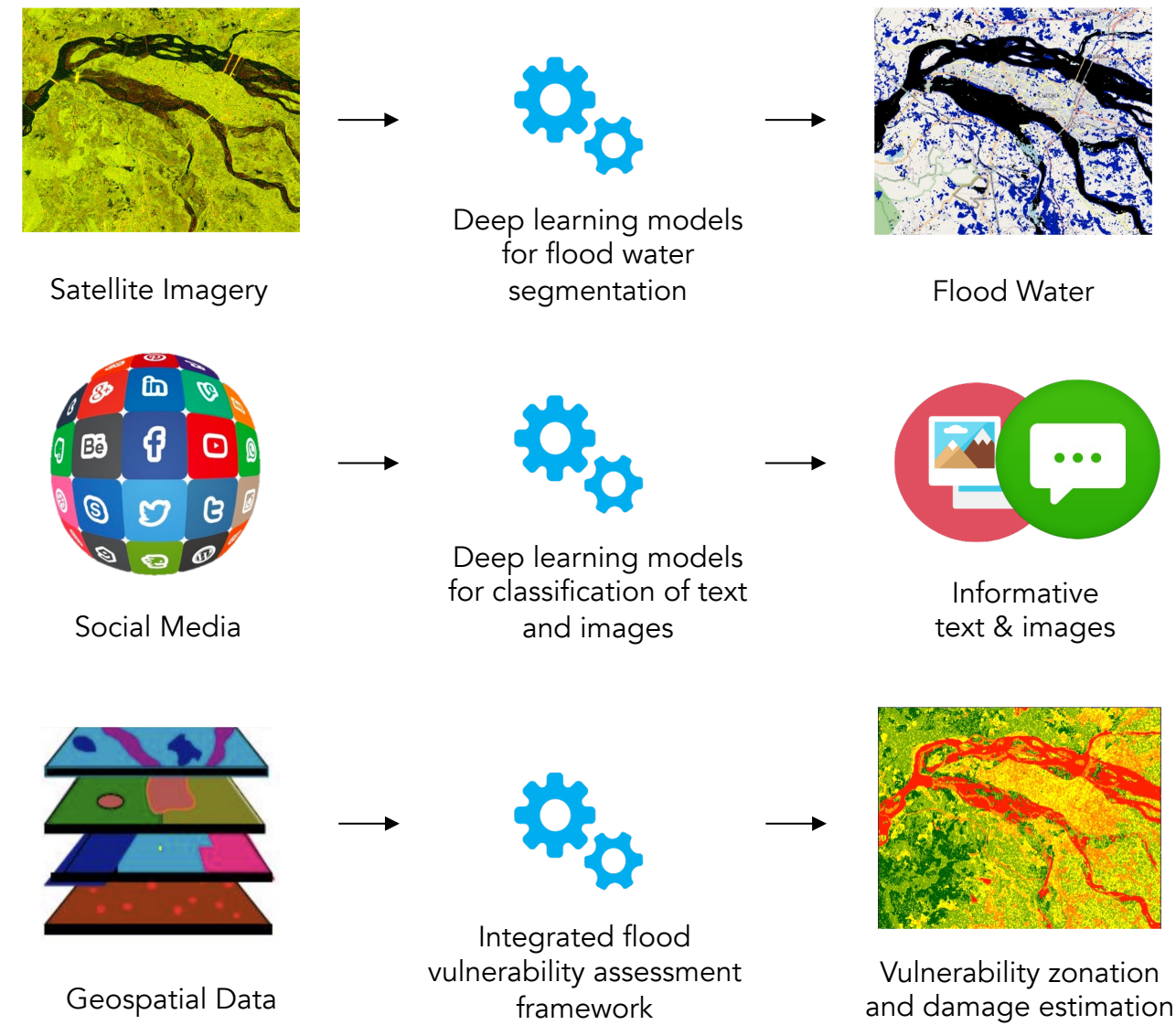# Triangulation of remote sensing, social sensing, and geospatial sensing for flood mapping, damage estimation, and vulnerability assessment

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What added value can we provide to crisis responders when fusing remote sensing, social sensing and geospatial data together?

1. Proposed solution for fusing three different data sources

Satellite Imagery → Deep learning models for flood water segmentation → Flood Water

Social Media → Deep learning models for classification of text and images → Informative text & images

Geospatial Data → Integrated flood vulnerability assessment framework → Vulnerability zonation and damage estimation

2. Tested the fusion of remote sensing and social media data

We found three added value that can be provided to crisis responders.

1) Confirmatory signals

When remote sensing and social media (tweet text and/or image) show flooding in the exact region, they confirm the flooding situation in that exact area.

2) Complementary signals

Tweet text and/or images which are intersecting or in close proximity to the flood layer can potentially provide three types of contextual information:

- **Needs and Requests:** i.e., food & water, shelter, money, rescue requests
- **Disaster Impact and Damages:** i.e., electricity, infrastructure damage
- **Situational Reports:** i.e., weather updates, affected area & individuals
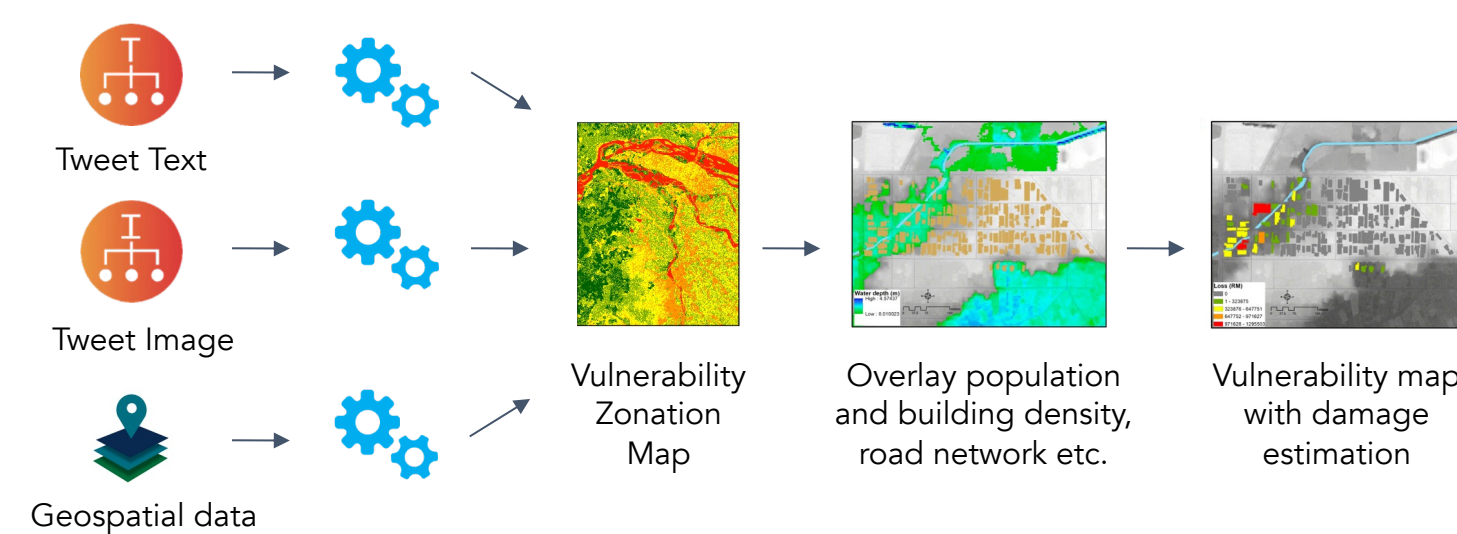
3) Novel signals

Informative tweets and images which are not overlapping with any flood water pixels are vital to detect flooded areas which are not detected by the remote sensing methods.

Flood Insights for Cyclone Fani
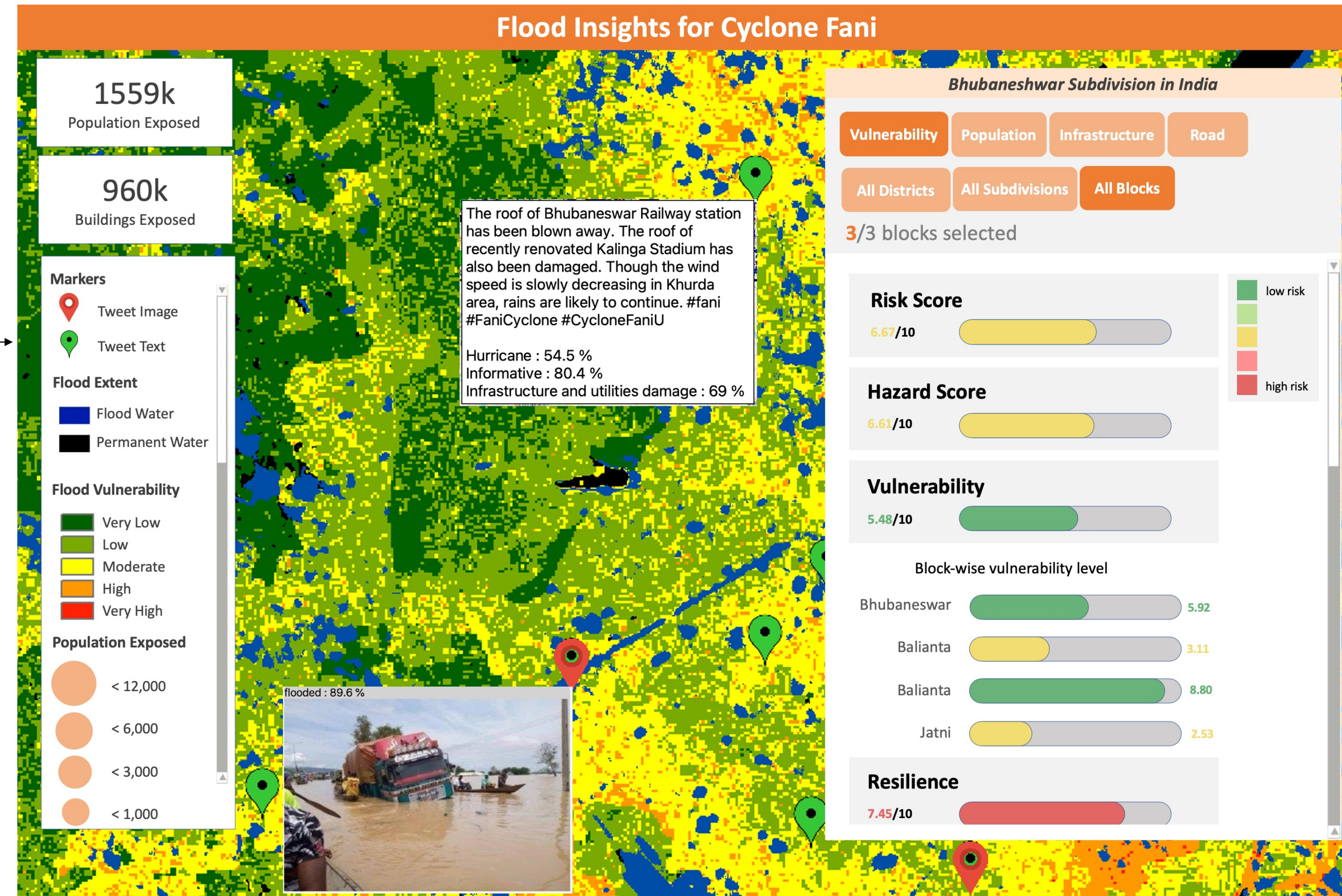
Comprehensive dashboard activated during a real flood event to allow crisis responders to make informed decisions

3. Testing the fusion of social media and geospatial data through the creation of a new framework

We are currently developing an integrated framework for flood vulnerability assessment.

Tweet Text → Tweet Image → Geospatial data → Vulnerability Zonation Map → Overlay population and building density, road network etc. → Vulnerability map with damage estimation

The framework will serve two purposes:

1) Creation of new flood vulnerability maps

When traditional geospatial indicators are outdated (e.g., census data) or unavailable due to data scarce regions, social media proxy variables can be used.

2) Enhancement of existing flood vulnerability maps

Novel signals from social media indicators can be used to enhance flood vulnerability maps derived from traditional indicators.

1 Boundary & Basemap
2 Satellite Imagery
3 Permanent & Flood Water
4 Social Media Text Markers
5 Social Media Image Markers
6 Vulnerability Map
7 Geospatial Layers

References

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