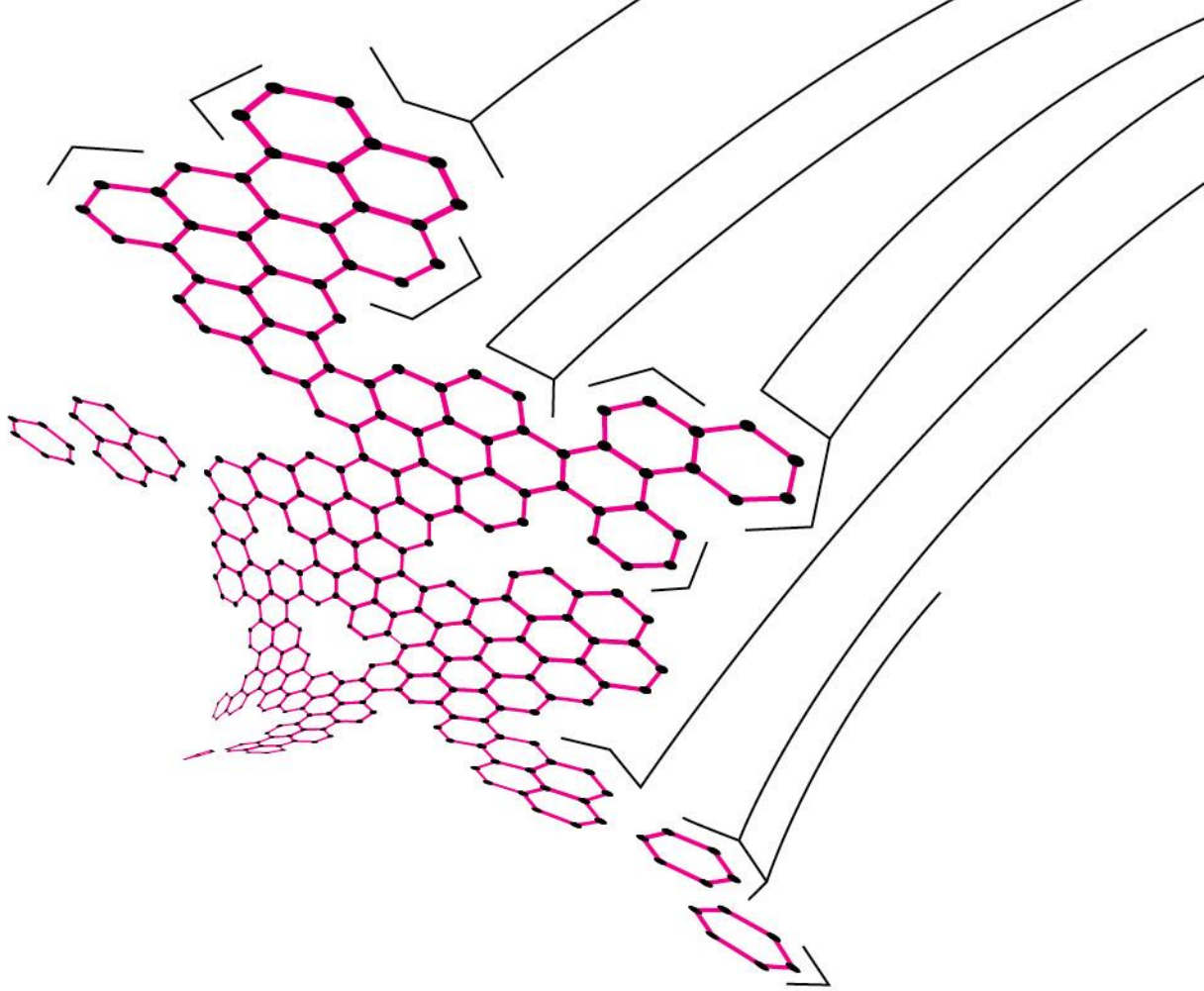
CITIZEN SCIENCE AND DISASTER RISK MANAGEMENT



NORMAN KERLE
APPLIED EARTH SCIENCES

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MY BACKGROUND & RESEARCH FOCUS

- Professor of *Remote Sensing and Disaster Risk Management* in the AES department
- Background in geography and volcano remote sensing
- Research focus on image analysis for **disaster damage mapping** and **post-disaster recovery**, UAVs/ drones, CS/VGI

http://www.itc.nl/4D-EARTH

REMOTE SENSING IN DISASTER RESPONSE/ RECOVERY

- Traditionally, **satellite** data have played the biggest role
  - Long archives, great for change detection, rapid response for inaccessible areas, different spectral areas (optical, radar, etc.)
- Increasingly **UAV** data are also used, at more local scales (advantage: more detailed, oblique, multi-perspective data)
- **Big data** processing (Google Earth Engine, etc.) and **machine learning** are gaining in prominence

REMOTE SENSING IN DISASTER RESPONSE/ RECOVERY

- Very frequent activity, for a large range of disaster

2010 Port-au-Prince, Haiti


Earthquake, Haiti (2010)


Tsunami, Japan (2011)


Wildfire, California (2018)


Typhoon/Storm surge, Philippines (2013)


Tornado, US (2013)

REMOTE SENSING IN DISASTER RESPONSE/ RECOVERY

- **Operational efforts** exist (International Disaster Charter, Copernicus Emergency Management Service, etc.)
- BUT: **damage mapping** is still done **manually** -> time intensive
- These service also don't make use of **local knowledge** or **validation**
- **Citizen science** has been used in damage mapping since 2008 (Wenchuan, China, earthquake). 2010 Haiti earthquake was the largest deployment

REMOTE SENSING IN DISASTER RESPONSE/ RECOVERY

- Mapping is challenging!
- Many **research questions**:
  - How to select suitable volunteers?
  - How to instruct volunteers?
  - How to monitor them, have them discuss difficult cases?
  - How to deal with the limited (vertical) perspective?

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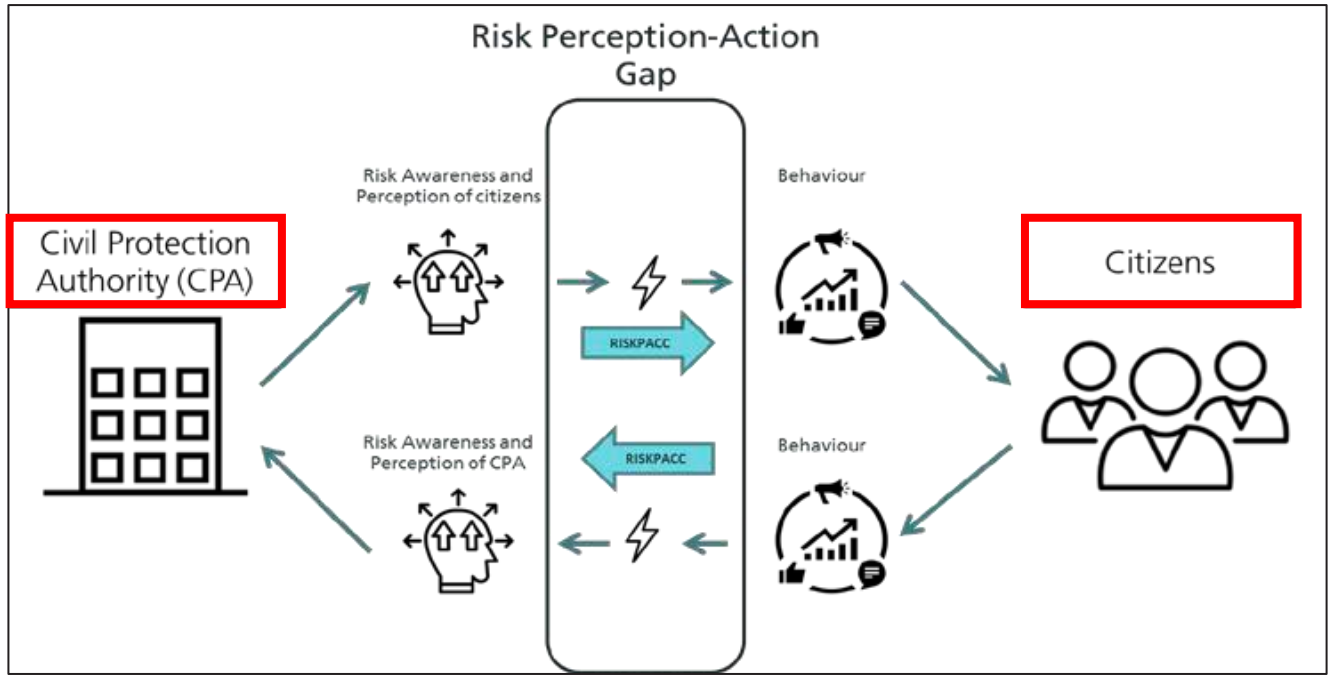
ONGOING PROJECT: RISKPACC

RiskPACC

https://www.riskpacc.eu/

- **RiskPACC** is a European-funded project that focuses on using citizen science/ VGI to reduce disaster risk
- Point is that citizens/ volunteers are not just a sensor or data provider: often they are part of the system/ problem



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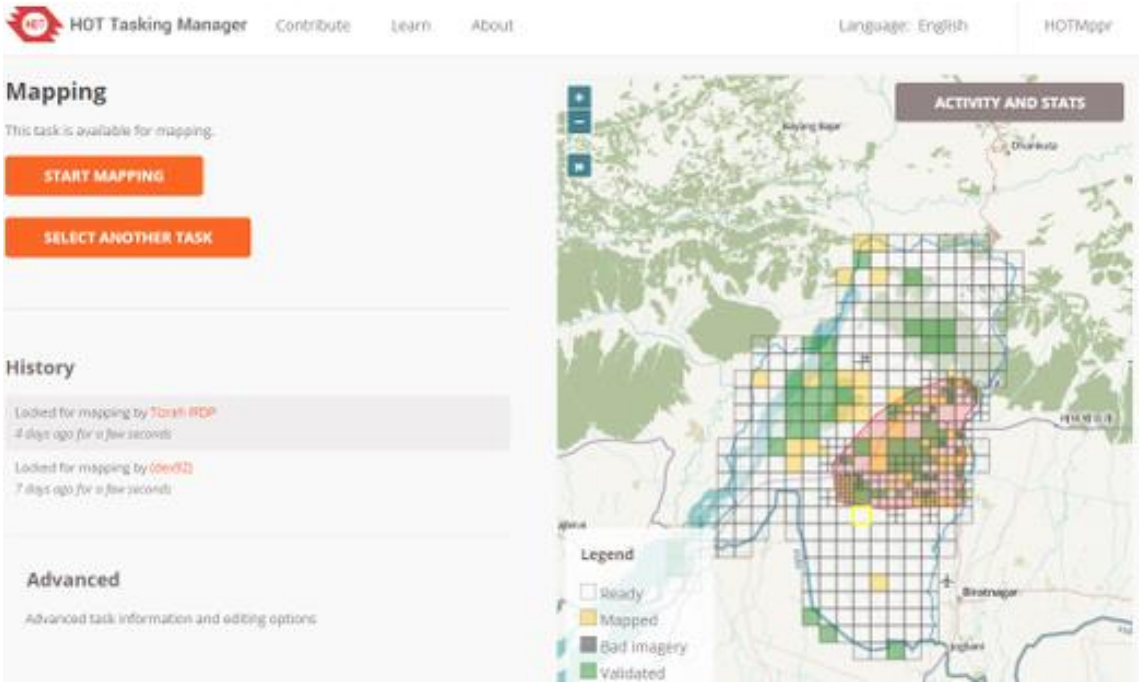
ONGOING PROJECT: RISKPACC

- **Citizens** can play a **range of roles**, and RiskPACC develops a range of them:
  - Analysis of (passive) social media data, e.g. Twitter
  - Report on incidents (fire, flood, landslide, etc.) via an app, together with capturing evidence (photo)
  - Hardest type is microtasking

Source: Poblet et al., 2018

ONGOING PROJECT: RISKPACC

- **Microtasking** is done in Humanitarian OpenStreetMap (HOT) [HOT is the disaster-arm of OSM]
- Directs volunteers to a specific image part and to map as per instructions
- Related with Missing Maps that focuses on mapping vulnerable communities



MISSING MAPS

American Red Cross BritishRedCross Humanitarian OpenStreetMap Team

https://www.missingmaps.org/

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ONGOING PROJECT: RISKPACC

- **Microtasking** may require specific skills, e.g. in image analysis

1. Wildfire event

2. Call for geospatial experts

3. FireWatch web app - differenced Normalized Burn Ratio (dNBR)

4. Burn severity classification

5. Risk communication

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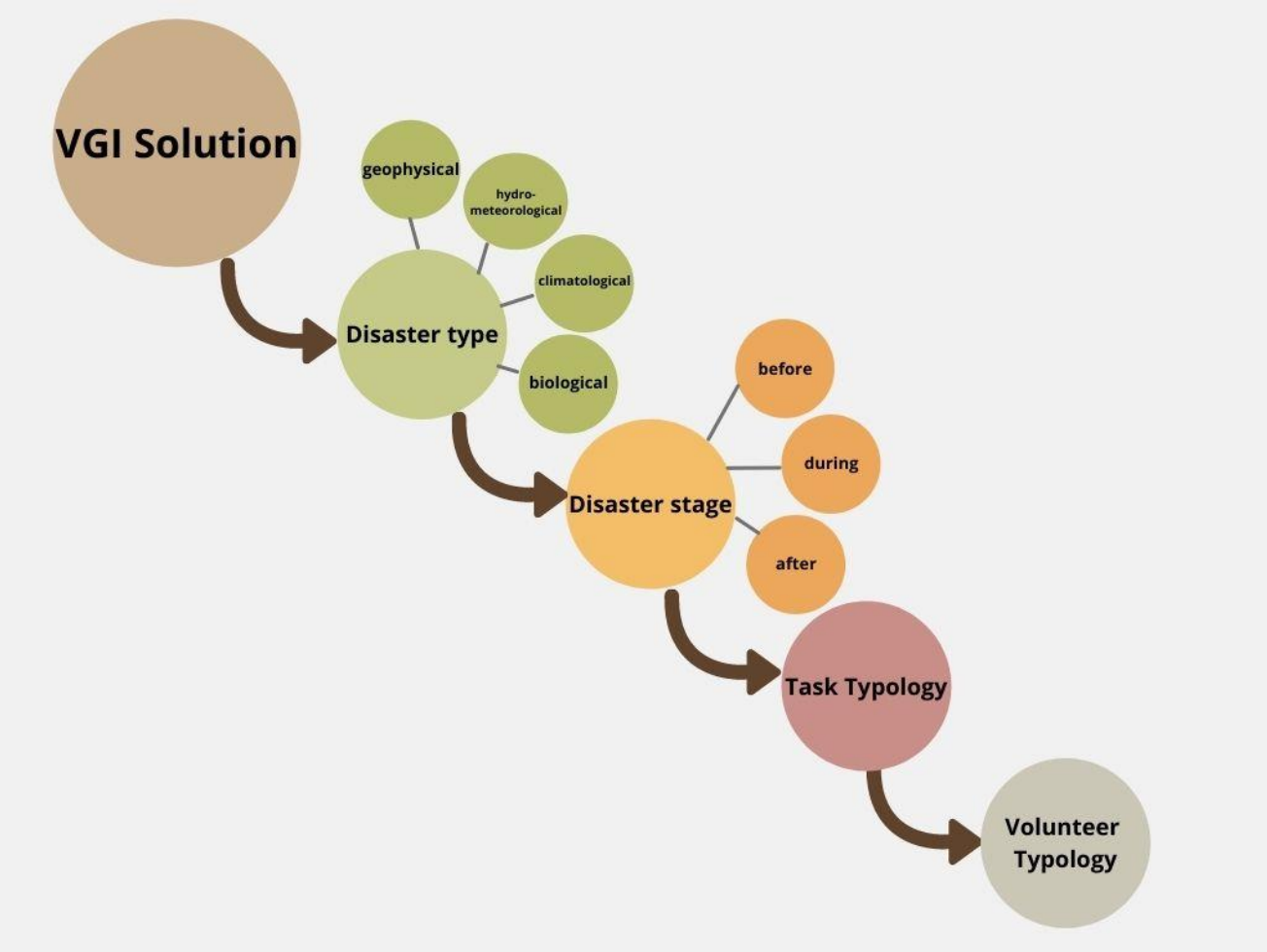
ONGOING PROJECT: RISKPACC

- **Challenge** really is to match a given problem to a suitable VGI solution, and the suitable volunteer



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TAKE-HOME MESSAGES

- **Disaster risk management (DRM)** involves pre-, syn- and post-event stages
- All require (typically **spatial**) **information**, be it on hazards, dangerous situations that are developing, damage caused, progress of clean-up and recovery, etc.
- Tasks range from **simple** to **hard** (expert-level), and can be **passive** or **active**
- **Many open questions** regarding how to recruit and retain volunteers, train them to give accurate information, the ICT infrastructure to collect and process the information
- How to integrate VGI with **existing models**, for example for risk assessment?
- Also the **actual needs** by civil protection authorities that can be filled by volunteers are not very clear
- ➡ plenty of research topics at both MSc and PhD level