



# **Mainstreaming Climate Vulnerability and Disaster Risk Assessment in Development Planning of Communities**

**UP RESILIENCE INSTITUTE**

**UP NOAH CENTER**

# Mainstreaming into local development plans

- Integration of DRR-CCA
- Cause to join the scientific approach and the best practices into the development planning process



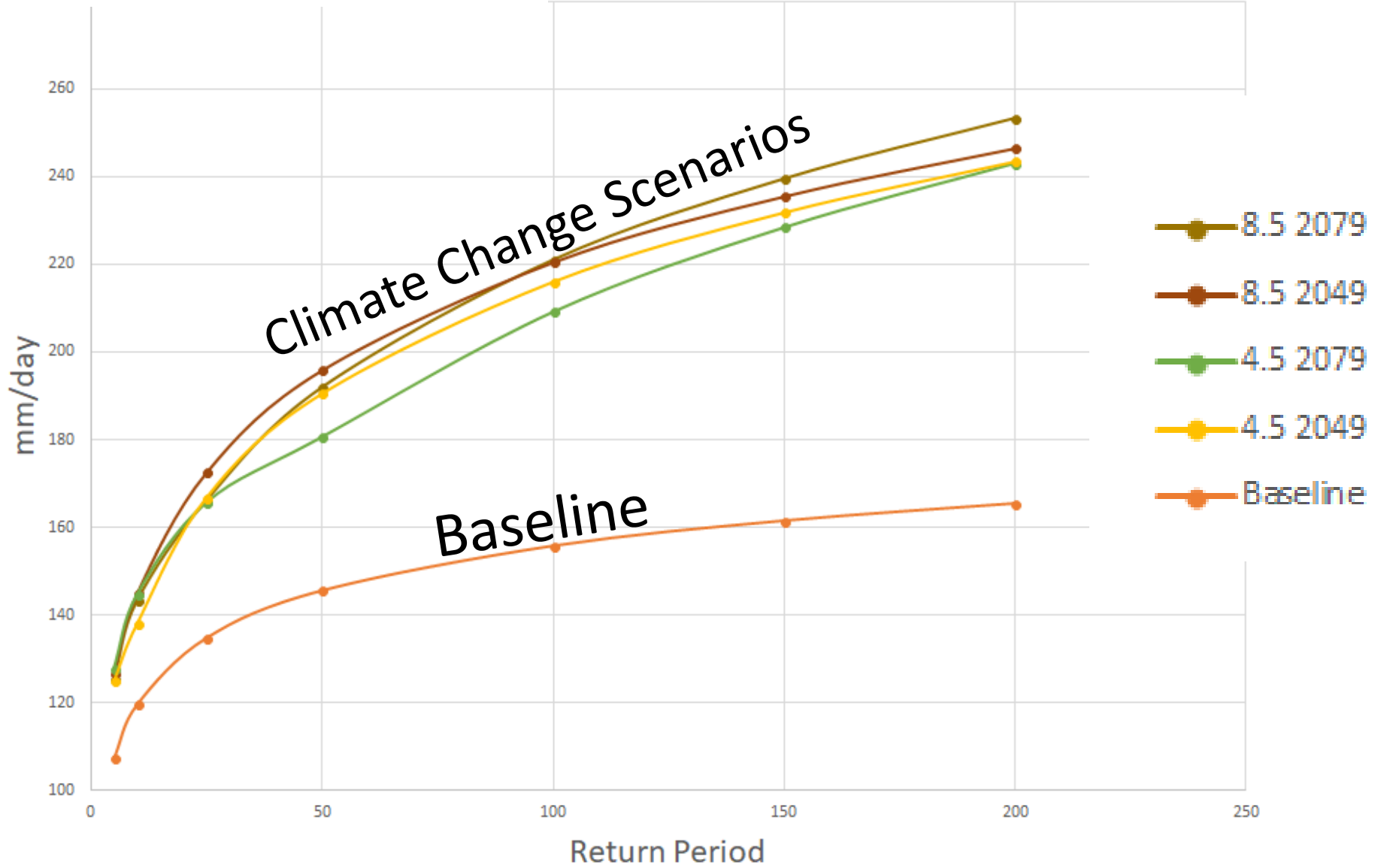
“Disasters are manifestations of unresolved development problems” (Hagman, 1984)

Disasters are thus **outcome-based** indicators of a skewed, unsustainable development paradigm based on unlimited growth, inequality and overconsumption.



# DRR-CCA

- Disaster Risk Reduction (DRR) – Reduce the damage caused by the impacts of natural hazards
- Climate Change Adaptation (CCA) - Actions taken to help communities and ecosystems cope with changing climate conditions. Adapt to the impacts of Climate Change to become resilient (e.g. sea-level rise, worsening floods, more landslides)
- **In both cases, we refer to the impacts of hazards**



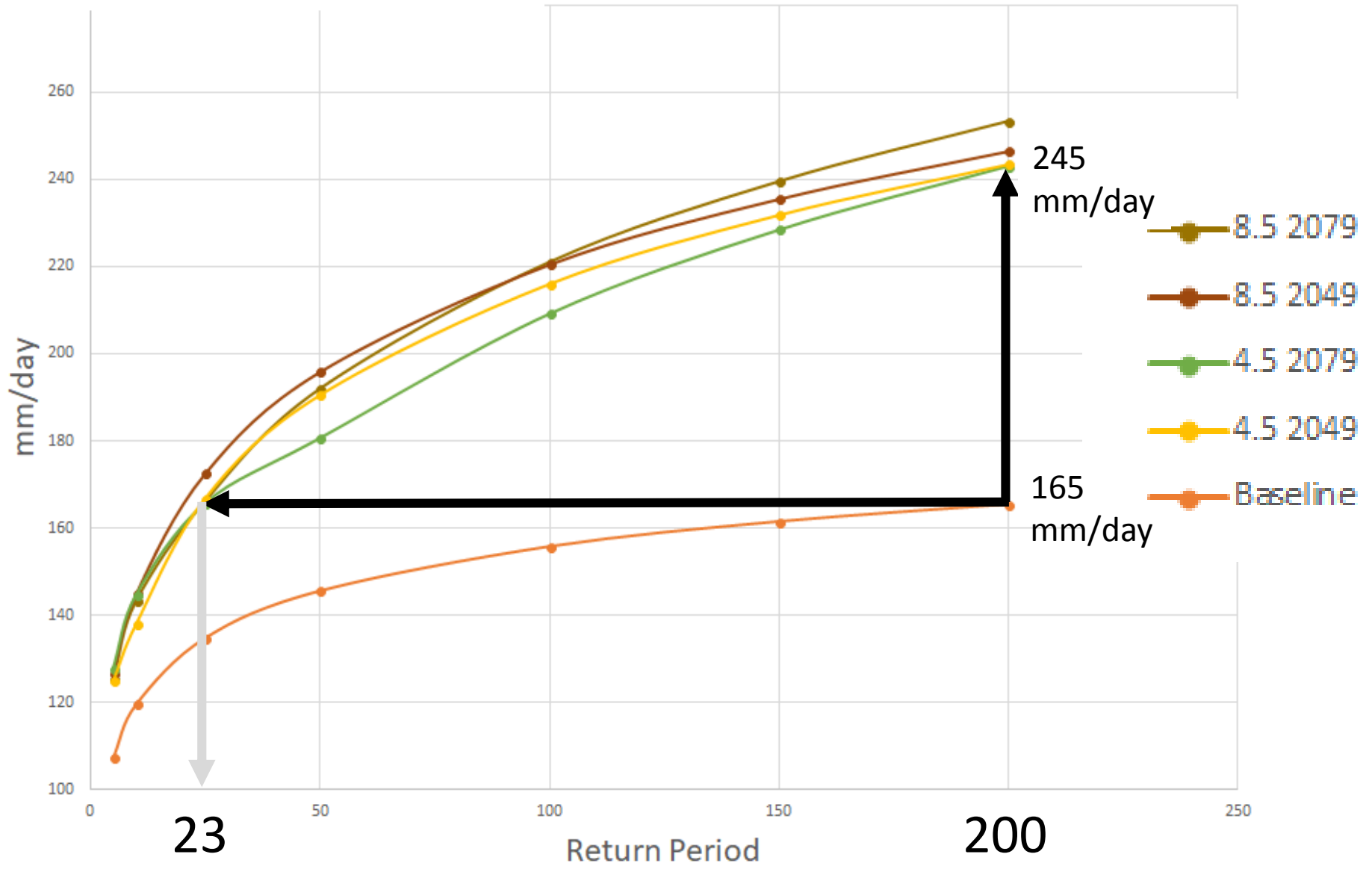




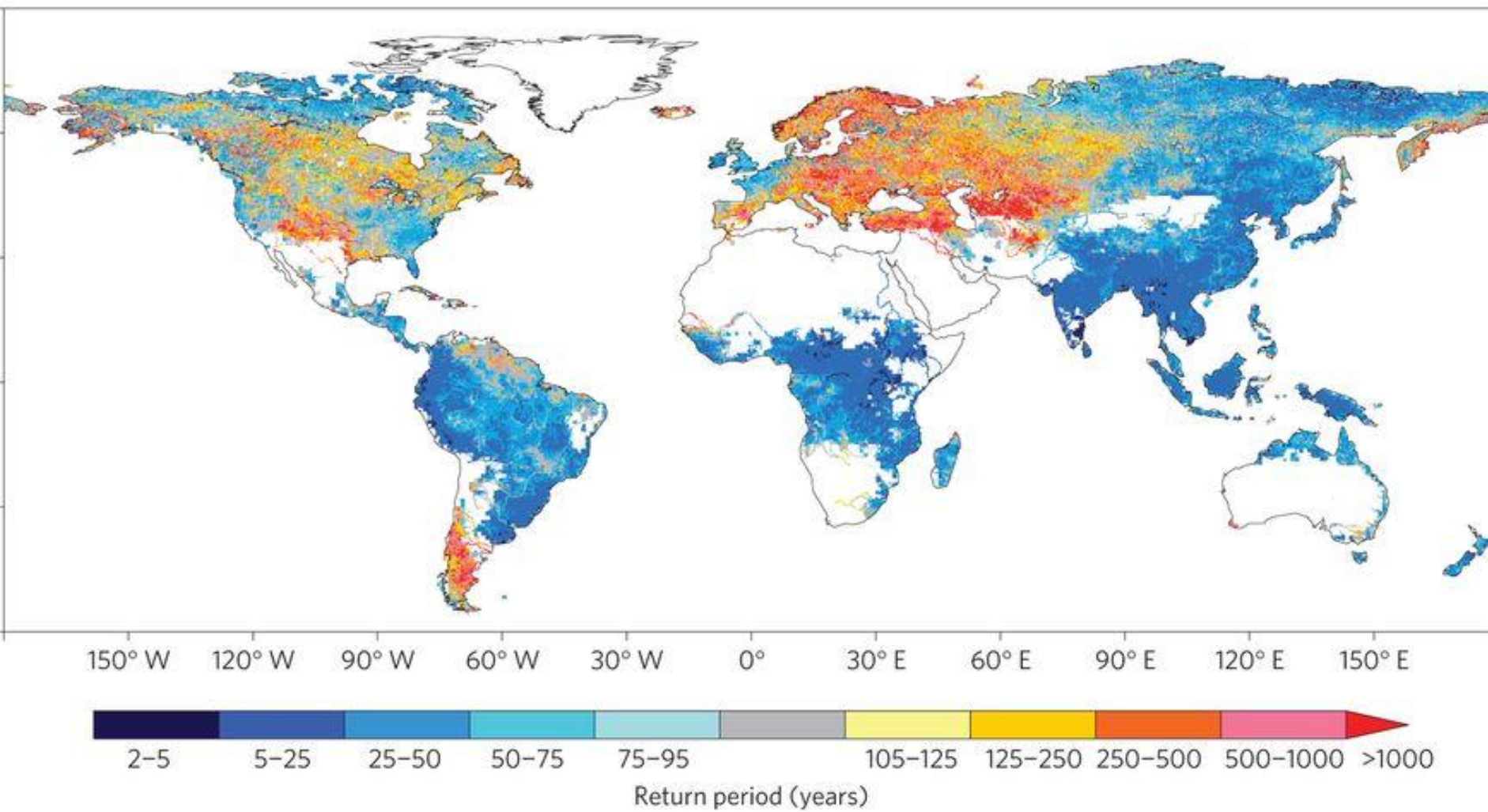
Image © 2013 DigitalGlobe

St. Ferdinand  
Cathedral Compound

**Legend**

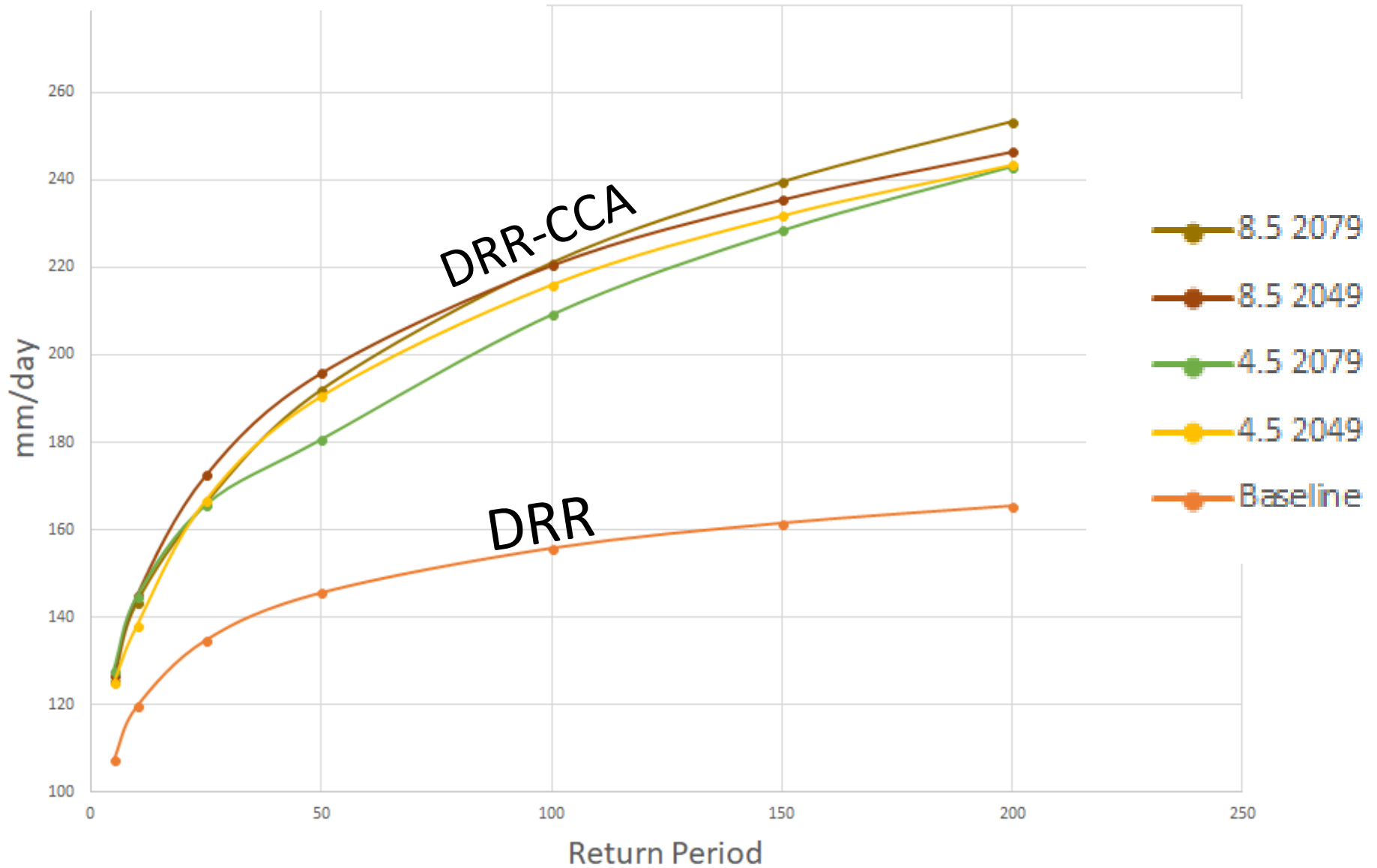
Flow Depth

- 0.00 - 0.20
- 0.21 - 0.50
- 0.51 - 1.00
- 1.01 - 2.00
- 2.01 - 5.00
- 5.01 and above

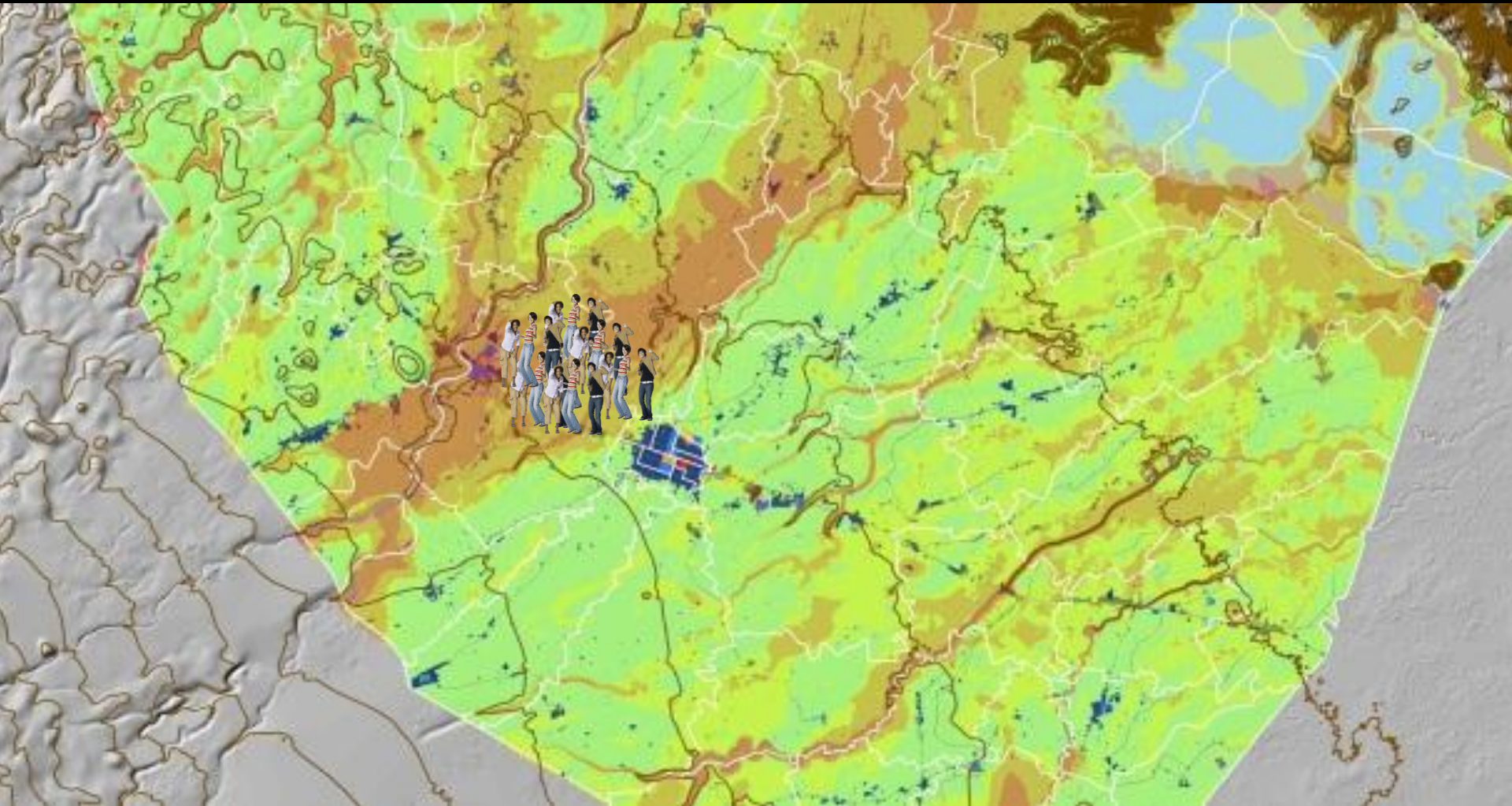


Hirabayashi, 2013 *Nature Climate Change* **volume3**, pages 816–821 (2013)

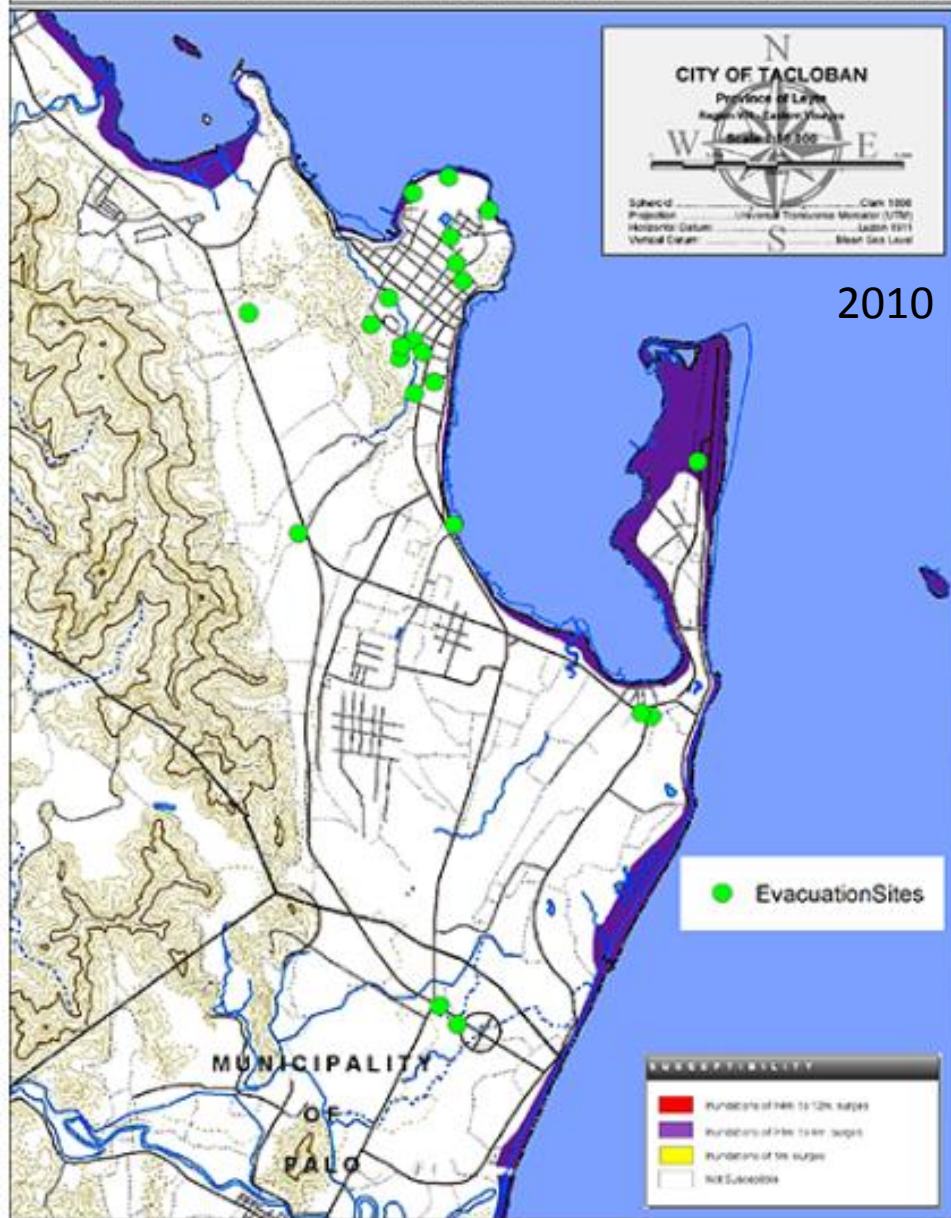




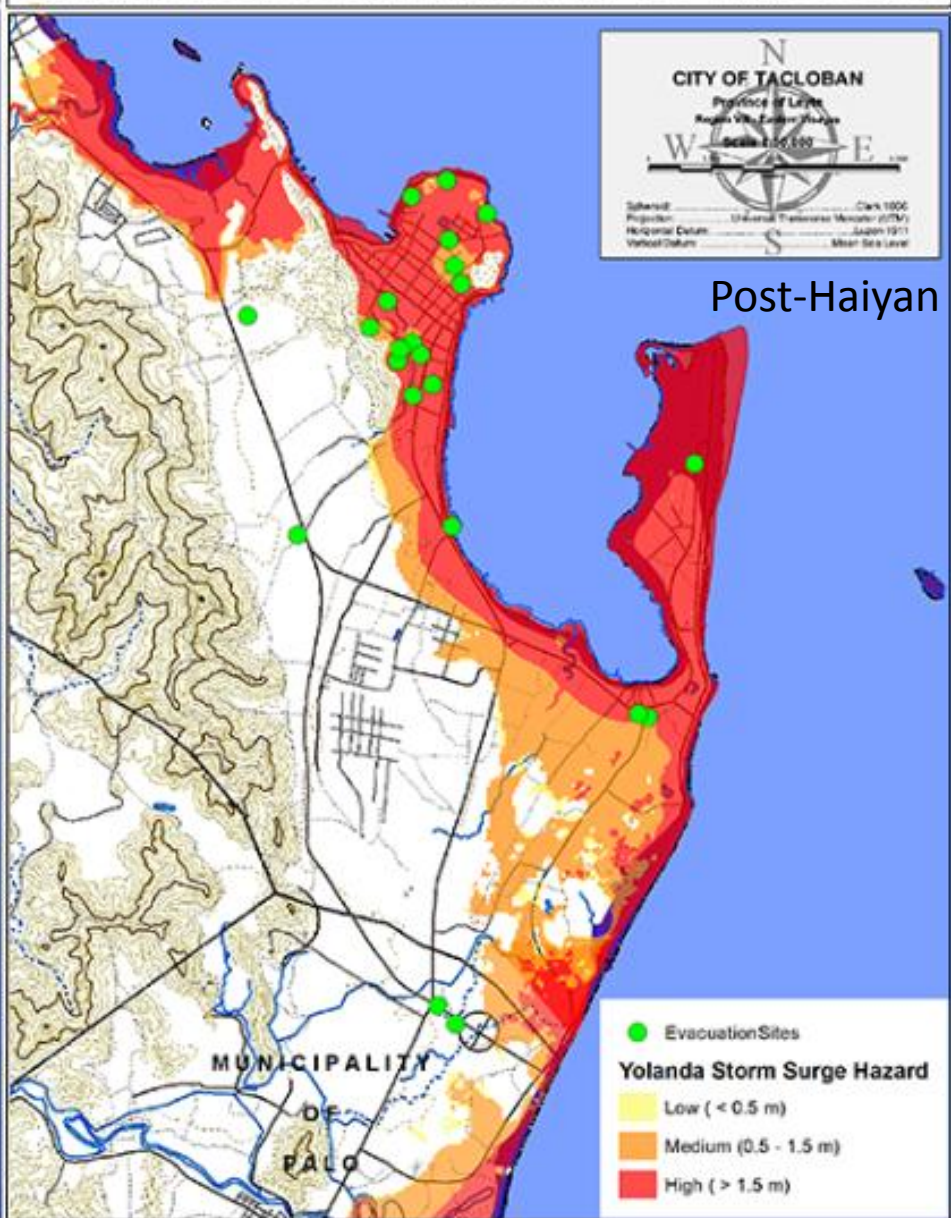
100 –year rain  
return flood



# A) THE READY PROJECT STORM SURGE HAZARD MAP OF TACLOBAN



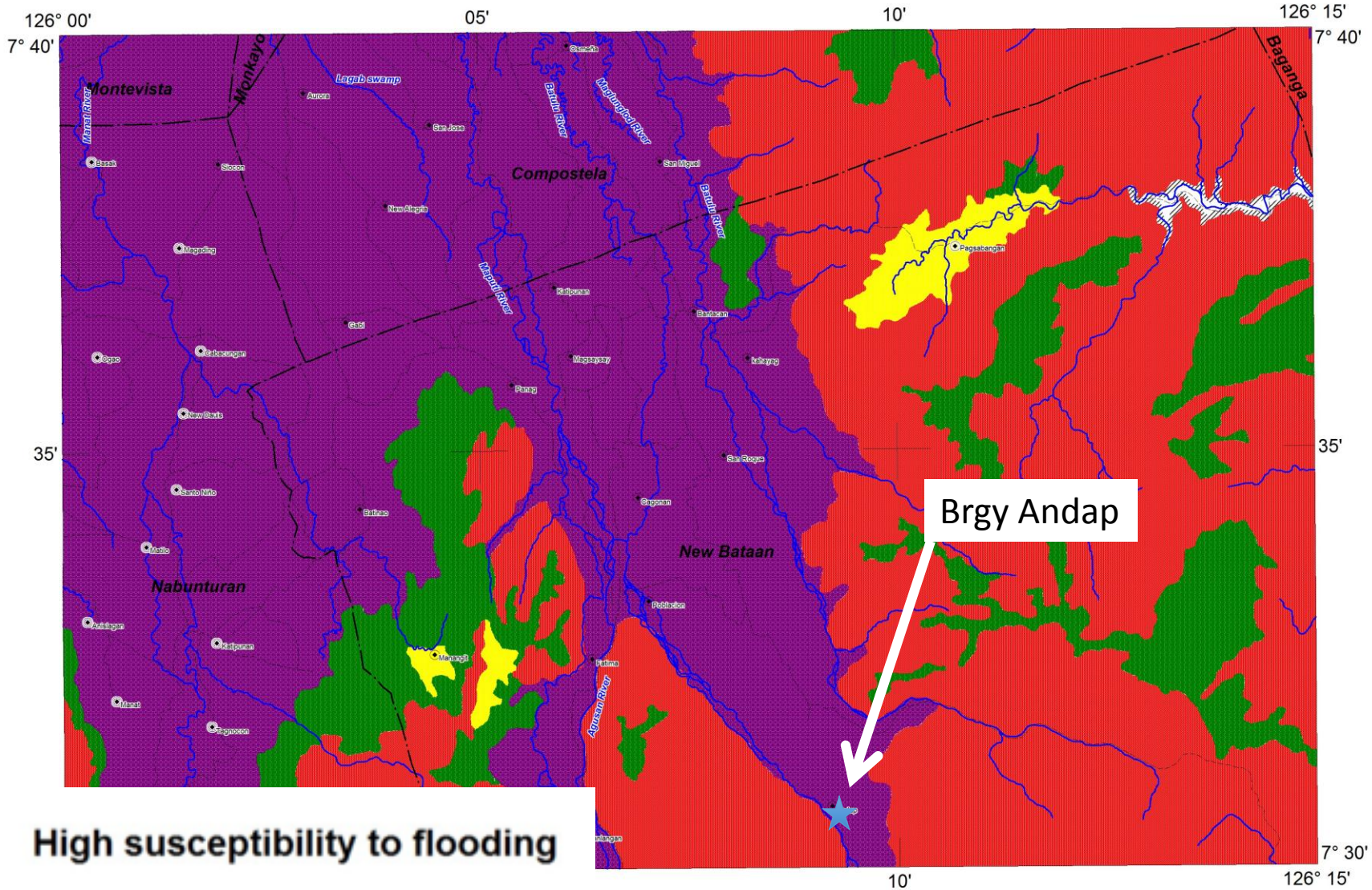
# B) DOST-PROJECT NOAH STORM SURGE HAZARD MAP OF TACLOBAN



70 % of evacuation centers in Tacloban were  
hit by storm surges



# LANDSLIDE AND FLOOD SUSCEPTIBILITY MAP OF MANAT QUADRANGLE COMPOSTELA VALLEY AND DAVAO ORIENTAL PROVINCES, PHILIPPINES

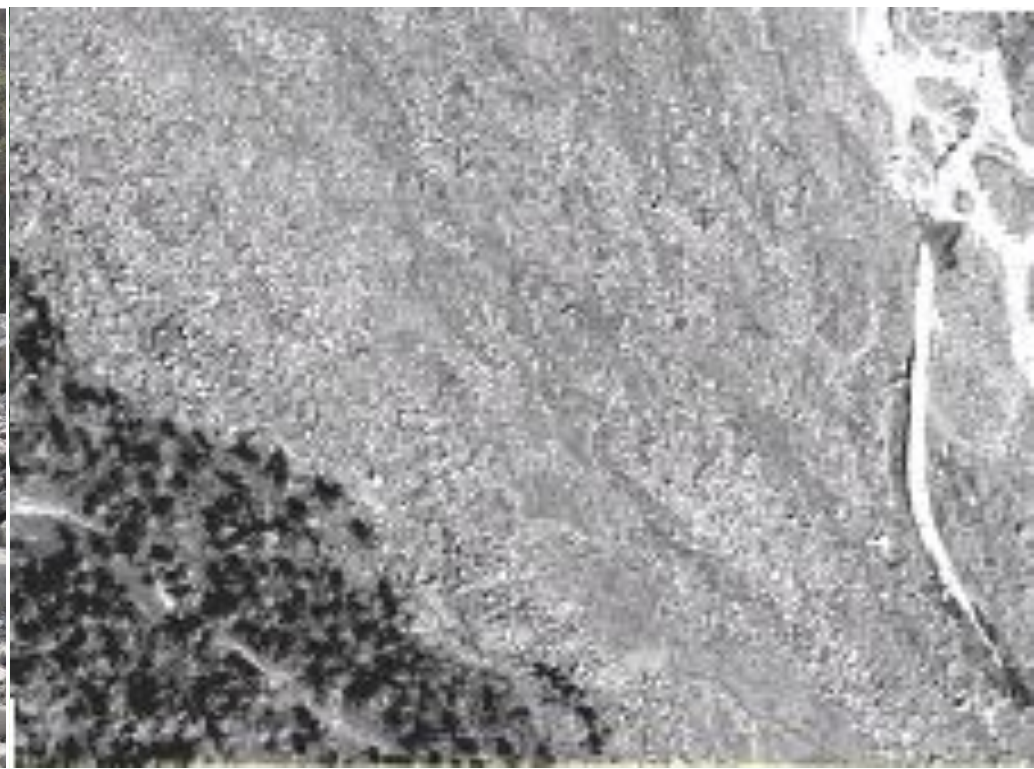


High susceptibility to flooding

LEGEND

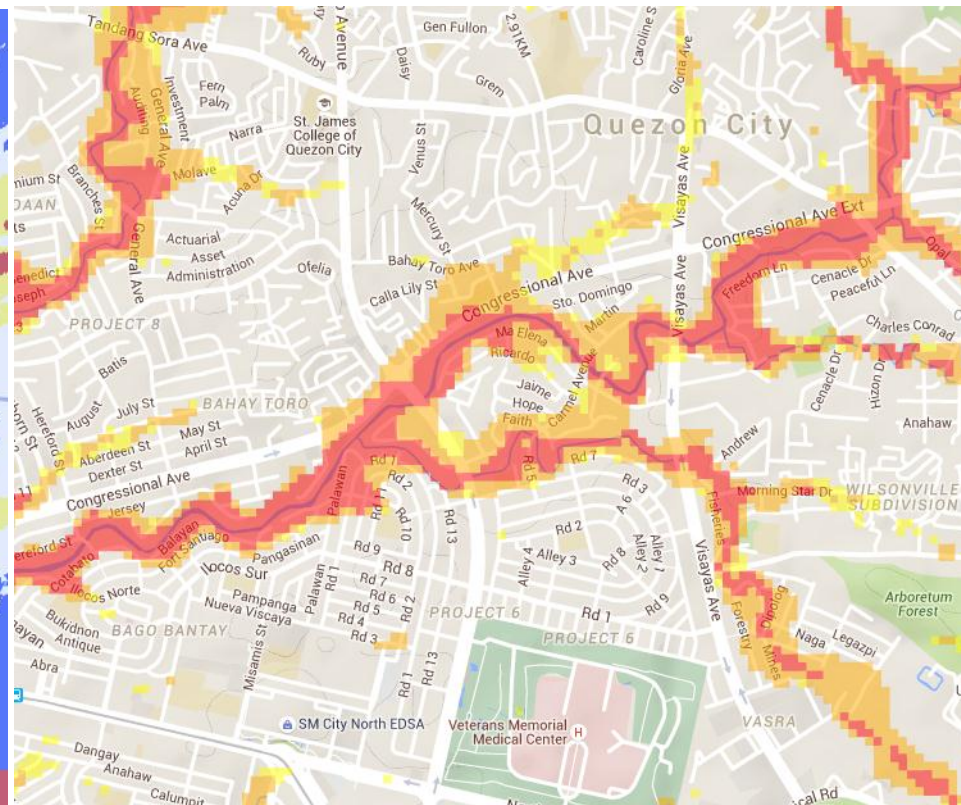
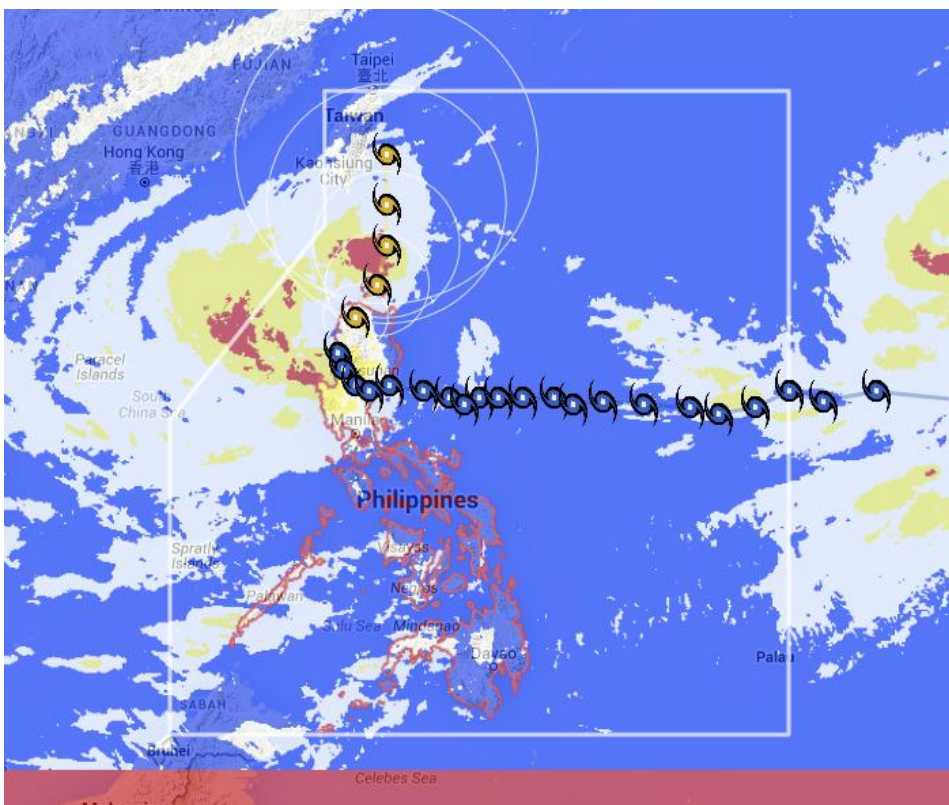
- Red square
- Green square
- Yellow square
- White square with diagonal lines
- Purple square





566 people were placed in an evacuation center overwhelmed by debris flows (This picture) which is a type of landslide

# AVOIDING DISASTERS



## WARN

Based on weather forecasts and near-real time information

## RESPOND

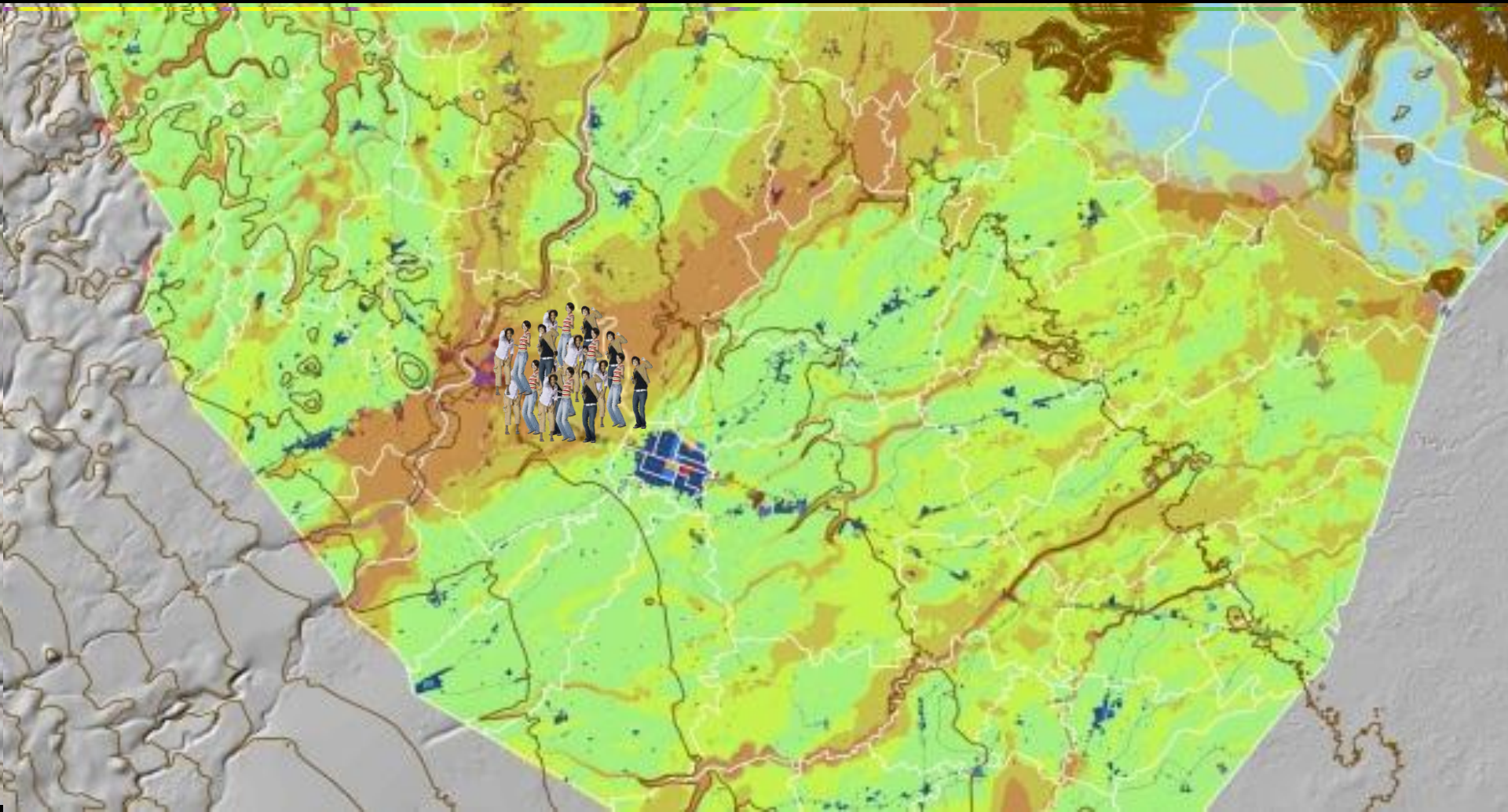
Based on awareness of hazards, education individuals and access to accurate hazard maps

# Example for development planning and locating evacuation centers

Municipality of Alang Alang, Leyte

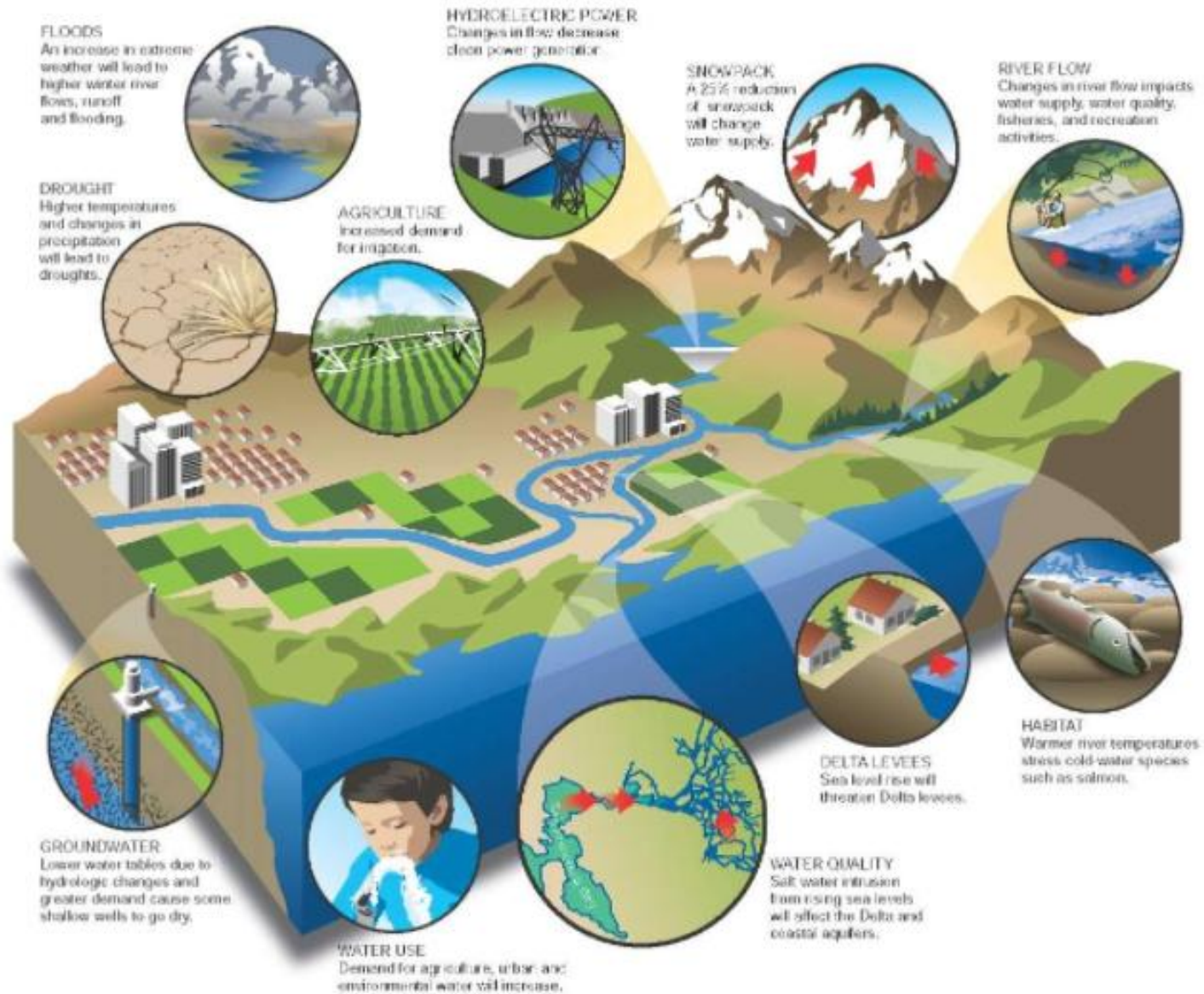


# Multi-scenario-based probabilistic hazard maps

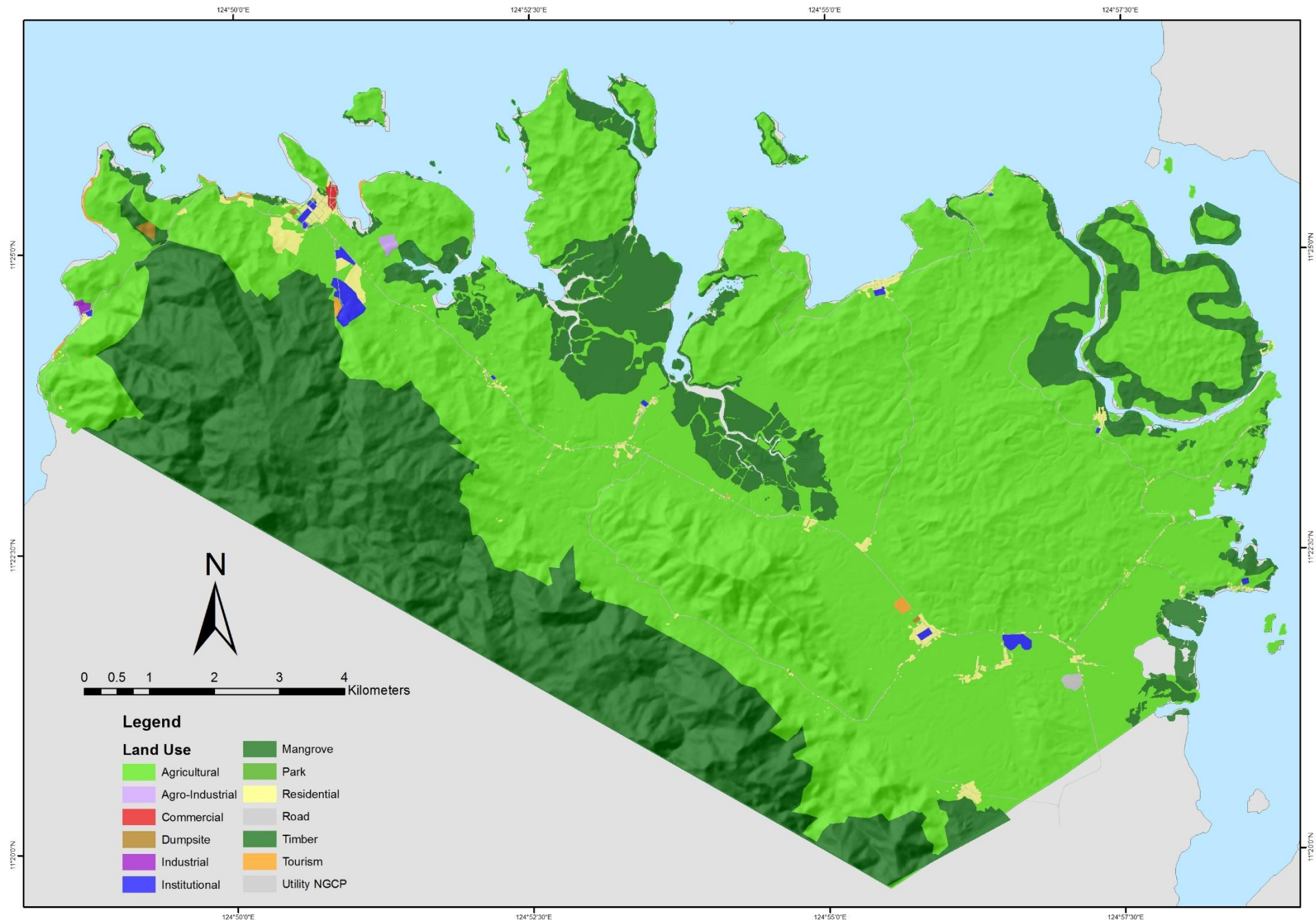


# Plans cut across all sectors

- Agriculture
- Coastal
- Water
- Health
- Forestry
- Biodiversity
- Environment
- Energy
- Education
- Tourism
- Infrastructure
- Settlement
- Mining



# EXISTING LAND USE MAP



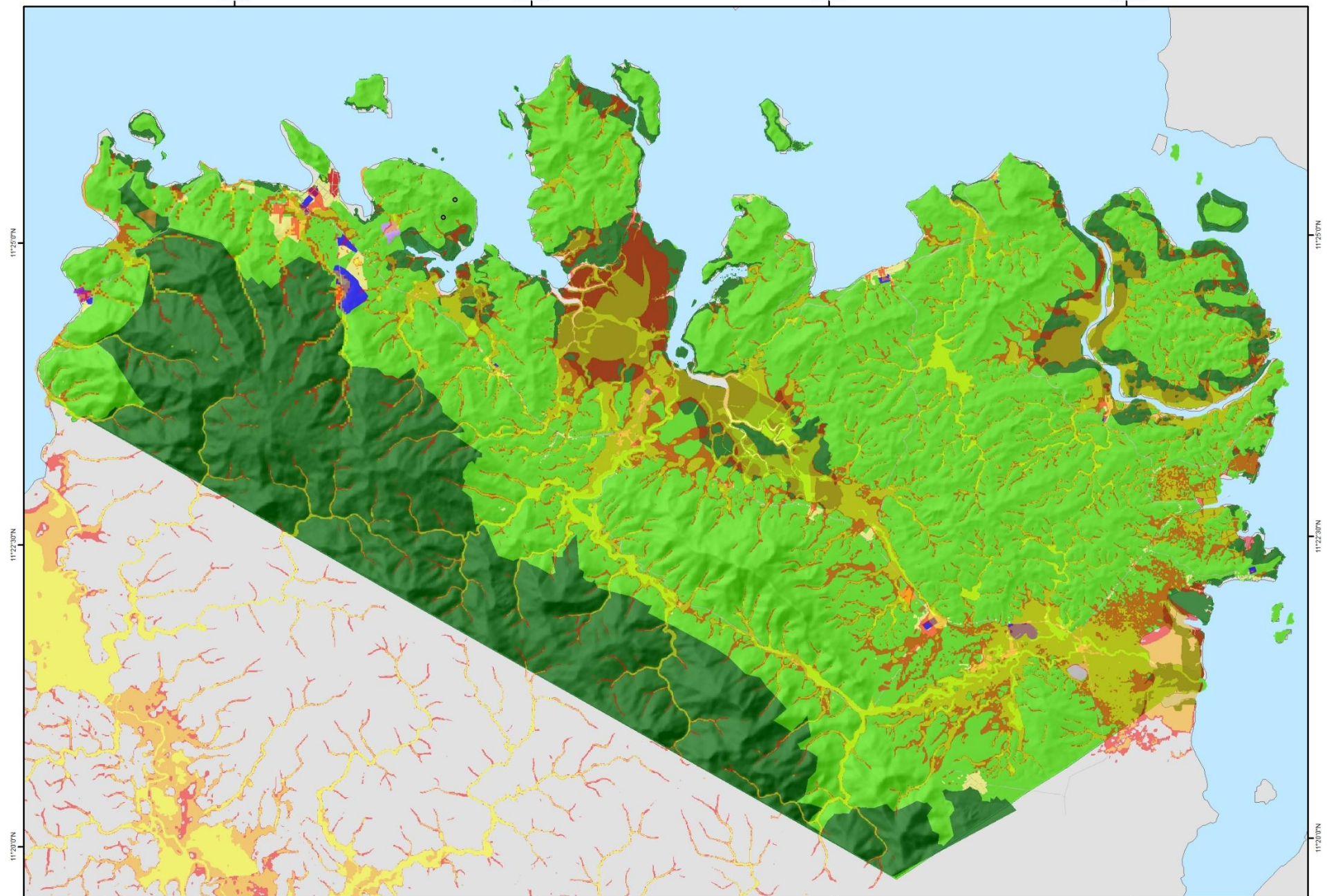
# EXISTING LAND USE OVERLAID WITH FLOOD HAZARD

124°50'0"E

124°52'30"E

124°55'0"E

124°57'30"E



124°50'0"E

124°52'30"E

124°55'0"E

124°57'30"E

11°20'0"N

11°20'0"N

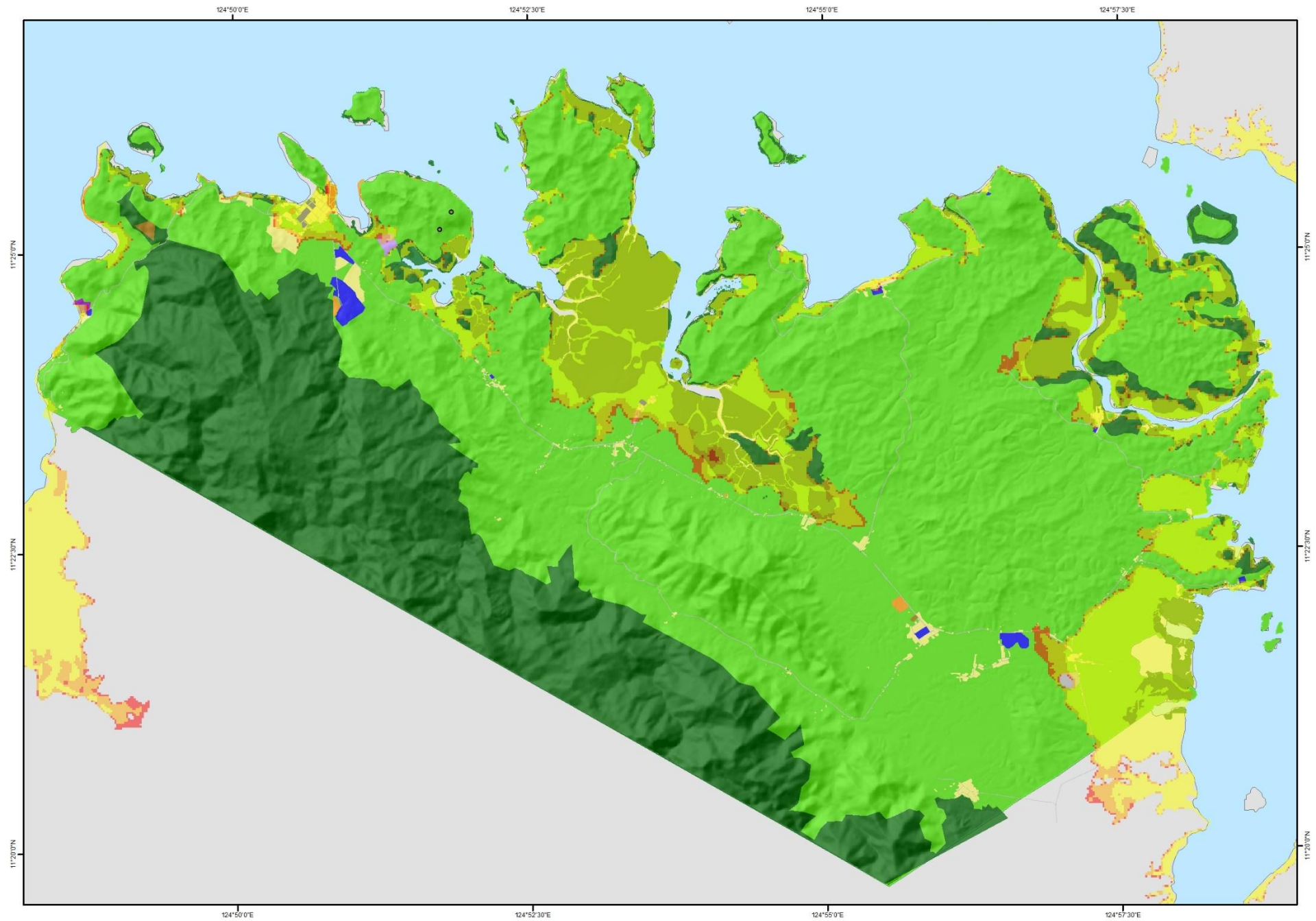
11°22'30"N

11°22'30"N

11°25'0"N

11°25'0"N

# EXISTING LAND USE OVERLAID WITH STORM SURGE HAZARD



# EXISTING LAND USE OVERLAID WITH LANDSLIDE HAZARD

124°50'0"E

124°52'30"E

124°55'0"E

124°57'30"E

124°50'0"E

124°52'30"E

124°55'0"E

124°57'30"E

11°20'0"N

11°22'30"N

11°25'0"N

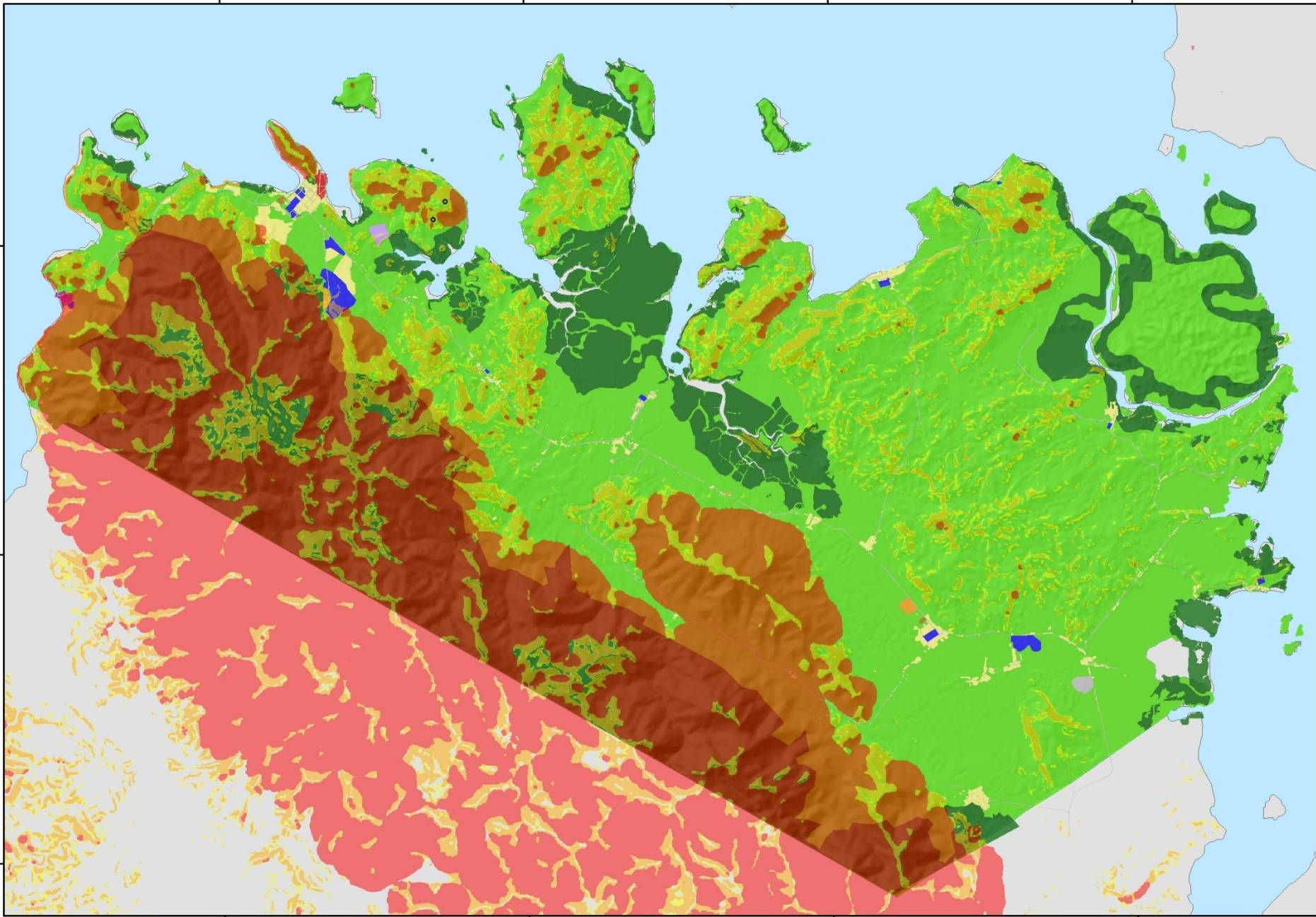
11°27'30"N

11°20'0"N

11°22'30"N

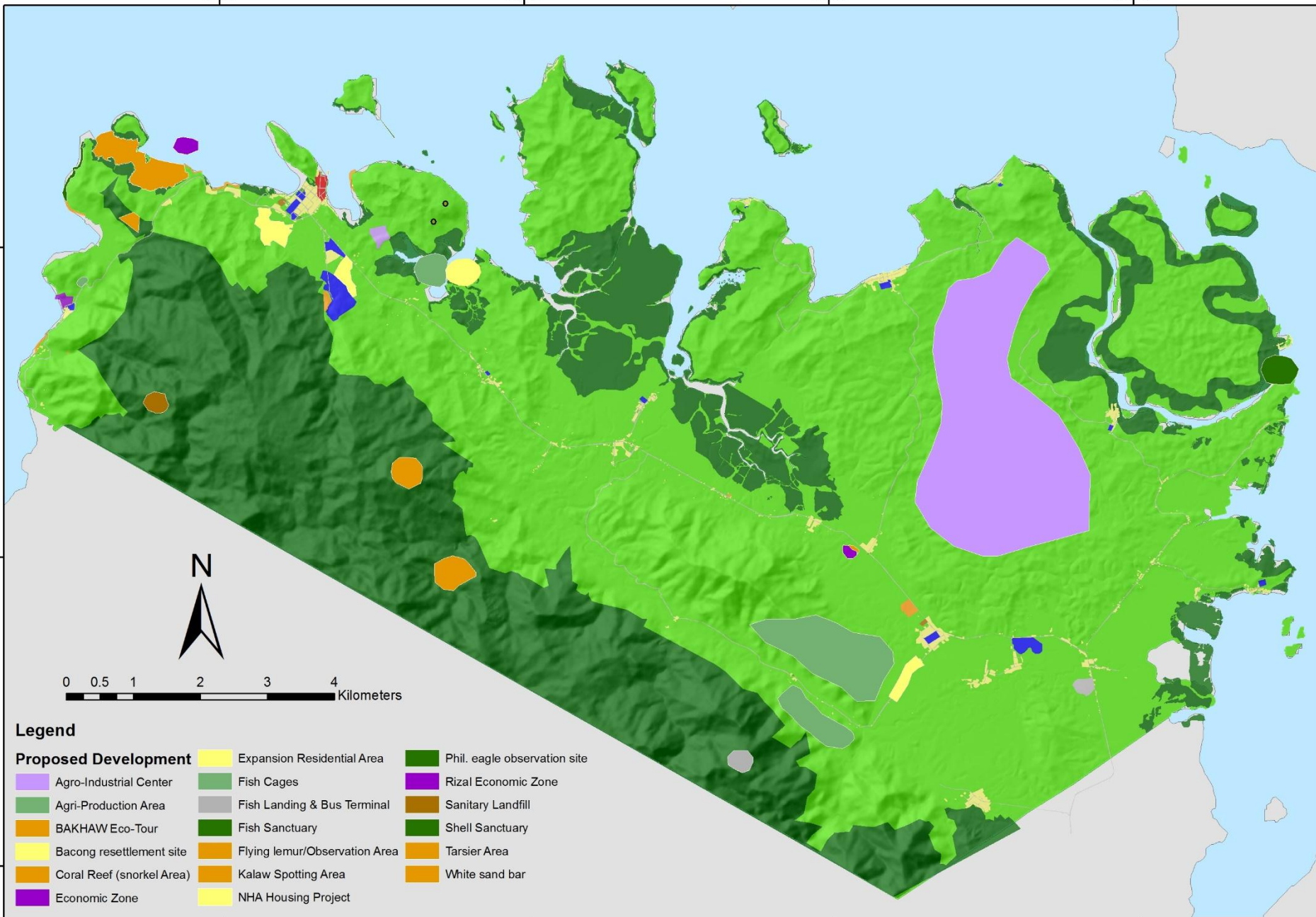
11°25'0"N

11°27'30"N



# (CONCEPTUAL) PROPOSED LAND USE MAP

124°50'0"E 124°52'30"E 124°55'0"E 124°57'30"E



0 0.5 1 2 3 4 Kilometers

## Legend

- |                             |                               |                              |
|-----------------------------|-------------------------------|------------------------------|
| <b>Proposed Development</b> | Expansion Residential Area    | Phil. eagle observation site |
| Agro-Industrial Center      | Fish Cages                    | Rizal Economic Zone          |
| Agri-Production Area        | Fish Landing & Bus Terminal   | Sanitary Landfill            |
| BAKHAW Eco-Tour             | Fish Sanctuary                | Shell Sanctuary              |
| Bacong resettlement site    | Flying lemur/Observation Area | Tarsier Area                 |
| Coral Reef (snorkel Area)   | Kalaw Spotting Area           | White sand bar               |
| Economic Zone               | NHA Housing Project           |                              |

124°50'0"E 124°52'30"E 124°55'0"E 124°57'30"E

11°25'0"N

11°22'30"N

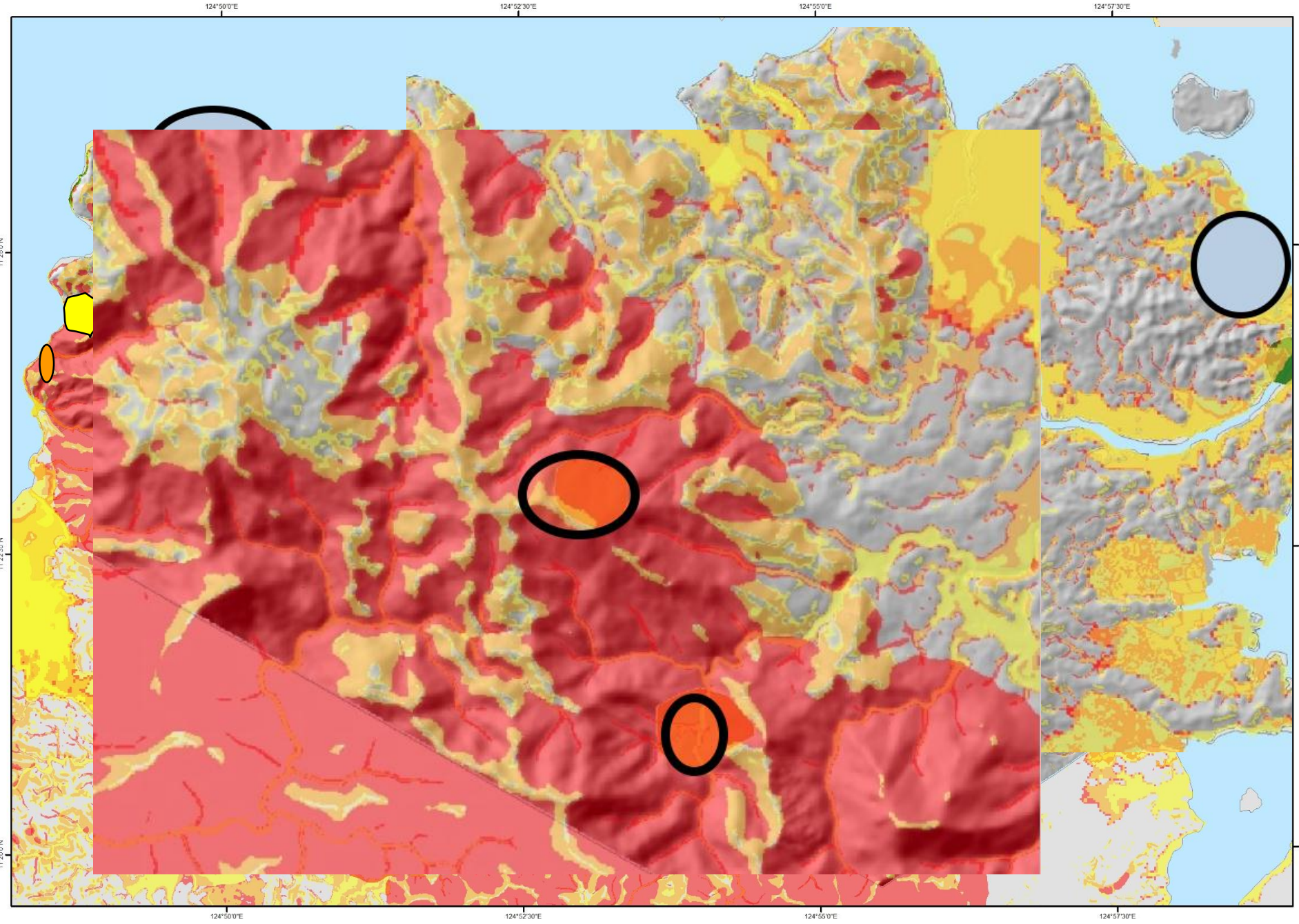
11°20'0"N

11°25'0"N

11°22'30"N

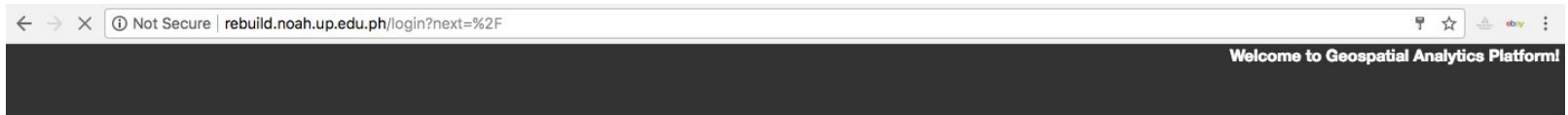
11°20'0"N

# (CONCEPTUAL) PROPOSED LAND USE OVERLAID WITH MULTI-HAZARD MAP





# Creation of an online analytics platform and repository for LCCAP and other development plans of the community



**Login Account**  
Authorized person only

---

**Username**

**Password**

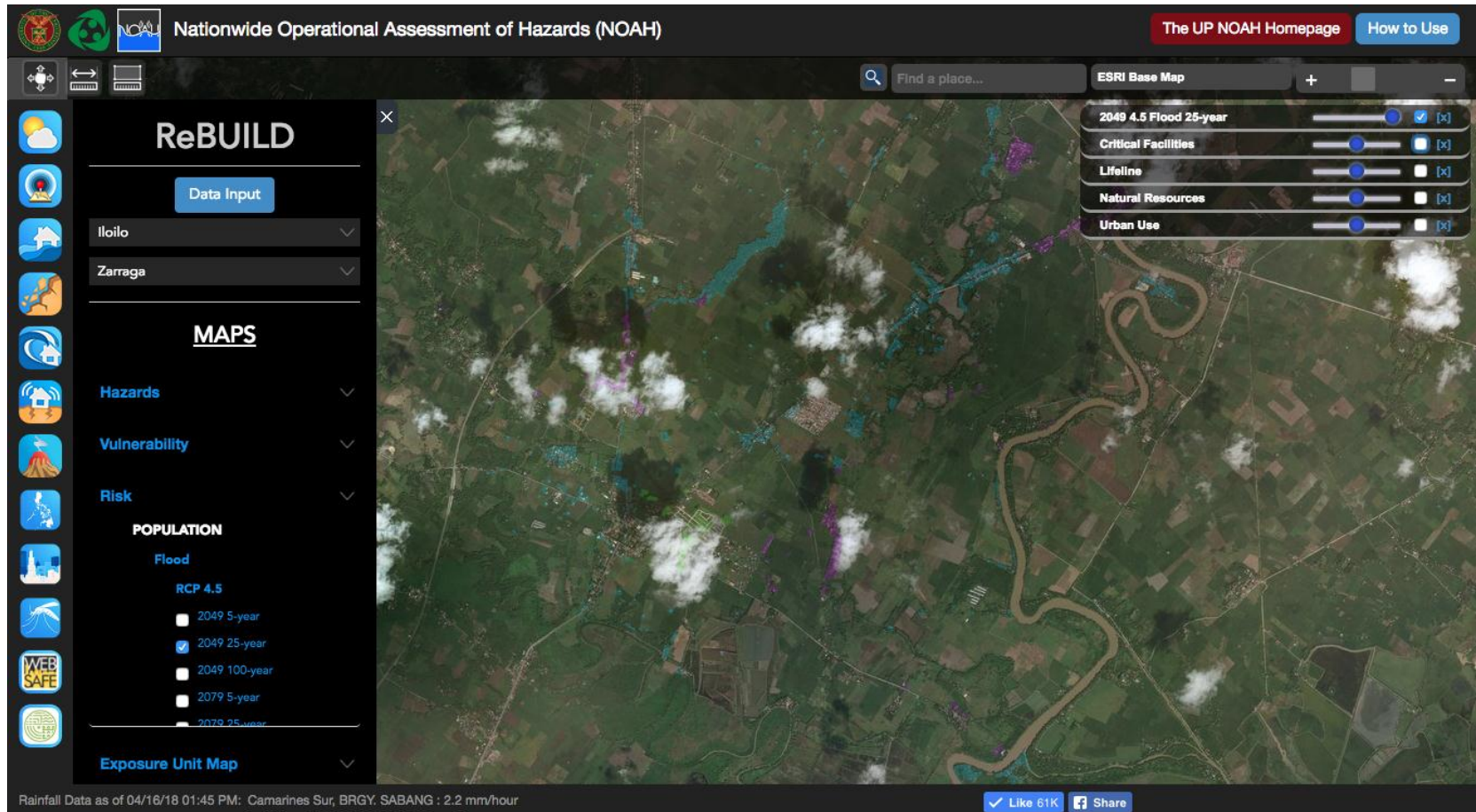
**Login**



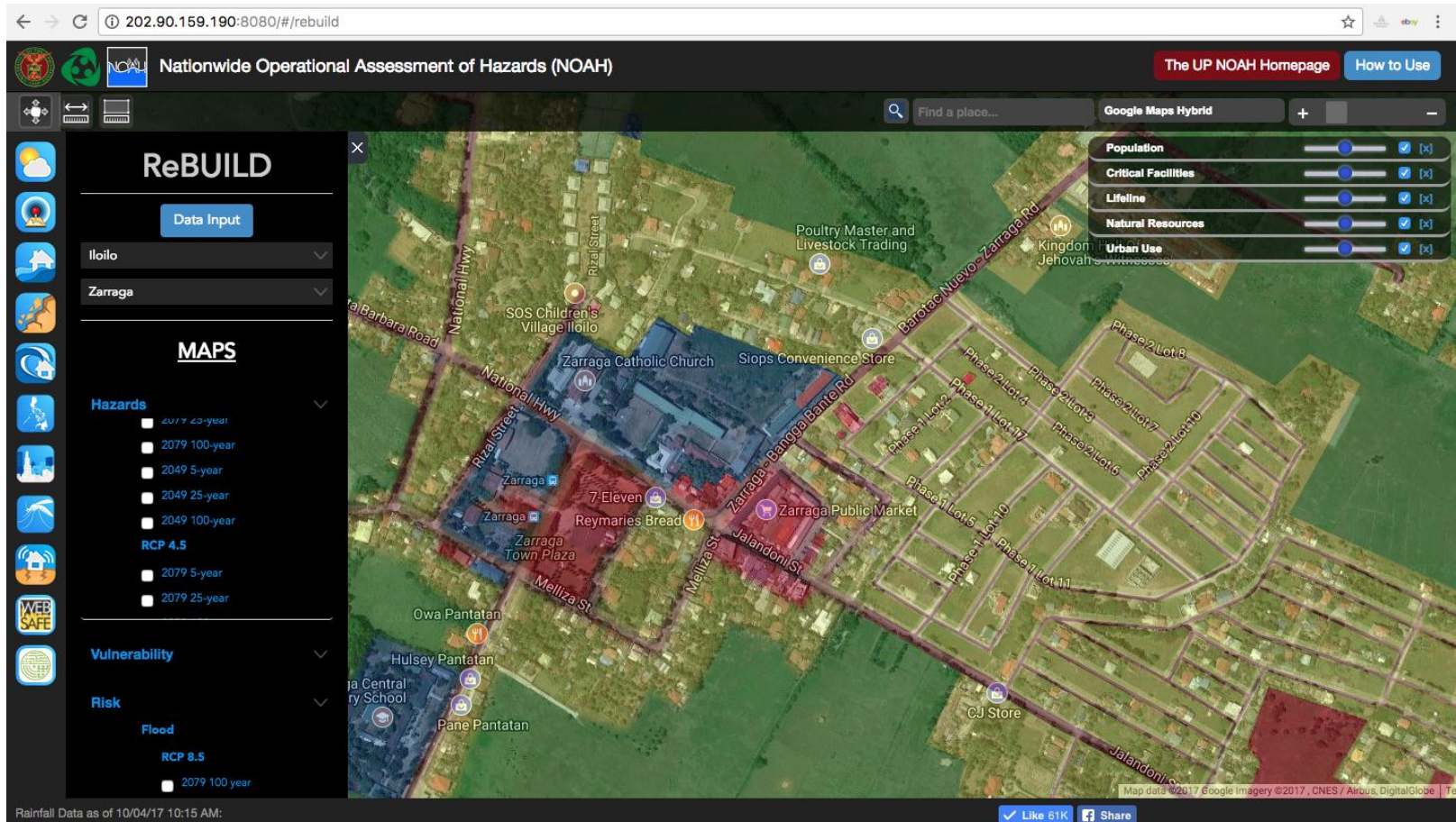
Copyright © 2017 All Rights Reserved



# Creation of an online analytics platform and repository for LCCAP and other development plans of the community



# Creation of an online analytics platform and repository for LCCAP and other development plans of the community




# Creation of an online analytics platform and repository for LCCAP and other development plans of the community

The screenshot shows a web browser window with the URL `rebuild.noah.up.edu.ph`. The page header includes a dark navigation bar with the text `[[{ selectedAssessment }]]`, `[[{ SELECTEDSCENARIO }]]`, and `DUMANGAS` with a user icon and a `Log Out` link. Below the header, there are two tabs: `Vulnerability Assessment` and `Disaster Risk Assessment`. The `Disaster Risk Assessment` tab is active. Underneath, there are three sub-tabs: `Flood`, `Landslide`, and `Storm Surge`. The `Flood` sub-tab is selected. The main content area is a table with two columns: `Baseline Hazard` and `Climate Change-Adjusted Hazard`. The table lists various Return Period (RRP) scenarios for the year 2049 and 2079. A `Next` button is located at the bottom of the table.

Baseline Hazard	Climate Change-Adjusted Hazard
<input type="checkbox"/> Flood 5-Year RRP	2049
<input type="checkbox"/> Flood 25-Year RRP	<input type="checkbox"/> Flood 5-Year RRP RCP 4.5
<input type="checkbox"/> Flood 100-Year RRP	<input type="checkbox"/> Flood 5-Year RRP RCP 8.5
	<input type="checkbox"/> Flood 25-Year RRP RCP 4.5
	<input type="checkbox"/> Flood 25-Year RRP RCP 8.5
	<input type="checkbox"/> Flood 100-Year RRP RCP 4.5
	<input type="checkbox"/> Flood 100-Year RRP RCP 8.5
	2079
	<input type="checkbox"/> Flood 5-Year RRP RCP 4.5
	<input type="checkbox"/> Flood 5-Year RRP RCP 8.5

[Next](#)

# Creation of an online analytics platform and repository for LCCAP and other development plans of the community



**PROJECT**  
**ReBUILD**

**VULNERABILITY ASSESSMENT**  
2049-FLOOD 100-YEAR RRP RCP 4.5  
ZARRAGA | [Log Out](#)

Population Areas
Urban Use Areas
Natural Resource-Based Production Areas
Critical Point Facilities
Lifeline Utilities

Exposure
Sensitivity ▾
Adaptive Capacity
Vulnerability

Barangay	Population	No. of Households	Residential Area (sq m)	Population Density (persons/sq m)	Exposed Area (sq m)	Exposed Population	Exposure Percentage
Balud I	981	244	60,254.1	0.016	37,964.5	618.102	63.01
Balud II	857	276	48,510.6	0.018	26,533.9	468.754	54.7
Balud Lilo-an	638	179	64,959.1	0.010	43,256.2	424.844	66.59
Dawis Centro	217	63	51,295.1	0.004	6,559.27	27.749	12.79
Dawis Norte	332	83	32,166.7	0.010	14,634	151.04	45.49
Dawis Sur	725	190	88,746.6	0.008	8,406.63	68.677	9.47
Gines	998	277	87,835.6	0.011	68,102.4	773.789	77.53
Ilawod Poblacion	2,497	653	440,336	0.006	130,322	739.014	29.6

# Creation of an online analytics platform and repository for LCCAP and other development plans of the community

rebuild.noah.up.edu.ph

**PROJECT ReBUILD** VULNERABILITY ASSESSMENT  
2049-FLOOD 100-YEAR RRP RCP 4.5  
ZARRAGA | Log Out

Population Areas | Urban Use Areas | Natural Resource-Based Production Areas | Critical Point Facilities | Lifeline Utilities

Search for Barangay

Barangay	Household Capacities to Relocate or Retrofit	Government Assistance in Preparation for a Disaster	Government Assistance After a Disaster	Availability of Evacuation Centers	Government Resources	Adaptive Capacity Score			
						Group 1	Group 2	Group 3	Average
Balud I	None	None	Yes	None. Resi	Irrigation	3	3	3	3
Balud II	None	None	Yes (Food pacl	School, Bar	Training o	2	3	3	2.67
Balud Lilo	None	None	Yes	None	Civic Cent	3	3	3	3
Dawis Cer	None	None	Relief goods	Elementar	None	3	3	3	3
Dawis No	Yes	None	Yes	Barangay I	None	3	3	3	3
Dawis Sur	None	None	Yes (Food pacl	Barangay I	None	3	3	3	3
Gines	None	None	Yes	EC, Barang	Provision	1	3	3	2.33
Ilawod Po	None	None	Yes (In-kind, C	Barangay I	Assistanci	3	3	3	3

# Creation of an online analytics platform and repository for LCCAP and other development plans of the community

rebuild.noah.up.edu.ph

**PROJECT ReBUILD** VULNERABILITY ASSESSMENT  
2049-FLOOD 100-YEAR RRP RCP 4.5  
ZARRAGA | Log Out

Population Areas | Urban Use Areas | Natural Resource-Based Production Areas | Critical Point Facilities | Lifeline Utilities

Search for Barangay

Exposure									
Barangay	Classification	Name	Length / Distance (km)	Construction / Replacement Cost (PhP per ln km)	Total Area per Road (sq m)	Exposed Area (sq m)	Exposed Length (ln km)	Exposed Value (PhP)	Exposure Percentage
Balud I	Baran	Jalud Nor	0.57	100000C	25534.2	15185.6	0	0	59.47
Balud II	Brgy Balud	Brgy Balud	0.53	100000C	14577.2	10329.5	0	0	70.86
Balud Lilo-i	Brgy Balud	Brgy Balud	0.38	100000C	35993.1	23081.2	0	0	64.13
Dawis Cent	Dawis cent	Dawis cent	0.03	100000C	13341	1715.47	0	0	12.86
Dawis Nort	Dawis Nort	Dawis Nort	0.6	100000C	7785.6	3364.41	0	0	43.21
Dawis Sur	Dawis Sur	Dawis Sur	0.62	100000C	18138.4	32.7	0	0	0.18

# Creation of an online analytics platform and repository for LCCAP and other development plans of the community

rebuild.noah.up.edu.ph

PROJECT VULNERABILITY ASSESSMENT

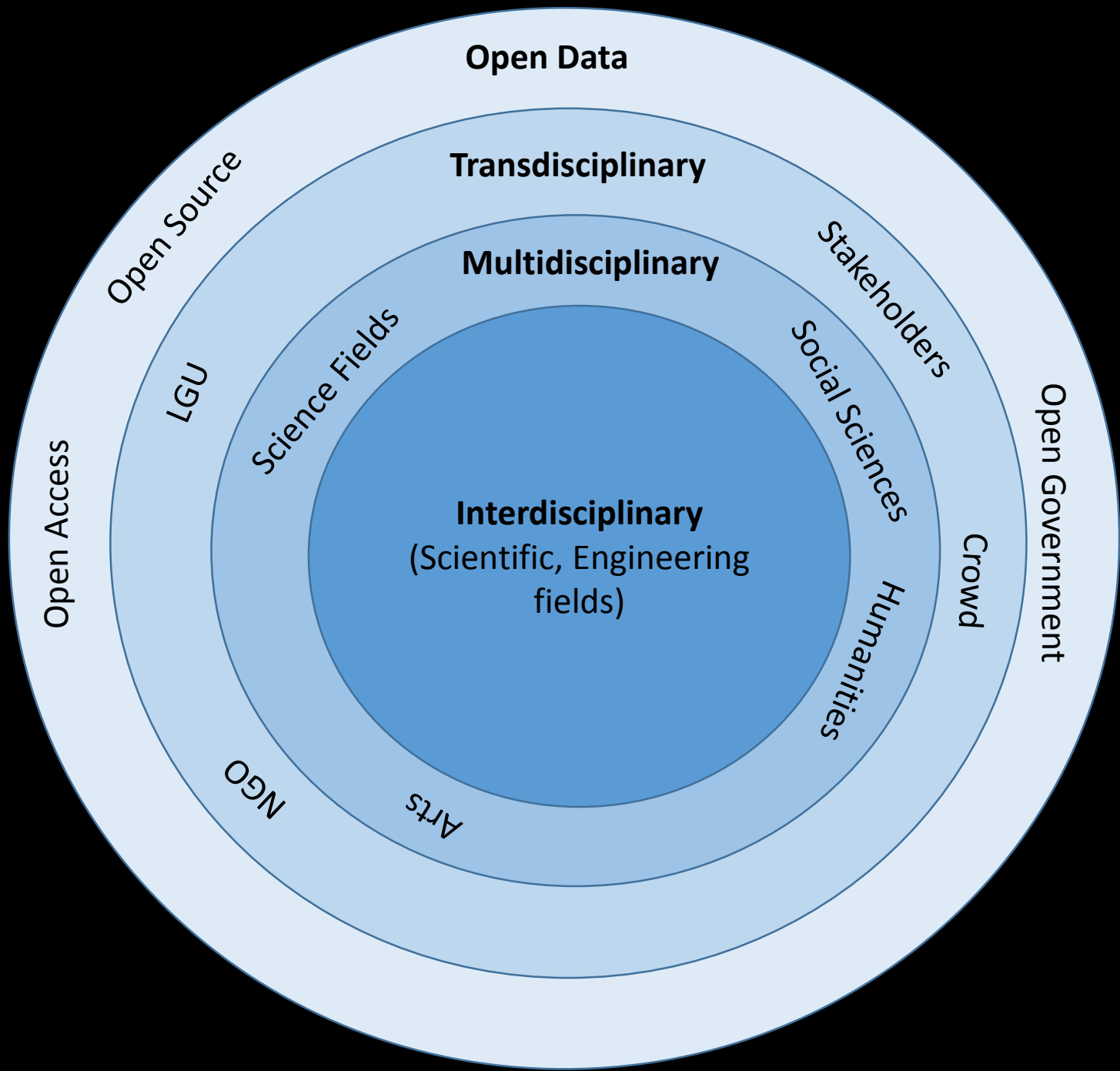
VULNERABILITY ASSESSMENT: LIFELINE UTILITIES (2049-FLOOD 100-YEAR RRP RCP 4.5)  
ZARRAGA

Barangay	Classification	Name	Exposure								Sensitivity			Impact		Adaptive Capacity				Vulnerability		
			Length/Distance (km)	Construction/Replacement Cost (PHP per In km)	Total Area per Road (sq m)	Exposed Area (sq m)	Exposed Length (In km)	Exposed Value (PHP)	Exposure Percentage	Exposure Score	Percentage of Road in Good Condition	Percentage of Road in Poor Condition	Sensitivity Score	Exposure + Sensitivity Score	Degree of Impact Score	Government Infrastructure Related Investment	Score			Vulnerability Index	Vulnerability Category	
																	Group 1	Group 2	Group 3			Average
Balud I	Barangay Road	Jalaud Norte to Balud I	0.57	10000000	25534.2	15185.6	0	0	59.47	4	80	20	2	6	3	Farm to market road completed last December 2016	3	3	3	3	9	High
Balud II	Barangay Road	Brgy Balud II	0.53	10000000	14577.2	10329.5	0	0	70.86	4	50	50	4	8	3		3	3	3	3	9	High
Balud Lilo-an	Barangay Road	Brgy Balud Lilo-an	0.38	10000000	35993.1	23081.2	0	0	64.13	4	80	20	2	6	3	Concreting of road to be completed on May 2017	3	3	3	3	9	High
Dawis Centro	Barangay Road	Dawis centro	0.03	10000000	13341	1715.47	0	0	12.86	2	100	0	0	2	1	Rehabilitation of national road	3	3	3	3	3	Low
Dawis Norte	National Road	Dawis Norte, Highway	0.6	10000000	7785.6	3364.41	0	0	43.21	4	80	20	2	6	3	Ongoing projects include approx. 1km farm to market road c/o KALAH-I-CIDSS and road widening. There are plans to improve the roads, but there is no budget.	3	3	3	3	9	High
Dawis Sur	Barangay Road	Dawis Sur	0.62	10000000	18138.4	32.7	0	0	0.18	1	80	20	2	3	1		3	3	3	3	3	Low
Gines		Brgy Gines	2.01	10000000	44143.5	32191.2	0	0	72.92	4	80	20	2	6	3	Concreting last 2015	3	3	3	3	9	High
Ilawod Poblacion	Pathway	Poblacion Ilawod	0.09	10000000	80557.6	15196	0	0	18.86	2	100	0	0	2	1	Concreting of municipal streets	3	3	3	3	3	Low
Ilaya Poblacion		mutual homes subd, Poblacion Ilaya	0.07	10000000	52382.6	30696.5	0	0	58.6	4	96	4	1	5	2		3	3	3	3	6	Moderate



# General Appropriations Act (2018)

- The University of the Philippines Resilience Institute (UPRI), together with other state universities and colleges, **shall support the Climate Change Commission in training LGUs** to formulate and complete Local Climate Change Action Plans (LCCAP) and Comprehensive Landuse and Development Plans (CLUDP).
- The **UPRI shall empower LGUs with science-based information and technologies for development planning**, such as Climate Vulnerability and Disaster Risk Assessment (CVDA) and multi-scenario, probabilistic hazard models.



**Open Data**

**Transdisciplinary**

**Multidisciplinary**

**Interdisciplinary**

(Scientific, Engineering fields)

Open Source

Stakeholders

Social Sciences

Open Government

LGU

Science Fields

Crowd

Open Access

Humanities

NGO

Arts



Thank you