Satellite-driven and in-field voluntary geospatial data collection for efficient disaster response and reconstruction efforts

QuinJunSAT (群众 & Satellites)
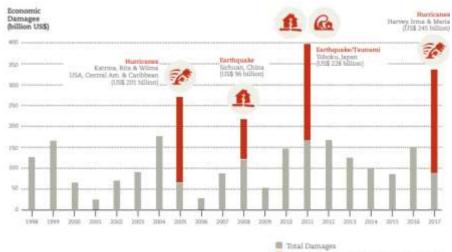
Refiz Duro, Scientist, AIT

Crisis and Disasters – Some Numbers

Source: CRED 2017

Source: Munich Re 2018

Telephone, fax, social media, e-mail

[slow, manual, prone to errors]

Crisis Management – Acquiring Data/Information

Telephone, fax, social media, e-mail

[slow, manual, prone to errors]

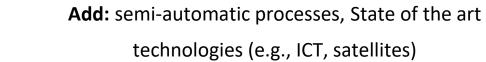**Add:** semi-automatic processes, State of the art

technologies (e.g., ICT, satellites)

Telephone, fax, social media, e-mail

[slow, manual, prone to errors]

Add: semi-automatic processes, State of the art technologies (e.g., ICT, satellites)

Near-real time situational awareness leading to:
1) smarter resource allocation and response actions
2) shorter reaction times
3) lower total costs for relief actions.

- **Improve the capacity of crisis managers and responders:**
  - before, during and after disaster events through information integration to obtain quick response and accurate assessment of damages/situation using different sources:
    - Satellite images & data
    - Crowdsourced information (e.g., sending tasks to volunteers)
    - Common Operational Picture
- **Achieve:**
  - Near real-time (and updated) situational awareness picture of crisis
  - Improved response actions, resource allocation & reaction times
  - Decreased costs for relief and response (geo-target where to distribute the resources and send responders)
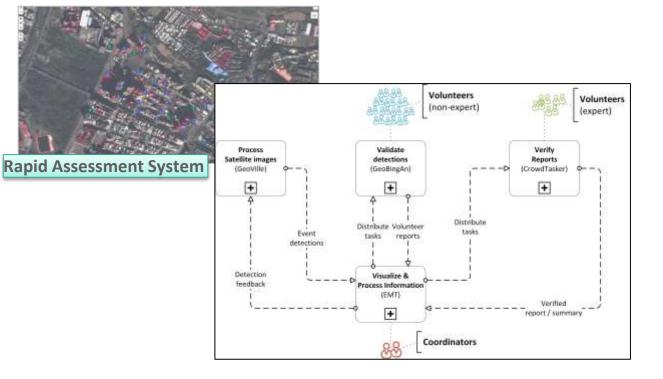
QuinJunSAT Approach

1 SATELLITE IMAGES
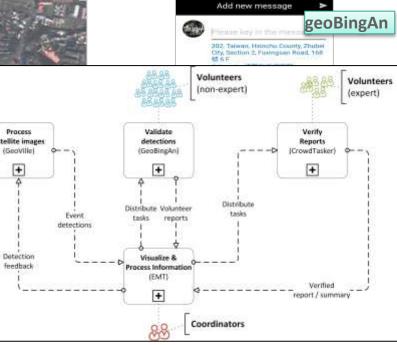Automatic image analysis
MAIN OUTPUT:
List of damages created

2 TASKS FOR VOLUNTEERS
Define crowdtasker assignments based on damage list
MAIN OUTPUT:
List of defined tasks

3 CROWDTASKING AND CROWDSOURCING DATA
Volunteers
1. complete tasks
2. collect additional info
MAIN OUTPUT:
Data on damages, building material and height, additional data

4 CROWDDATA vs SATELLITE DATA
Automatic comparison of data
MAIN OUTPUT:
Confirmed damages, results on accuracy, location precision, etc.

The Way of Data and the Tools

Rapid Assessment System

The Way of Data and the Tools

geoBingAn

CrowdTasker

Rapid Assessment System

The Way of Data and the Tools

geoBingAn

CrowdTasker

Rapid Assessment System

Emergency Maps Tool

Change Detection using Very High resolution Satellite imagery

Pre-event image

Post-event image

Difference

Taiwan Drill Day

- "921 International Disaster Prevention Drill" is an annual set of events across the whole Taiwan, commemorating the devastating earthquake on 21st September, 1999.

- More than 2,000 lives were lost, damaging tens of thousands of buildings and destroying infrastructure.

- **Include technological advancements for the damage detection / data collection for rapid assessment & creation of a crisis picture:**

  - **Satellite Technologies (from above)**

    - *Very high resolution imagery (sub-meter)*

  - **Crowdsource Data (from the ground)**

    - *Smartphone Apps for crowdtasking (geoBingAn, CrowdTasker)*

  - **Crisis Mapping**

    - *Emergency Maps Tool for decision making support*

Taiwan Drill Day

- Hsinchu County in Taiwan

- Disaster Prevention and Resilience Center
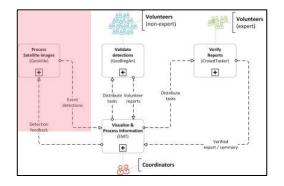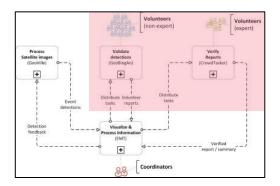
- Crisis responders & managers, volunteers

Taiwan Drill Day

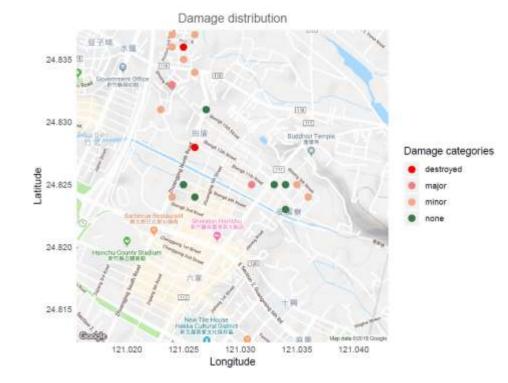# Taiwan Drill Day

Taiwan Drill Day

Collect, Assess and Visualize Data to Assist in Decision Making

Potential Applications & (some of the) Identified Challenges

Applications in the light of Response/Recovery & Sustainability:

- Flexible enough to be applicable to most disaster types (e.g., earthquake, typhoon) and crisis phases (preparedness, response, recovery, mitigation) by "information collection and assessment activities"

- Different types of data can be gathered depending on the disaster (e.g., building height, material, flood water color, smell, etc.)

- Challenge: applying the same damage detection algorithm to different types of cities/places (e.g., Katmandu vs Taipei)

- Challenge: relies on temporal and spatial resolution of the remote sensing missions

- Challenge: sufficient number of volunteers is critical

Thank You!

quinjunsat.info

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[3] GeoThings Inc.