MAP EFFECTIVENESS REPORT

Analysis on the Effectiveness of
Map-Based Risk Communication

September, 2017

tiveness of Map-Based Risk Communication

Communicating Risks of Hazard

g hazards has been evident due to its recognized function in relation to vulnerability and disaster risk management zel, & Voss, 2014). However, there are reluctance in using end hazards warnings due to the belief that people are not ff, & McNeill, 2016).

hat were struck by Typhoon Haiyan[1] in order to determine mmunicating risks and hazards. Survey respondents were vere given a print-out copy of the storm surge flood map to he accomplished survey forms were processed to capture 's ID, address (Barangay, Phase, Block, Lot, Street), nterpret the map, house location of the respondents on the ss, and nearest corner from the respondents' house. The ion is attached as Annex A.

ted in the survey. Out of 86 respondents, about 84% or 72 they thought their houses were located, while 73 responded e map.

espondents gave clear details on their actual addresses and ouses in the given map. The survey results were further nd Google Earth to locate the given addresses of the oss location is correctly placed on the specified street, the pared to the Tacloban City Map in Google Maps. Street e traced in Google Maps. Then each cross location was ecified street name to determine accuracy. Responses were : (1) Low - for cross location that does not coincide with easured offset distance of greater than 300 meters; (2) is slightly offset with measured distance of less than 300 ocation that coincides with street name. Only points with orrectly placed on the specified street) were plotted using S.

s have high accuracy in locating their houses in the map ldresses. Only six (6) respondents were classified with

n as "Yolanda" hit the Eastern Visayas Region of the 13. According to the National Disaster Risk Reduction 14, Typhoon Haiyan's storm surge affected more than 16 , and destroyed more than 1.1 million dwellings.

moderate accuracy while seven (7) respondents were classified with low accuracy. Table 1 presents the respondents with high, medium, and low accuracy in locating their home.

Table 1. Respondents with High, Medium, and Low Accuracy in Locating their Houses

ACCURACY	NO. OF RESPONDENTS	RESPONDENT'S ID	OFFSET
High	16	A2, A20, A25, A31, A38, A41, B13, B14, B15, B16, B17, B35, B37, B39, B40, B42	0
Moderate	6	A6, A19, A29, A30, B10, B12	< 300 m
Low	7	A15, A16, A18, A23, A32, B8, B9	> 300 m

Further analysis of the results shown in Table 1 was presented in Figure 1. The assumed location of the houses of the respondents compared to the provided addresses and nearest corners were plotted in the map and deviations or offset distances were measured. Point X represents the location of the cross and point Y represents the intersection of the nearest corners. Specific details on the deviations or measured offset distances from X to Y of respondents with low and medium accuracy are presented in Table 2.

Table 2. Deviations or Measured Offset Distance for Low and Medium Accuracy

RESPONDENT'S ID	ACCURACY	DEVIATION/ MEASURED OFFSET DISTANCE (M)
A6	Moderate	122.046
A19	Moderate	236.702
A29	Moderate	147.847
A30	Moderate	131.549
B10	Moderate	208.738
B12	Moderate	291.269
A15	Low	571.999
A16	Low	448.355
A18	Low	813.720
A23	Low	310.948

A32	Low	322.000
B8	Low	468.473
B9	Low	413.987

The results of the survey suggest that map alone may not be effective to use as the primary medium in communicating risk and sending warnings. Maps may help in the visualizations of risks and hazard warnings but should be supported with textual information understandable to the local communities. In a study conducted that compared the effectiveness of maps versus text-based messages in communicating wildfire warning information in Western Australia concluded that comprehensive and effective map-based warning instruments may be useful for people who favors graphical presentations but still it does not replace the effectiveness of textual messaging (Cao, Boruff, & McNeill, 2016). More, the effectiveness in using maps in communicating risk requires the provision of informative details other than plain description of the risk and hazards but should also include information about the evacuation centers and routes, disaster management centers, dangerous spots, communication channels and systems, evacuation criteria, tips for evacuation including emergency kits, and mechanisms and symptoms of hazards for educational propose, which had also been proven effective to facilitate evacuation of people in Japan (Osti, 2008).

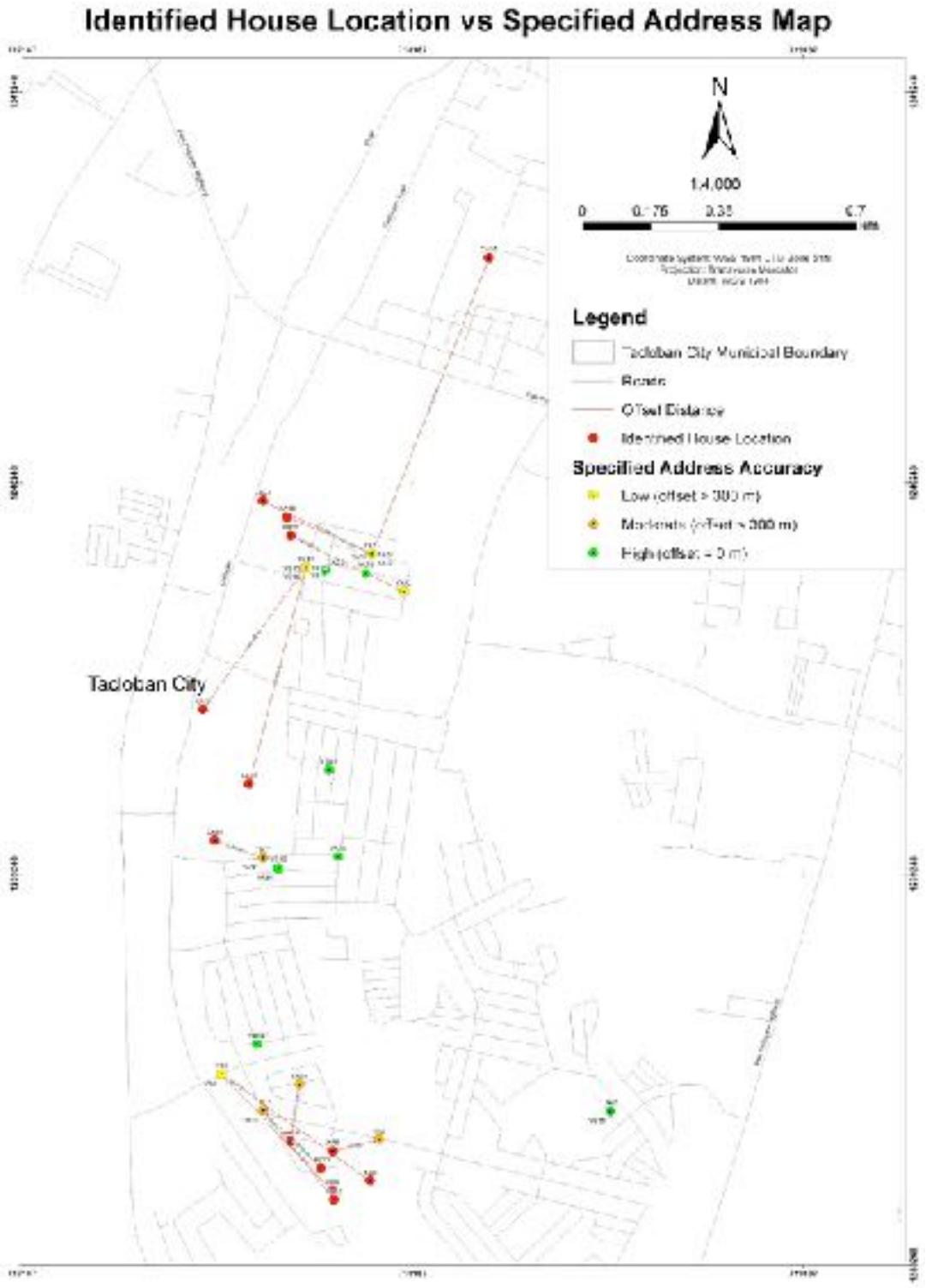

Figure 1. Identified House Locations vs. Specified Addresses

II. Using geohazard maps in lieu of surge maps

The Philippine Government through the Geo-hazard Mapping and Assessment Program produced maps to communicate hazard information. Two (2) projects were implemented under the program, one is the Geo-hazard Mapping and Assessment Project (GhMAP) implemented by the Department of Environment and Natural Resources – Mines and Geosciences Bureau (DENR-MGB) and the other one is the Project Nationwide Operational Assessment of Hazards (NOAH) implemented by the Department of Science and Technology (DOST).

GhMAP started as early as 2006 while Project NOAH started six (6) years after, in 2012. Major activity of GhMAP is the geohazard mapping at 1:50,000 and 1: 10,000 scale to identify areas prone to landslide, flooding, ground subsidence, and coastal erosion. It involves the conduct of province/municipal-wide Information and Education Campaign (IEC) and provision of hazard maps and threat advisories. It also includes identification and assessment of relocation sites, assessment of evacuation centers and establishment of community-based early warning system (Badilla, R.A., et al.). For Project NOAH, project components include the production of hazard map that identify areas in the country which are susceptible to floods, storm surges, and landslides. The DOST conducts the Information, Education and Communication Campaign of Project NOAH (Andoy, Gregorio, & Ugay, 2016).

While both are implementing IEC activities, the DENR-MGB conducts more intensive campaigns and reproduce maps, manuals, and information materials for public dissemination (Andoy, Gregorio, & Ugay, 2016). Further, the DENR-MGB provides seminar/ workshops for local government officials to increase awareness and preparedness on natural hazards, and training on proper use of geo-hazard maps (Andoy, Gregorio, & Ugay, 2016). Because of this, the geo-hazard maps produced by the DENR-MGB became more accessible to the Local Government Units (LGUs). More LGUs are using the geo-hazard flood susceptibility maps in the preparation of Comprehensive Land Use Plan and in Disaster Risk Reduction and Management planning activities. However, this does not include the necessary information about storm surges.

Storm surge maps are different from flood susceptibility maps. Storm surge is defined to be the abnormal rise in seawater due to effects of typhoons above predicted tidal levels which may cause in extreme coastal flooding (landward). Flood is defined as the covering/overflow of water over usually dry land (usually seaward). Another notable difference of the produced maps of DENR-MGB and DOST-Project NOAH was articulated by the Philippine Institute of Volcanology and Seismology (PHIVOLCS). According to PHIVOLCS, the DENR-MGB map is a susceptibility map that identifies the areas which are easily affected by hazards while the DOST-Project NOAH map is a scenario map that shows what can happen on a given hazard level (Rey, 2015).

A comparison on the DENR-MGB flood map and DOST-Project NOAH storm surge map was performed to determine the consistency of the information presented in the two (2) maps, and evaluate the reliability of using the DENR-MGB flood map as source of information on

storm surges. The comparison was undertaken using the data and information from Tacloban City and Davao City.

The maps prepared by the DENR-MGB and the DOST-Project NOAH for Tacloban City is presented in Figure 2. Consistent rating on flood susceptibility and storm surge hazard for Tacloban City was observed (Table *3*).

Table 3. DENR-MGB and DOST-Project NOAH Tacloban City Hazard Rating Based of Water Height

Rating	Water Height	
	DENR-MGB Flood Susceptibility Rating[1]	DOST-Project NOAH Storm Surge Hazard Level [2 3]
High	>1.5 m	>1.5 m
Moderate	0.5-1.5 m	0.5-1.5 m
Low	<0.5 m	<0.5 m

Sources:

[1]*Results of MGB Regional Office No. VIII Landslide/Flood Assessment and Geological Mapping of Tacloban City Leyte* (Mines and Geosciences Bureau Regional Office No. VIII, 2011)

[2]*Disseminating near real-time hazards information and flood maps in the Philippines through Web-GIS* (Lagmay, Disseminating near real-time hazards information and flood maps is map in the Philippines through Web-GIS, 2012)

[3]*Devastating Storm Surges of Typhoon Yolanda* (Lagmay & Project NOAH Storm Surge Team, 2014)

The flood susceptibility rating parameters used by DENR-MGB for Tacloban City is further described below:

HIGH : Areas likely to experience flood height of greater than 1.5 meters and/or flood duration of more than 3 days; These areas are immediately flooded during heavy rains of several hours; include lands forms of topographic lows such as active river channels, abandoned river channels and areas along river banks; also, those prone to flash floods.

MODERATE : Areas likely to experience flood heights of 0.5 to 1.5 meters and/or flood duration of 1 to 3 days; These areas are subject to widespread inundation during prolonged and extensive heavy rainfall or extreme weather condition; Fluvial terraces, alluvial fans, and infilled valleys are areas moderately subjected to flooding.

LOW : Areas likely to experience flood heights of less than 0.5 meter and/or flood duration of less than 1 day; these areas include low hills and gentle slopes; They also have sparse to moderate drainage density.

Though there is consistency on the ratings used by DENR-MGB and DOST-Project NOAH, difference on the water heights mapped in most of the areas within Tacloban City is observed, as shown in Figure 2.

In the case of Davao City, different water height ratings were used in the two (2) maps. DENR-MGB has four ratings for flood susceptibility: very high/critical, high, moderate, and low while DOST-Project NOAH, on the other hand, is consistent with the three-level ratings for storm surge hazard: high, moderate and low. The ratings from the two agencies cover different water heights for the critical, high and moderate ratings. Similarities were only observed at low rating. Table 4 presents the hazard rating based on water height.

Table 4. DENR-MGB and DOST-Project NOAH Davao City Hazard Rating Based of Water Height

Rating	Water Height	
	DENR-MGB Flood Susceptibility Rating[1]	DOST-Project NOAH Storm Surge Hazard Level[2]
Critical	>2.0 m	-
High	1.0-2.0 m	>1.5 m
Moderate	0.5-1.0 m	0.5-1.5 m
Low	<0.5 m	<0.5 m

Sources: [1]*Results of the MGB's 1:10,000 Scale Geohazards Assessment and Mapping of Agdao, Baguio, Valinan, Talomo and Toril Districts, Davao City, Province of Davao Del Sur* (Mines and Geosciences Bureau, 2014)

[2]*Disseminating near real-time hazards information and flood maps in the Philippines through Web-GIS* (Lagmay, Disseminating near real-time hazards information and flood maps is map in the Philippines through Web-GIS, 2012)

Specific description on the flood susceptibility very high/critical rating of DENR-MGB in Davao City is presented below:

VERY HIGH / CRITICAL : Areas likely to experience flood heights in excess of 2.0 meters and/or flood duration of more than 3 days. These areas are immediately flooded during heavy rains of several hours; include landforms of topographic lows such as active river channels, abandoned river channels and areas along river banks; also, prone to flash floods.

Aside from the established difference in the assignment of water height assessment rating, the DENR-MGB flood susceptibility map and the DOST-Project NOAH Storm Surge map also presented different flood height and storm surge height on specific sites in Davao City. This is observed in the presented maps in Figure 3.

Given the observed differences, it is conclusive that the use of DENR-MGB Flood Susceptibility Map is not an appropriate substitute or alternative to DOST-Project NOAH Storm Surge Map in terms of communicating risk and hazard warnings.

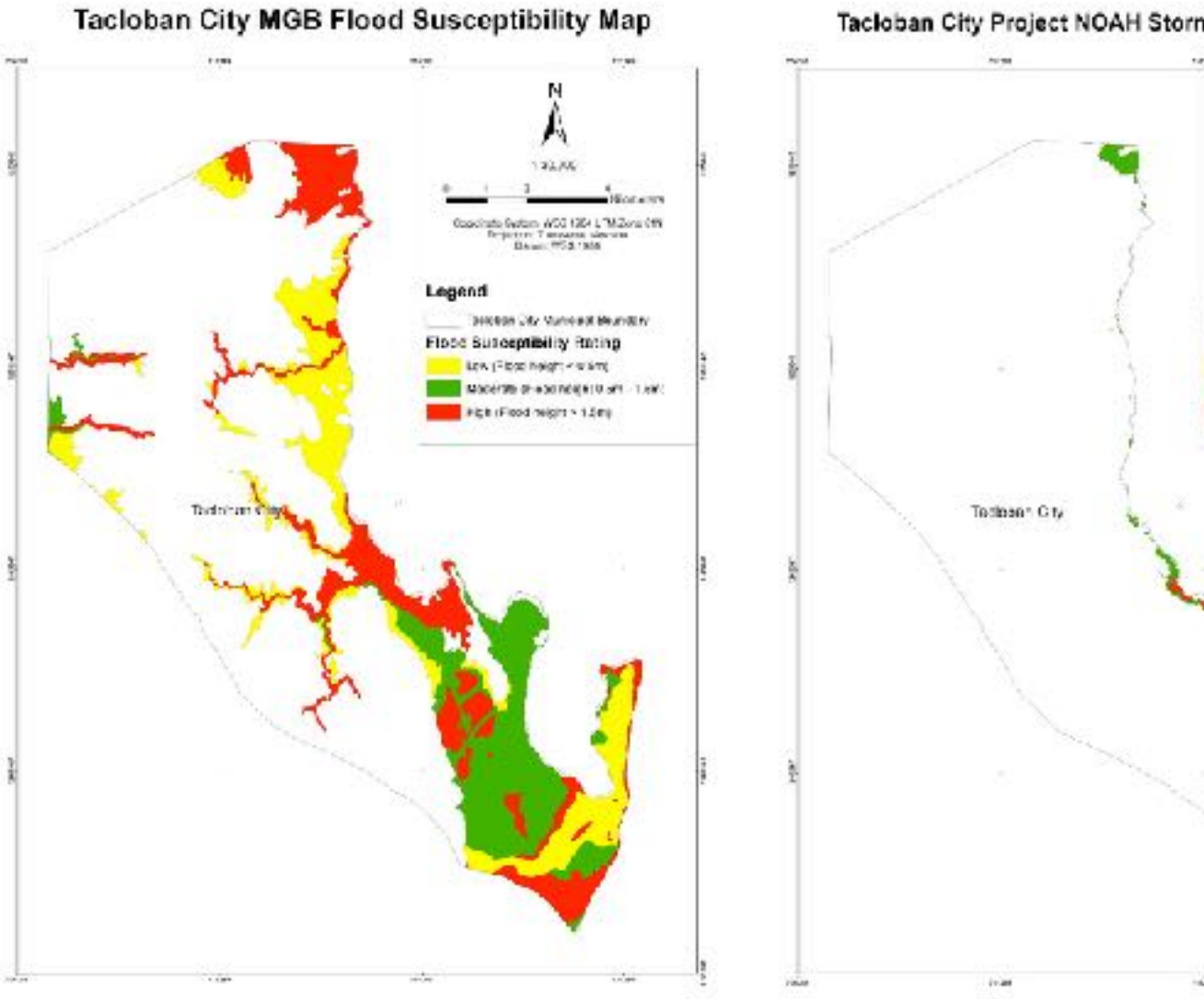

Figure 2. Comparison of Tacloban City DENR-MGB Flood Susceptibility Map and DOST-Project NOAH Storm Surge Advisory Map

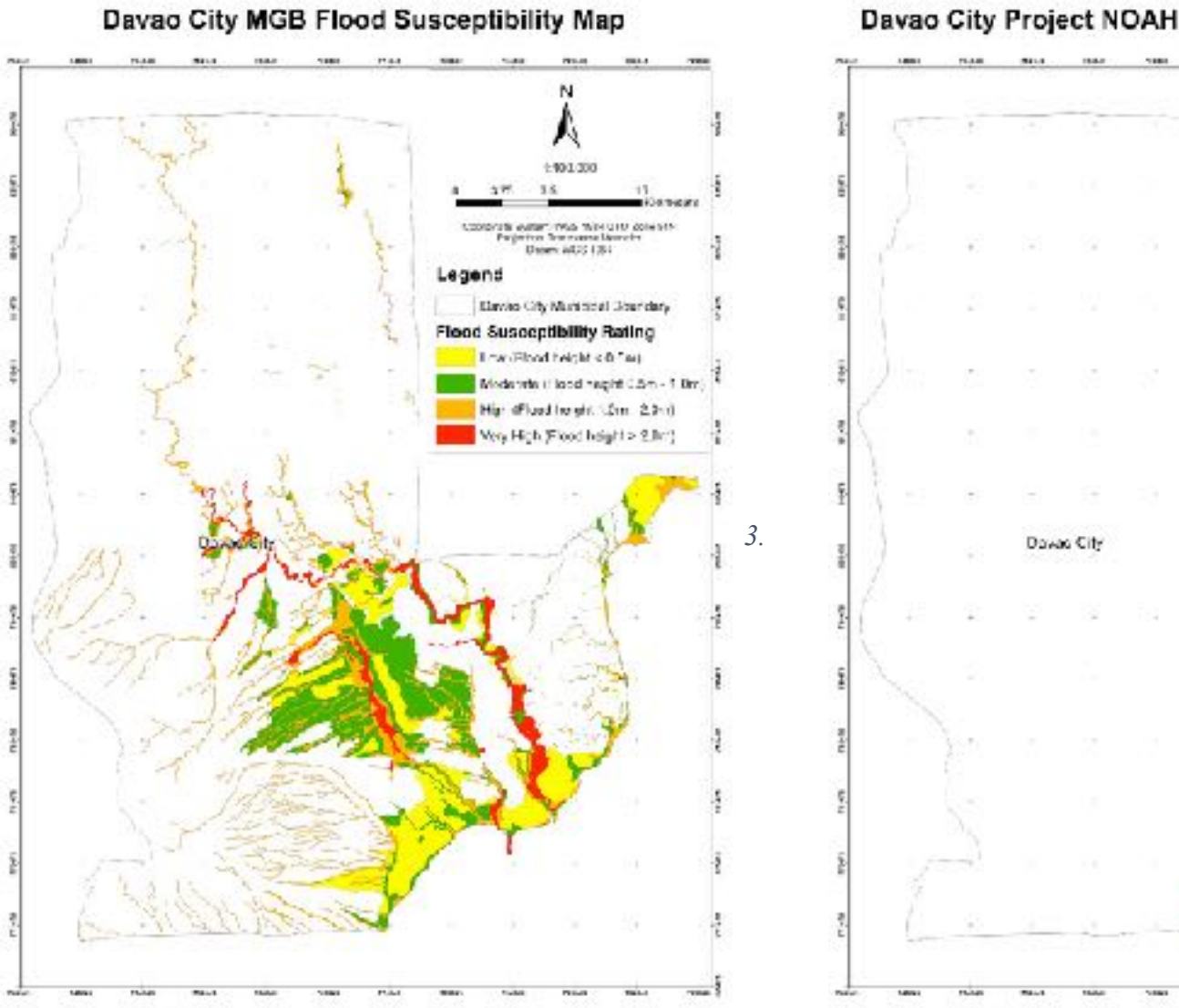

Figure 3. Comparison of Davao City DENR-MGB Flood Susceptibility Map and DOST-Project NOAH Storm Surge Advisory Map

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