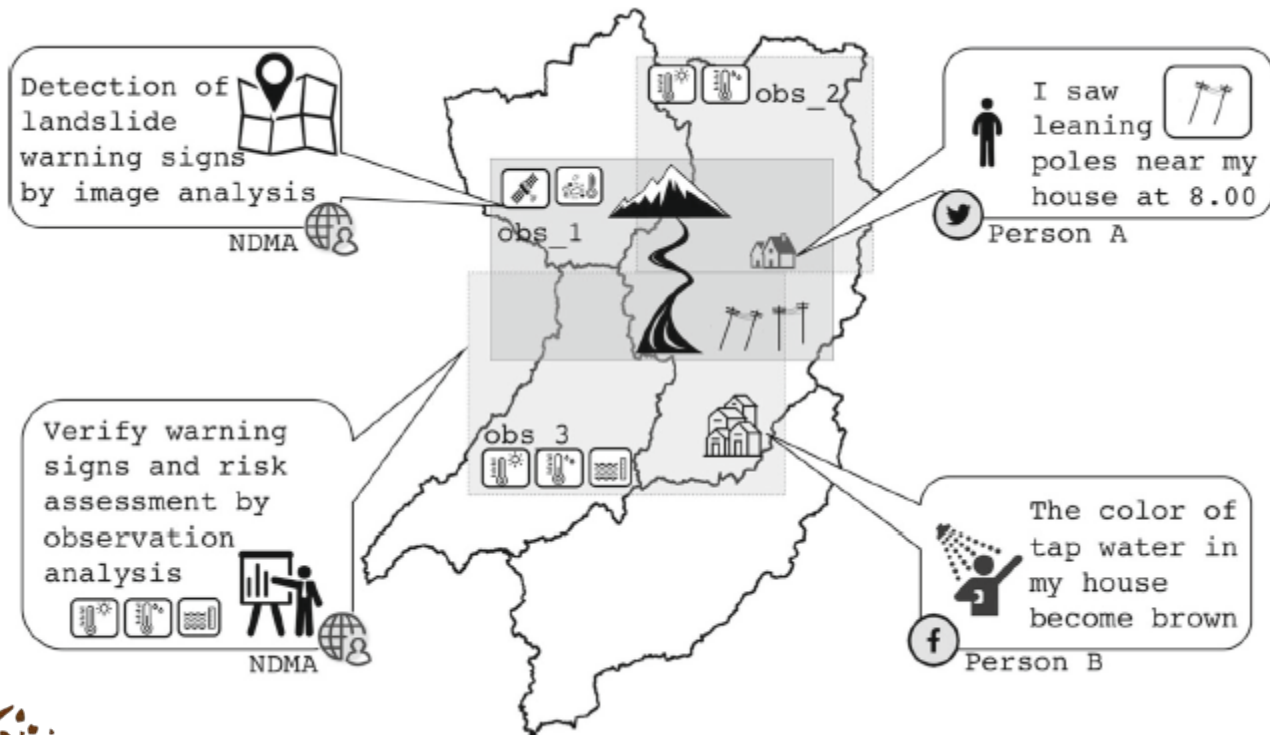

19.05.17 - Uttarakhand

13.05.17 - Nigeria

Searching unstructured data to help identify warning signs
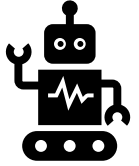

Source: Phengsuwan et al. (2019) https://doi.org/10.1007/s00607-019-00730-7

Chat bots – enhancing information

Wow, I just witnessed a landslide

Hi, I'm a chatbot developed by XXX. Are you safe? Is anyone hurt?

Yes I'm safe. No one has been injured.

Thank you. I'm interested in knowing more about the landslide to support our research. Could you send a photograph? Where is the landslide?

LANDSLIP

Hypothetical conversation

BGS

Object-Based Image Analysis - OBIA

The information content of an object and process or feature knowledge are used to classify features in a landscape.

Replicating human cognitive processes that underpin visual image interpretation.

Does the image feature a landslide?

Dr Phil Collins @PhilCollins_UK · Feb 19
Landslip at Barton-on-Sea today pic.twitter.com/GmtBO6g9we
↩ Reply ♺ Retweeted ★ Favorite

Flag media

Social media as a method of communication – Face Book and WhatsApp

- Save The Hills – an NGO in the Darjeeling-Sikkim Himalaya, India established a Hazard Alert (HA) system using What's app.
- Limited by 250 users.

Science for Humanitarian Emergencies & Resilience

SHEAR

The use of social media in natural hazard Early Warning Systems

Photo credit: Marisa Roman

Authors:

Emma Bee, British Geological Survey;
Mirianna Budimir, Practical Action

This short knowledge paper describes some of the ways social media has been used in the context of natural hazard early warning to aid decision making and enable people to communicate and access information.

Summary

The recent growth in technology and use of social media provides an opportunity for additional streams of information for decision making, and channels for disseminating early warning and risk information.

This document outlines some of the ways social media can be used in natural hazard early warning systems, providing examples of where it is already being used.

Introduction

Information and knowledge about a natural hazard event as it unfolds are vital to ensure effective preparedness and response to disasters. Those responsible for making decisions in advance of and in response to disasters need to know as much as they can about what the situation is and how it is unfolding. Citizens affected on the ground need to know how to stay safe or where they can obtain supplies.

Applications developed using Web 2.0 technologies, such as social media sites, blogs, wikis etc., have had a profound impact on people's ability to interact and collaborate, and to generate, share and access content publically and instantaneously through virtual environments.
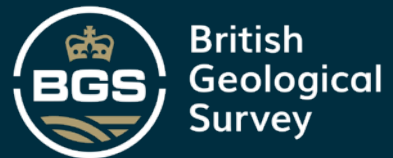
The growth in technology and use of social media offers an opportunity for supplementary and complementary information alongside existing sources. Social media data can collect additional information to monitor hazards, assess exposure and vulnerability, guide disaster response, assess the resilience of natural systems, and engage with communities (Antilla-Hughes et al., 2015).

"Social media provides opportunities for engaging citizens in the emergency management by both disseminating information to the public and accessing information from them" (Simon et al., 2015).

Social media can complement and support EWS in several ways:

- Providing additional data on real-time monitoring of hazard, vulnerability and risk, often at a higher spatial density than monitoring and observation stations.
- Getting the right information to the right people in the right ways, building on trusted and well-used existing communication channels and platforms.
- Generating new evidence to develop our understanding of the communication and use of risk information in disaster resilience, preparedness and response.

https://practicalaction.org/wp-content/uploads/2019/07/SHEAR_The-use-of-social-media-in-natural-hazard-Early-Warning-Systems.pdf

BGS

THANK YOU

Any questions?