Utilizing NASA and NOAA Earth Observations to Enhance Cyclone Movement and Intensity Measurements to Improve Disaster Relief Planning in the Philippines

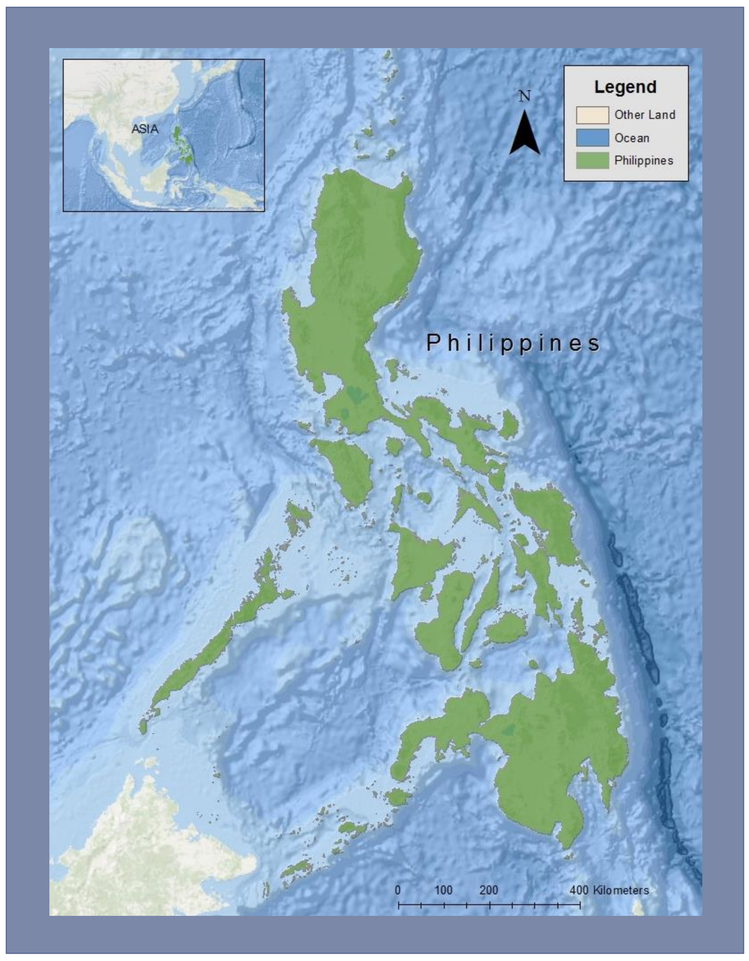
Abstract

The Philippine islands, located within the northwest Pacific Ocean basin, are frequently affected by tropical cyclones. During and after tropical cyclones, the number of gender-based violence (GBV) crimes increase. To assist the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), a cyclone vulnerability assessment for each municipality within the Philippines was created and streamlined with demographic data to identify at risk communities. For this effort, hurricane satellite (HURSAT-B1) data were downloaded for each tropical cyclone that affected the Philippines from 1985 to 2009. To include the recent record, data were gathered for tropical cyclones affecting the study area from 2010 to 2015 from the Cooperative Institute for Research in the Atmosphere's (CIRA) Multiplatform Tropical Cyclone Surface Wind Analysis (MTCSWA). The HURSAT and CIRA products were used to derive estimates of the 18 m/s, 26m/s, and 33 m/s wind radii for each of the four quadrants (i.e. northwest, northeast, southeast, southwest) of each tropical cyclone at a 6-hour temporal resolution. The wind radii estimates were provided by the National Oceanic and Atmospheric Administration's National Environmental Satellite, Data, and Information Service (NESDIS). The wind speed data were used to estimate the Integrated Kinetic Energy (IKE) of each tropical cyclone in the study period. IKE values were then accumulated over the entire study period for the Philippines and used to generate a climatology of cyclone intensity for each municipality. Additionally, areas susceptible to rainfall-triggered landslides were mapped using slope data from Shuttle Radar Topography Mission.

Objectives

- **Enhance** vulnerability maps with storm size and intensity used for disaster preparedness and response
- **Assess** gender vulnerability based on improved storm climatology
- **Enable** our partners to predict areas of greatest vulnerability in future cyclone events

Study Area



Methodology

Data Acquisition
- International Best Track Archive for Climate Stewardship (IBTRaCS) Hurricane Satellite dataset (HURSAT-B1)
- Multi-Platform Tropical Cyclone Surface Wind Analysis (MTCSWA)
- Satellite Radar Topography Mission (SRTM)
- Philippines Demographics

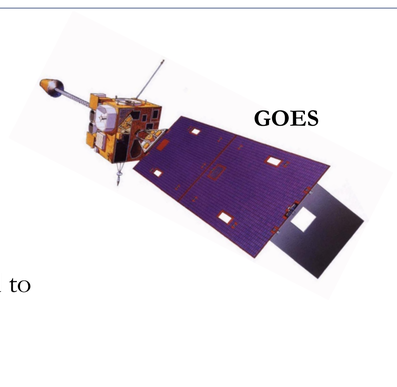
Data Analysis
- Calculate the climatological Track Integrated Kinetic Energy (TIKE) of all tropical cyclones that affected the Philippines from 1985 – 2015
- Create a comprehensive precipitation initiated nationwide landslide susceptibility index

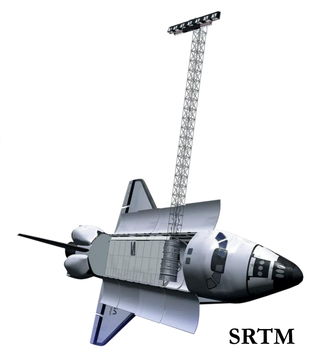
End Products
- Improved natural hazards risk index
- Interactive ArcMap file for disaster prevention

Earth Observations

Geostationary Operational Environmental Satellite Suite (i.e. GOES-8) contributes to HURSAT dataset.

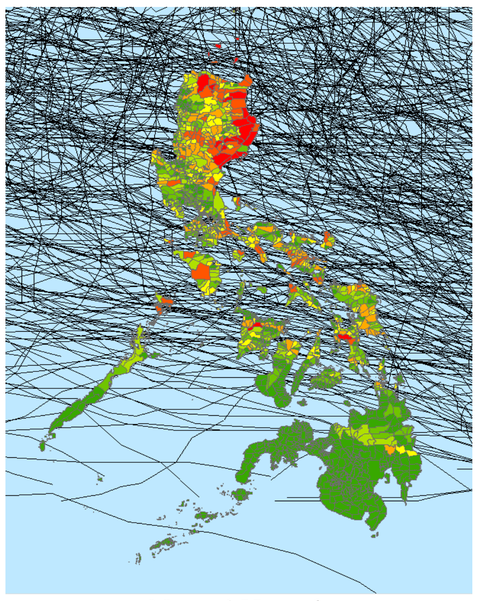
Shuttle Radar Topography Mission (SRTM) data were used to analyze slope stability in landslide risk assessment.



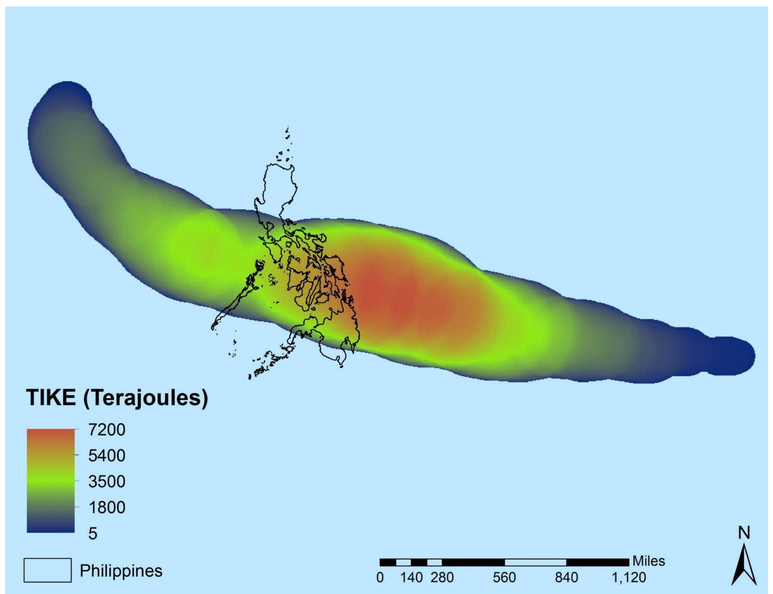


SRTM

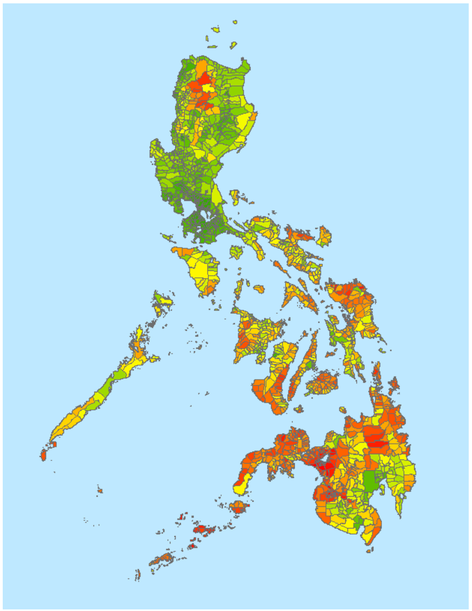
Results



Natural Hazards



Typhoon Haiyan



Demographics

Conclusions

- The project improved the identification of areas with greatest natural hazard risk using HURSAT & IBTRaCS data to calculate IKE.
- The IKE data more accurately determined which portions of the Philippines are at greatest need for disaster mitigation preparation.
- Results discovered in this project can be improved upon & expanded to other nations vulnerable to tropical cyclones.

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Project Partners

- United Nations Office for the Coordination of Humanitarian Affairs (OCHA)
- Netherlands Red Cross
- United Nations Institute for Training and Research, Operational Satellite Applications Programme (UNOSAT)
- NOAA, National Environmental Satellite, Data, and Information Service (NESDIS)

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Philippines Disasters II