Flood Extent of Different Land-use Scenarios under Event-based Precipitation in Silang-Sta. Rosa Subwatershed, Philippines

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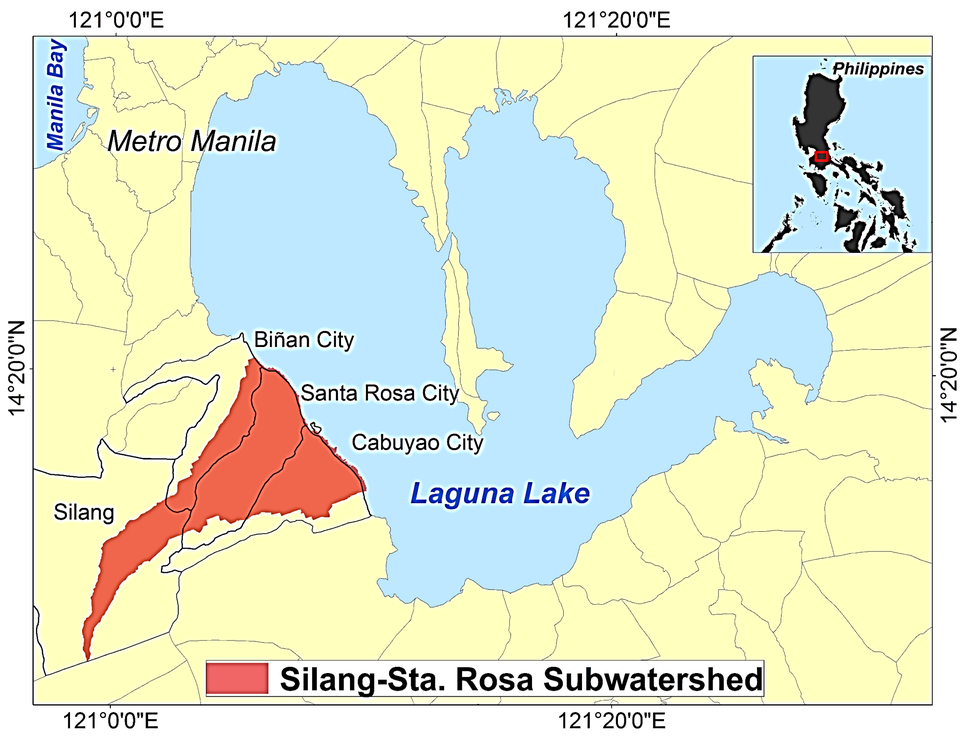
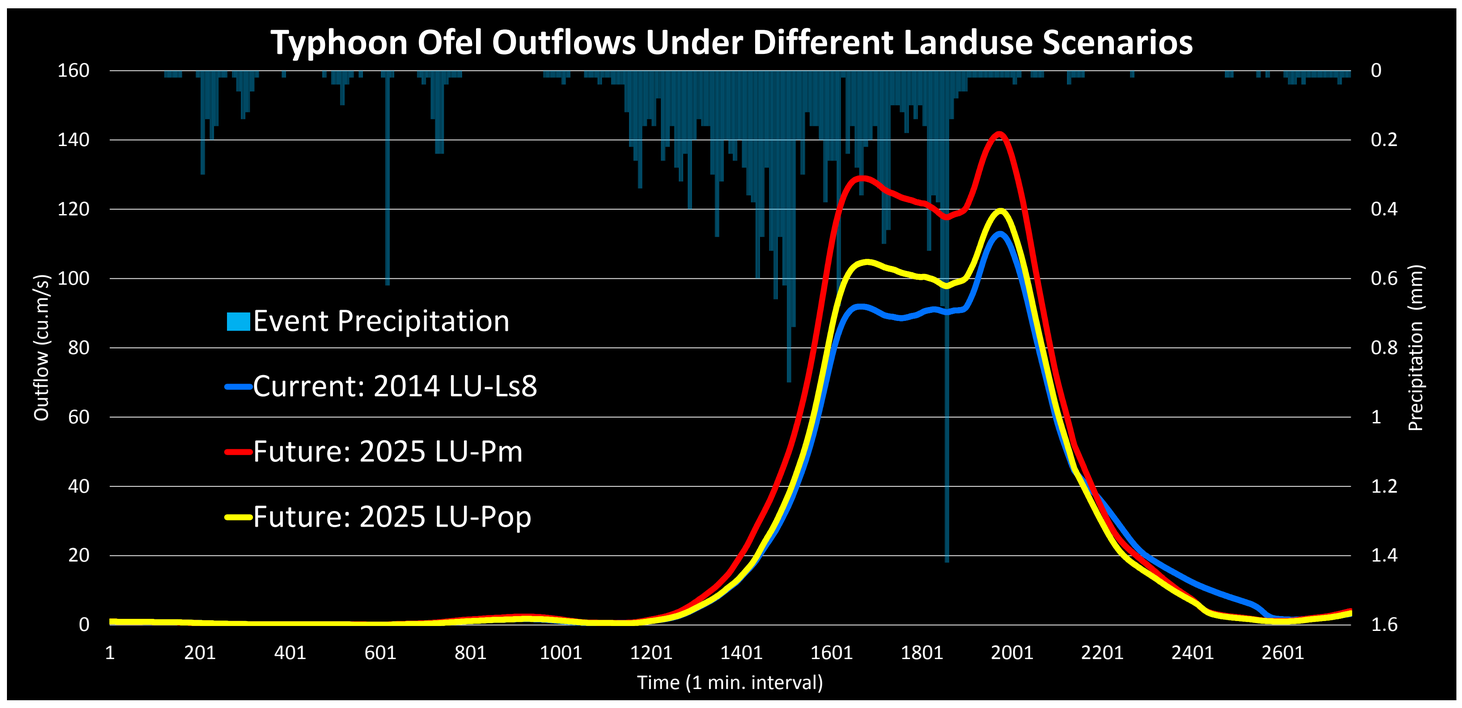
Overview

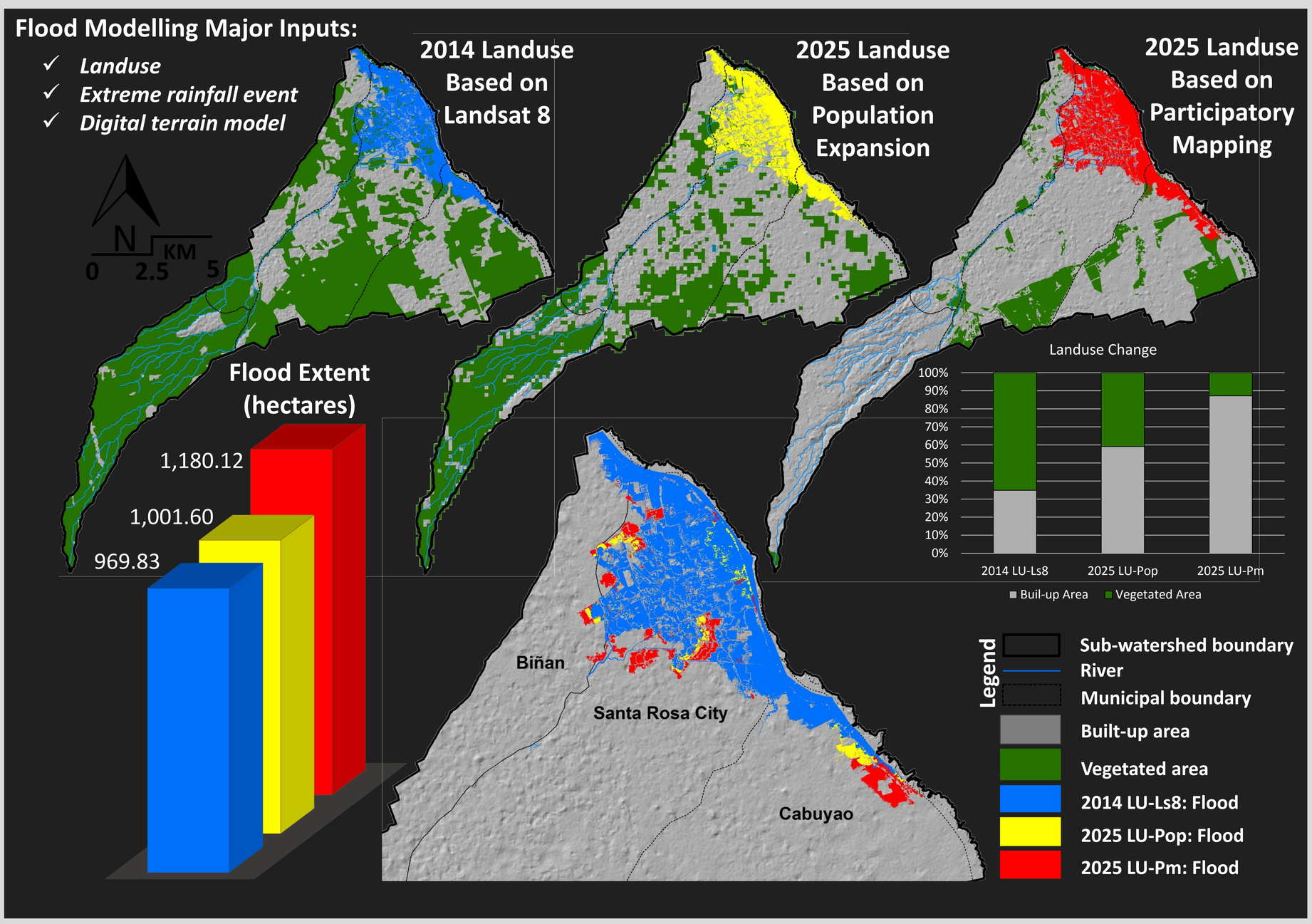
- Three land-use scenarios (current: 2014 LU-Ls8 [1] , future: 2025 LU-Pm [2],and future: 2025 LU-Pop[3]) were generated and analyzed for flood modelling.
- Event-based precipitation[4] with 10 year rain return period classification and high resolution digital terrain model from LiDAR data [5] were used to generate detailed flood simulation [6].
- Findings from this study will be shared to the local government units to help make their land-use planning climate sensitive.





Results

- The proposed land-use con-version in scenario 2 or 2025 Land-use based on participatory mapping, shows an increased built-up area by 150% (from 3,929 has. to 9,816 has.). While scenario 3 or 2025 Landuse based on population expansion shows an increased built-up area by 84% (from 3,929 has. to 7,232 has.).
- The Increased built-up area resulted to 22% and 3% increase in flooded area in scenario 2 and scenario 3, respectively.
- The flood simulation only accounts the land-use change scenarios under an extreme rainfall event. The higher the land-use conversion to built-up areas, the higher the risk of flooding in downstream areas of the subwatershed.



[1] Scenario 1 LU input: Land cover classification using Landsat 8 satellite images (2014) courtesy of the United States Geologic Survey (USGS) with pixel size of 30 m.

[2] Scenario 2 LU input: Predicted future land-use in 2025 based on population expansion model with mesh/grid size of 150m x 150m.

[3] Scenario 2 LU input: Proposed future land-use in 2025 of the Silang-Sta. Rosa sub-watershed derived from the participatory mapping activity participated by the four local government units (the cities of Santa Rosa, Biñan, and Cabuyao and the municipality of Silang).

[4]Selected extreme rainfall event: Typhoon Ofel (Int. Name: Son-Tinh) Oct. 25, 2012; Duration: 12 hours; Amount: 224.4 mm collected using Tipping Bucket Rain Gauge installed in Silang (Upstream). Classified as 10 year rain return period based on Ambulong Station RIDF (Rainfall Intensity-Duration Frequency Curve) which has a 54 years record, prepared by Hydrometeorological Data Application Section (HMDAS), Hydro-Meteology Division, Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA)

[5] Flood extent boundaries were generated using the Hydrologic Engineering Center-River Analysis System (HEC-RAS), a freeware designed and coded for the U.S Army Corps of Engineers that allows both one dimensional and two dimensional hydraulic analysis for steady and unsteady flow in rivers.

[6] LiDAR (Light detection and ranging) data for the downstream part of the subwatershed was requested from the Phil-LiDAR project of the Philippine government for detailed digital terrain model.

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