

Mapping Vulnerability of Inland Wetlands to Climate Change Hazards

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Organised Session 06: Wetlands for a Sustainable Urban Future
International Conference on Human Settlements Planning and Development



Presentation Outline

- Introduction
- Data Sources
- Methodology
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- Conclusion

Introduction

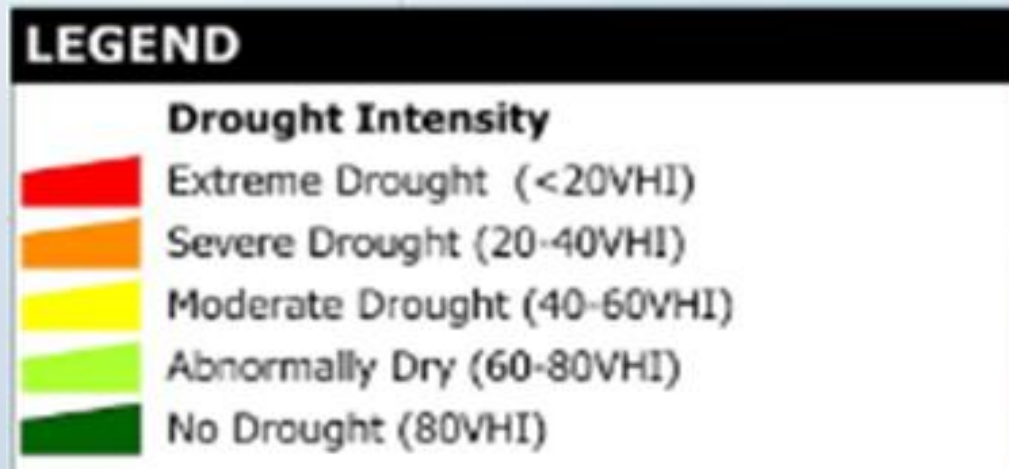
- The List of Wetlands Susceptible to Hazard was developed to identify which Philippine inland wetlands are most susceptible to the effects of rain induced landslide, flooding, and drought - hazards which has direct impact to wetland ecosystems and the many communities that depend on them.
- The 314 inland wetlands included in the list is based on the 2016 Atlas of Philippine Inland Wetlands and Classified Caves published by the Department of Environment (DENR) – Biodiversity Management Bureau.

Data Sources: Drought

- Drought Vulnerability was from the Drought Vulnerability Assessment-Agricultural Drought Frequency and Severity Mapping using MODIS of the University of the Philippines, Diliman Training Center for Applied Geodesy and Photogrammetry.
- The dataset produced from MODIS described the characteristics of drought in the Philippines and utilized vegetation and land surface temperature measurements from moderate-resolution imagery.
- Agricultural drought, according to the study, is the reduction in rainfall over a short duration at a critical point in the growing season. Characteristics of this kind of drought is low soil moisture leading to reduced crop yields.

Data Sources: Drought

- The agricultural drought data was used in this project as it covers 14 years of earth surface details (from January 2003 to December 2016) with spatial resolutions ranging from 250m-1km.









Literature suggests that the higher the VHI, the less prone to agricultural drought an area is.

Data Source: Flooding and Landslides

- Flooding and rain-induced landslide susceptibility data are from the 1:10,000 scale maps developed by the DENR – Mines and Geosciences Bureau's (MGB) National Geohazard Assessment Program.

Rating Parameters

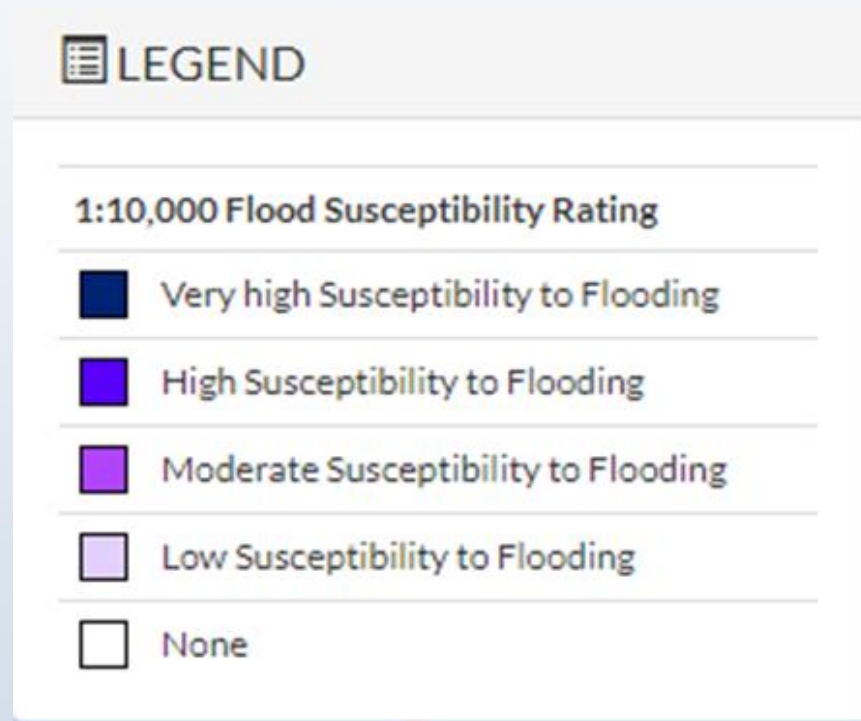
LEGEND

-  Very high Susceptibility to Landslide
-  High Susceptibility to Landslide
-  Moderate Susceptibility to Landslide
-  Low Susceptibility to Landslide
-  Debris Flow Path/Possible Accumulation Zone
-  None

Data Sources: Flooding and Landslides

- Very High: Areas usually with steep to very steep slopes and underlain by weak materials. Recent landslides, escarpments and tension cracks are present. Human initiated effects could be an aggravating factor.
- High: Areas usually with steep to very steep slopes and underlain by weak materials. Areas with numerous old/inactive landslides.
- Moderate: Areas with moderately steep slopes. Soil creep and other indications for possible landslide occurrence are present.
- Low: Gently sloping areas with no identified landslides.

Data Source: Flood Susceptibility



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.

- Very High: 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 flashfloods.
- High: Areas likely to experience flood heights of greater than 1 meter 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 flashfloods.
- Moderate: Areas likely to experience flood heights of 0.5 to 1 meter 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.

Methodology

- The list of wetlands susceptible to hazard was generated by overlaying the 314 inland wetlands with each of the three hazard maps using Geographic Information System. The level of risk was calculated using a scorecard method.
- The maps developed from the list of inland wetlands susceptible to hazard were presented to all DENR regional representatives handling wetland concerns, together with the Technical Working Group on Inland Wetlands (composed of representatives from National Government Agencies with direct or related concern to water and inland wetlands). The maps and methodology were critiqued during the activity. The group also gave helpful advice on how to improve the outputs.

Methodology

Flooding and rain-induced landslides

Parameter	Score
Very High	1.00
High	0.75
Moderate	0.50
Low	0.25
Not Affected	0

Retaining the parameters used by the MGB, a score of 1.00 is given to those sites which falls inside the “very high” category for flood, and landslide susceptibility; 0.75 for “high”; 0.50 for “moderate” ; 0.25 for “low”.

The score given to each inland wetland is always based on the highest degree of susceptibility around/nearest the site.

Methodology

Drought

Parameter	Score	VHI
Very High	1.00	0-20
High	0.75	20-40
Moderate	0.50	40-60
Low	0.25	60-80
No Data	0	0

Scoring for drought is based from the VHI of the area where the wetland is located. As literature suggests, the higher the VHI, the lower its susceptibility to drought. The score given to each inland wetland is always based from the highest degree of susceptibility around/nearest the site.

Methodology

Flooding, landslide, and drought scores per wetland were then added to achieve the total score which are categorized as:

- Very High Susceptibility
- High Susceptibility
- Moderate Susceptibility
- Low Susceptibility
- No Data

Susceptibility Rating	Score
Very High Susceptibility	2.25- 2.5
High Susceptibility	1.75-2
Moderate Susceptibility	1-1.5
Low Susceptibility	0.25-0.75
No Data	0

Results:

Inland Wetlands that are susceptible to flooding, landslides and drought

NAME	REGION	PROVINCE	WETLAND TYPE	FLOODING RATING	LANDSLIDE RATING	DROUGHT RATING	Total Ranking	Susceptibility
Binga Reservoir	CAR	Benguet	Water Storage Area	1	1	0.5	2.5	VHS
Philex Mine Tailing Ponds	CAR	Benguet	Pond	1	1	0.5	2.5	VHS
San Roque Reservoir	Region I	Pangasinan	Water Storage Area	1	1	0.5	2.5	VHS
Lake Balanan	Region XVIII	Negros Oriental	Lakes	1	1	0.5	2.5	VHS
Lake Dapao	ARMM	Lanao del Sur	Lakes	1	1	0.5	2.5	VHS
Ambuclao Reservoir	CAR	Benguet	Water Storage Area	1	0.75	0.5	2.25	VHS

VHS – Very High Susceptibility

NAME	REGION	PROVINCE	WETLAND TYPE	FLOODING RATING	LANDSLIDE RATING	DROUGHT RATING	Total Ranking	Susceptibility
Pantabangan Reservoir	Region III	Nueva Ecija	Water Storage Area	0.75	1	0.5	2.25	VHS
Tambo Lake	Region III	Tarlac	Lakes	0.75	1	0.5	2.25	VHS
Mt. Pinatubo Crater Lake	Region III	Zambales	Lakes	0.75	1	0.5	2.25	VHS
Mapanuepe Lake	Region III	Zambales	Lakes	0.75	0.75	0.75	2.25	VHS
Laguna Lake	Region IV-A	Laguna, Rizal, NCR	Lakes	1	0.75	0.5	2.25	VHS
Tadlac Lake	Region IV-A	Laguna	Lakes	1	0.75	0.5	2.25	VHS

VHS – Very High Susceptibility

NAME	REGION	PROVINCE	WETLAND TYPE	FLOODING RATING	LANDSLIDE RATING	DROUGHT RATING	Total Ranking	Susceptibility
Taal Lake	Region IV-A	Batangas	Lakes	1	0.75	0.5	2.25	VHS
Bonot Lakes	Region V	Camarines Norte	Lakes	0.75	0.75	0.75	2.25	VHS
Manipis Lake	Region V	Camarines Sur	Lakes	1	0.75	0.5	2.25	VHS
Tayak Lake	Region V	Camarines Sur	Lakes	1	0.75	0.5	2.25	VHS
Lake Buhi	Region V	Camarines Sur	Lakes	1	0.75	0.5	2.25	VHS
Lake Bato	Region V	Camarines Sur and Albay	Lakes	1	0.75	0.5	2.25	VHS

VHS – Very High Susceptibility

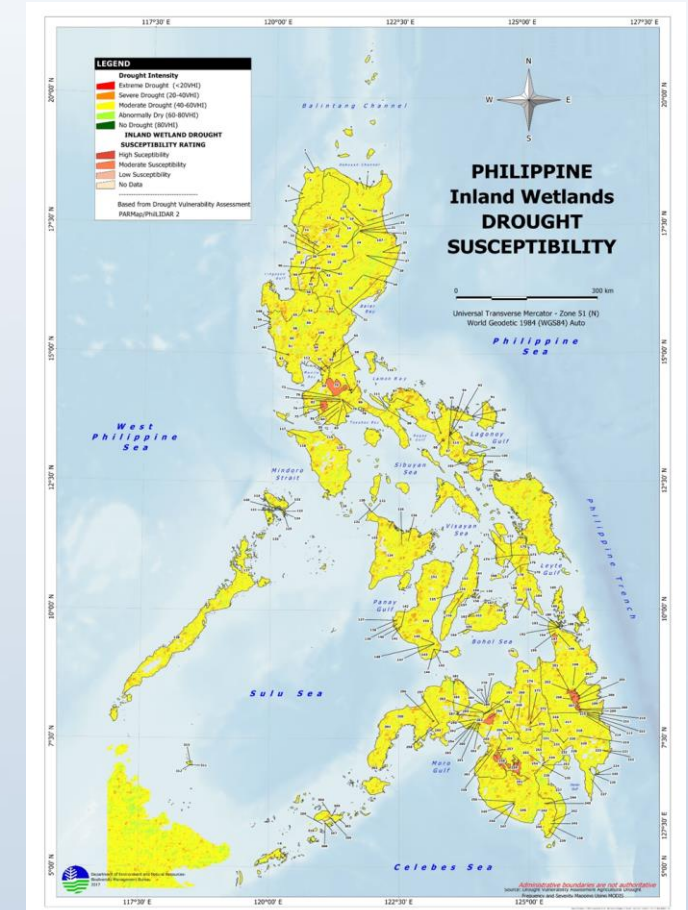
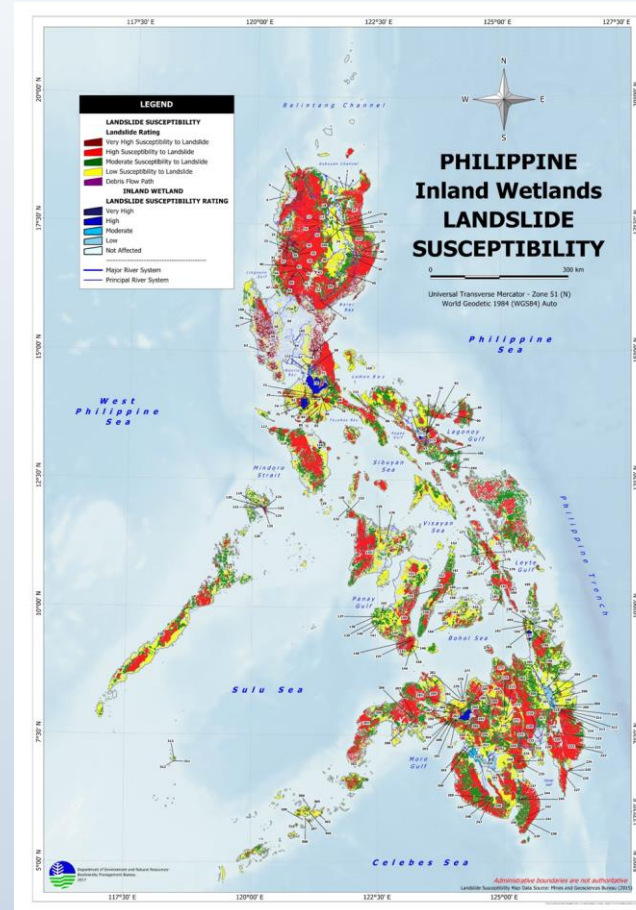
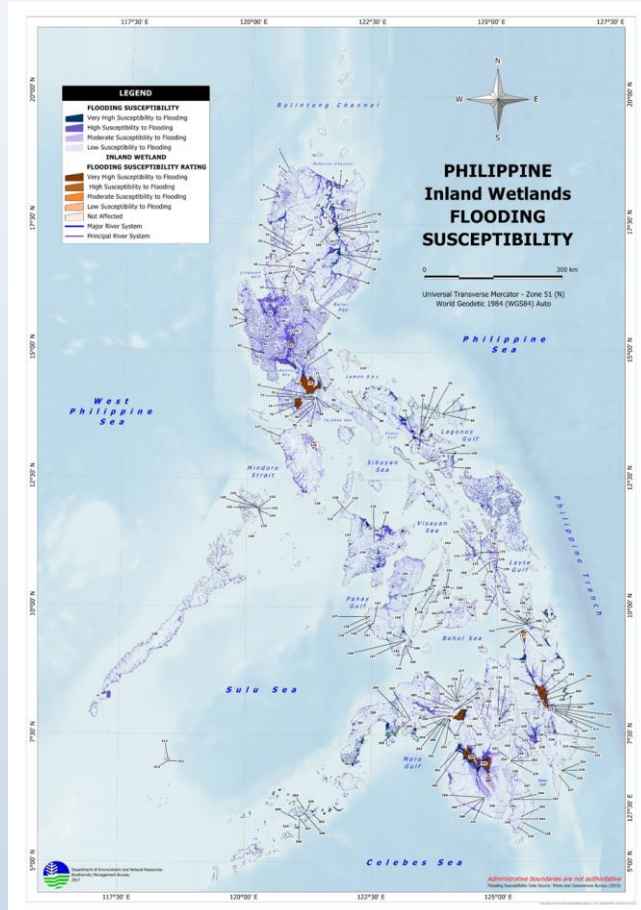
NAME	REGION	PROVINCE	WETLAND TYPE	FLOODING RATING	LANDSLIDE RATING	DROUGHT RATING	Total Ranking	Susceptibility
Cansibit Mining Pit	Region XVIII	Negros Occidental	Pond	1	0.75	0.5	2.25	VHS
Cansibit Mining Pit 2	Region XVIII	Negros Occidental	Pond	0	0.25	0.5	2.25	VHS
Sab-A Peatland	Region VIII	Leyte	Peatland	1	0.75	0.5	2.25	VHS
Sabang Dam Reservoir	Region XIII	Dinagat Islands	Water Storage Area	1	0.75	0.5	2.25	VHS
Lake Lanao	ARMM	Lanao del Sur	Lakes	1	0.75	0.5	2.25	VHS

VHS – Very High Susceptibility

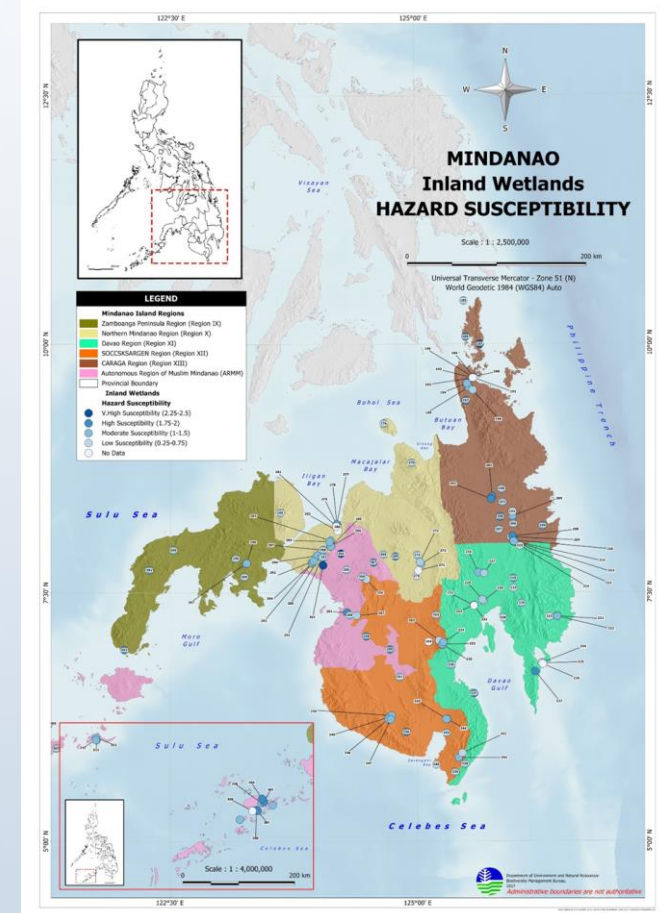
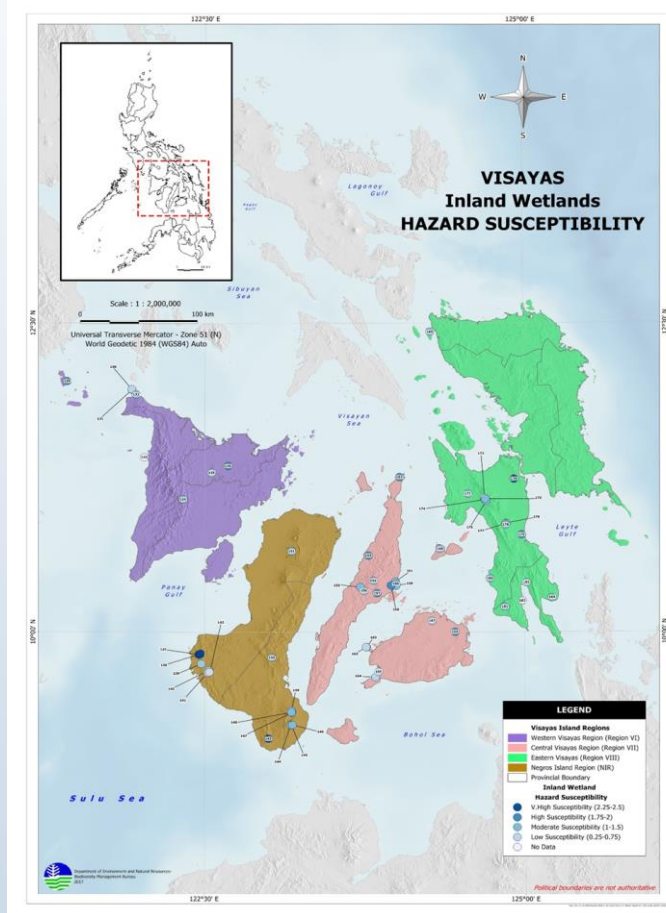
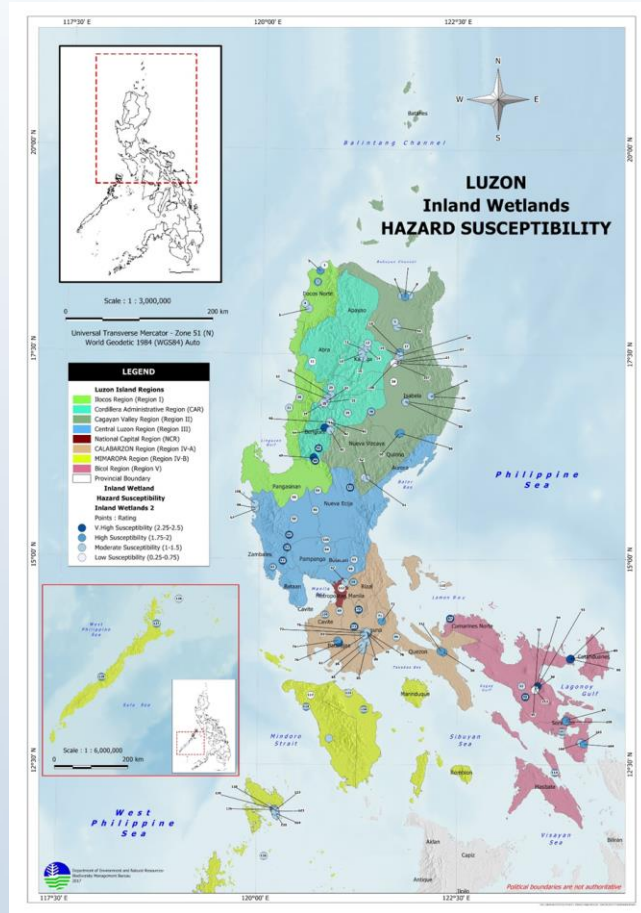
Mapping the Results

- Seven (7) maps were produced.
- Of this, 3 were country-wide thematic maps which shows each hazard together with the susceptibility rating of the inland wetlands in respect to flooding, landslide, and drought;
- The other 3 were composite maps showing the total susceptibility rating (all three hazards) for Luzon, Visayas, and Mindanao
- A country-wide composite map was also developed to consolidate the results.

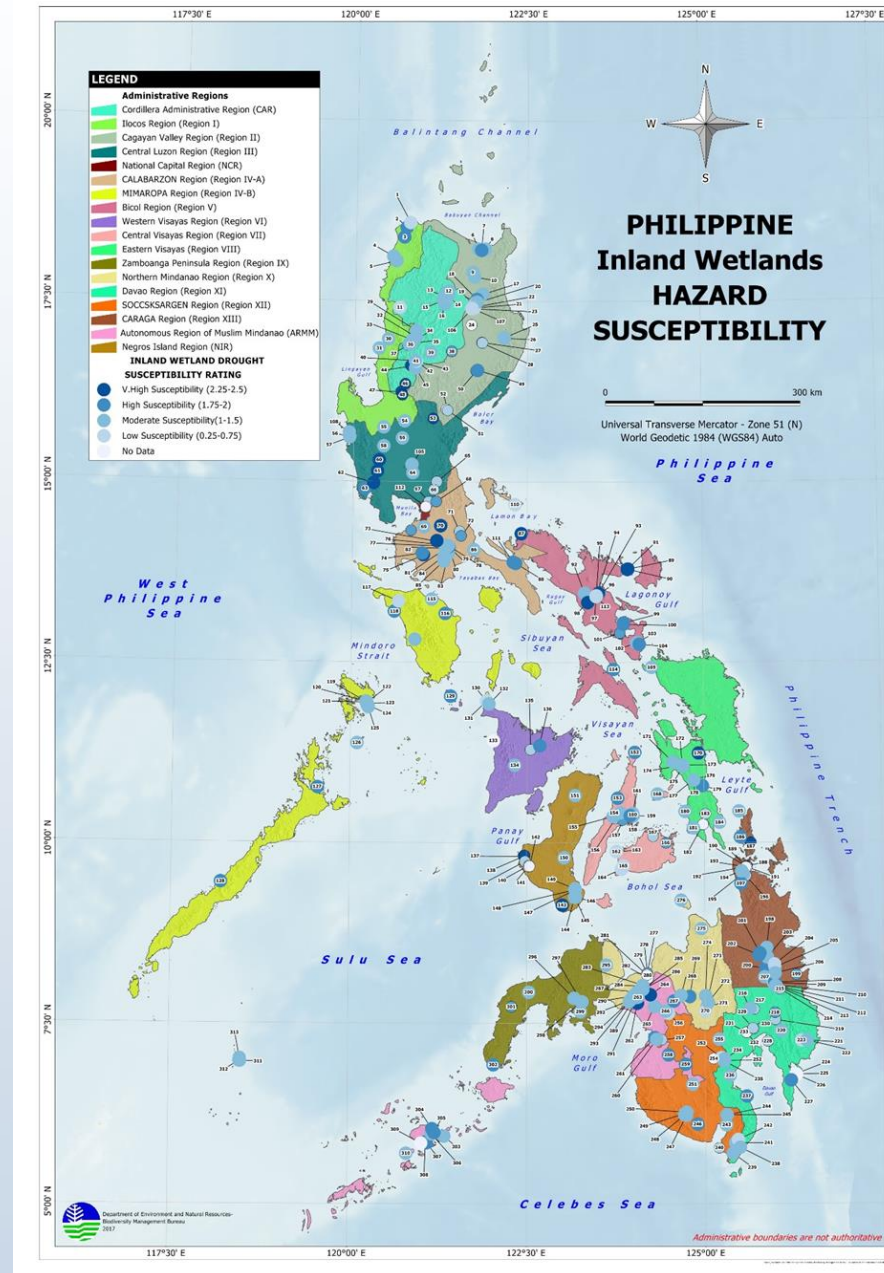
Thematic Maps



Composite Maps



Philippine Inland Wetlands Hazard Susceptibility Map



Conclusion

- The Philippine Inland Wetlands Hazard Susceptibility Maps can be a tool for decision-makers in planning, development and conservation of urban areas with wetlands.
- Contribution to the pool of knowledge in wetland conservation, urban and regional planning and climate change adaptation and mitigation strategies.



Thank You!



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