

# UP Resilience Institute, SUCs and the LCCAP

UP RESILIENCE INSTITUTE

UP NOAH CENTER

# CLIMATE CHANGE PROJECTION (RCP4.5 and RCP8.5) Radiative Concentration Pathways

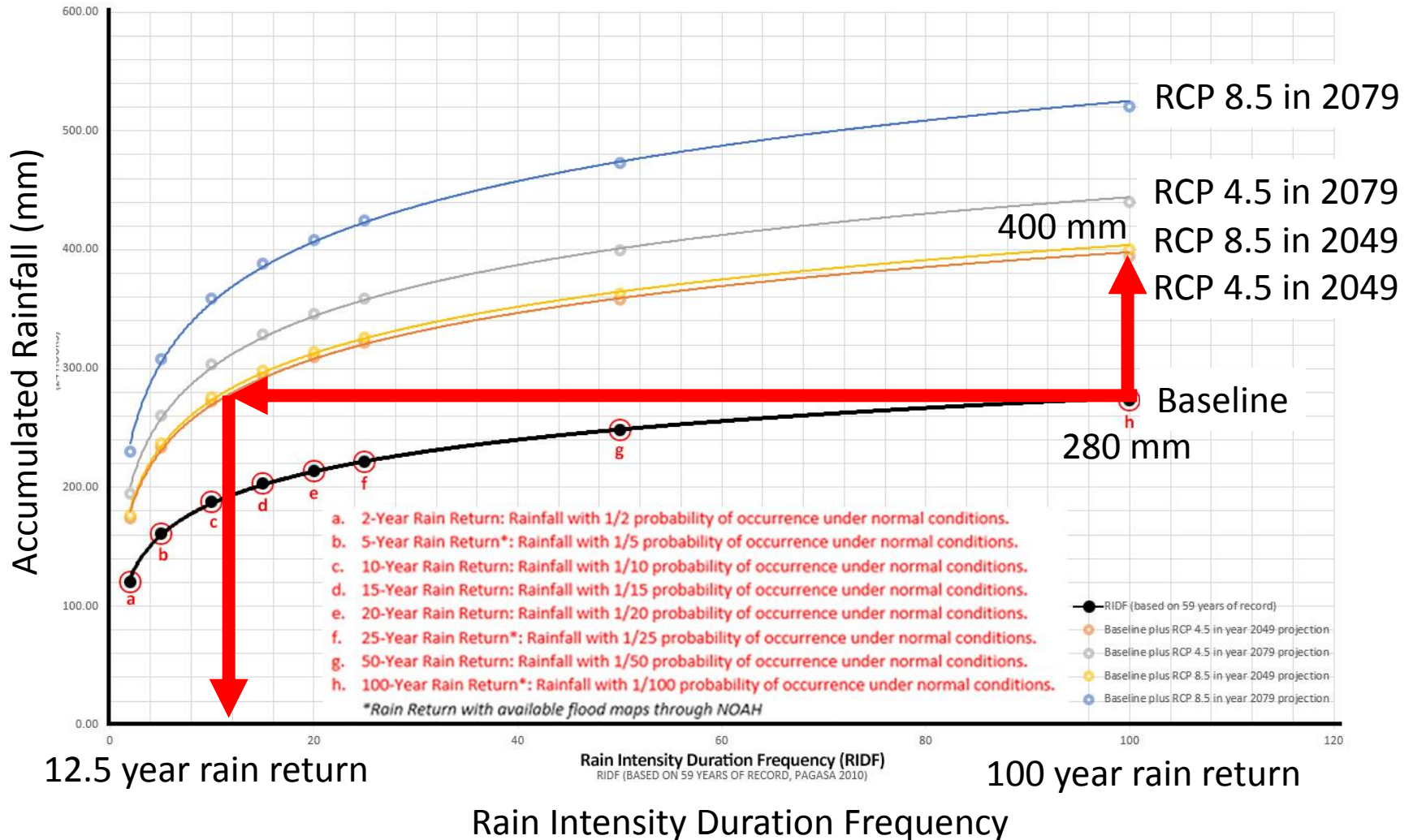




Image © 2013 DigitalGlobe

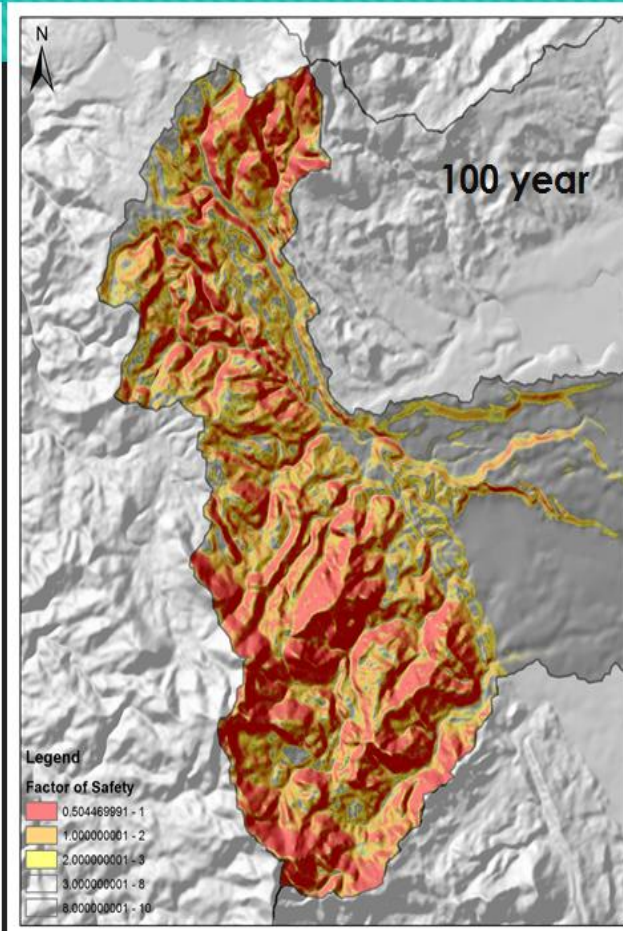
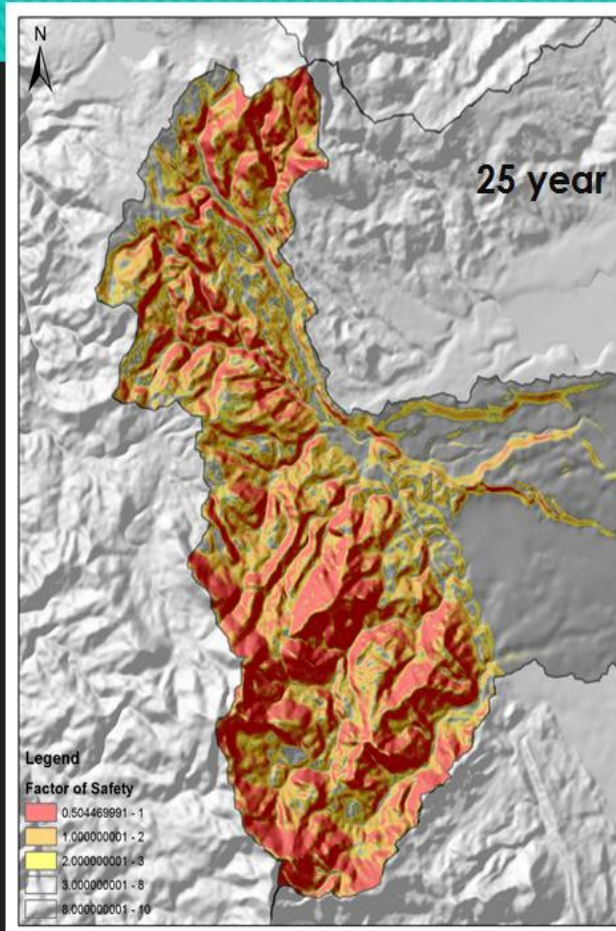
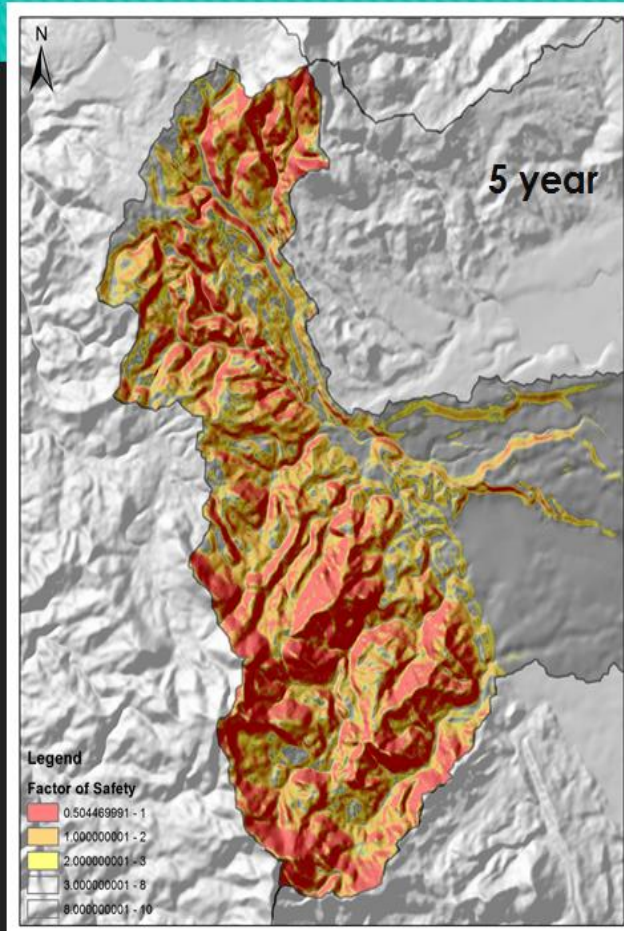
St. Ferdinand  
Cathedral Compound

**Legend**

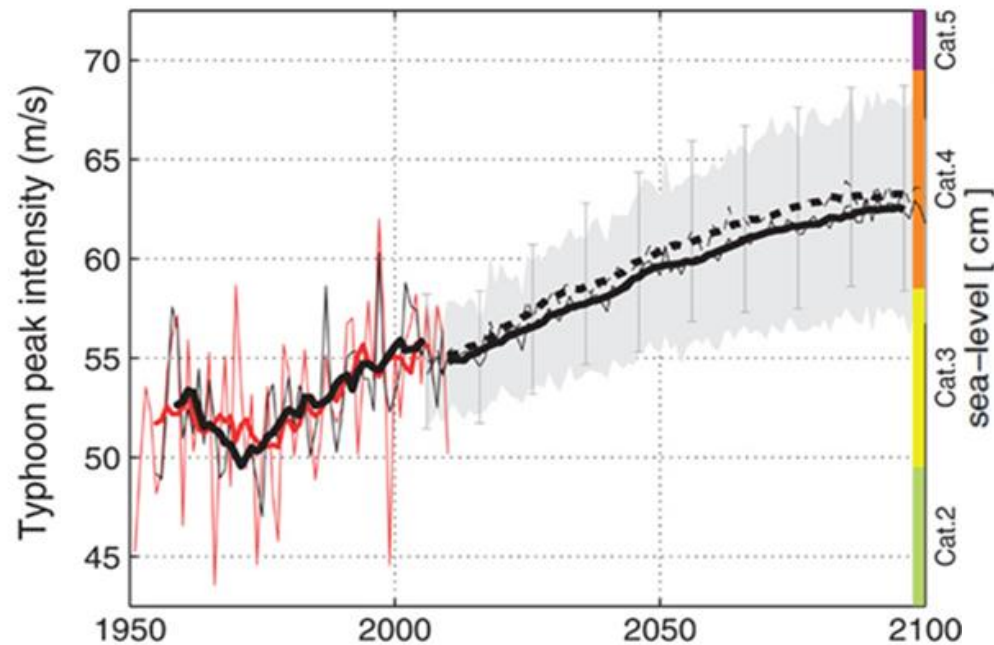
Flow Depth

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

# CLIMATE-ADJUSTED RAINFALL-INDUCED LANDSLIDE HAZARD MAPS

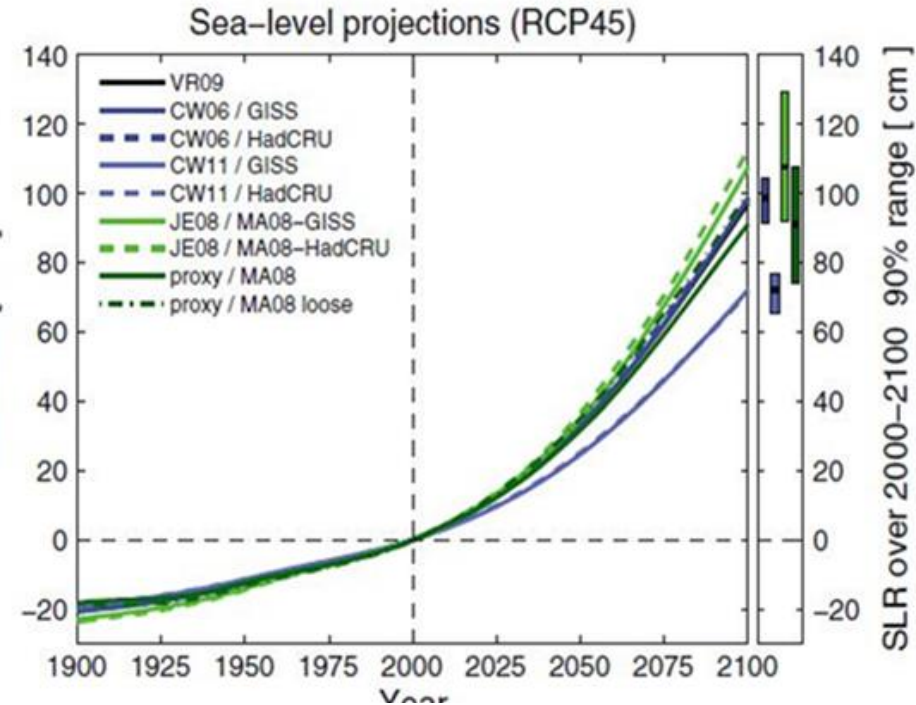


# Storm Surge



## Typhoon Intensity Projection

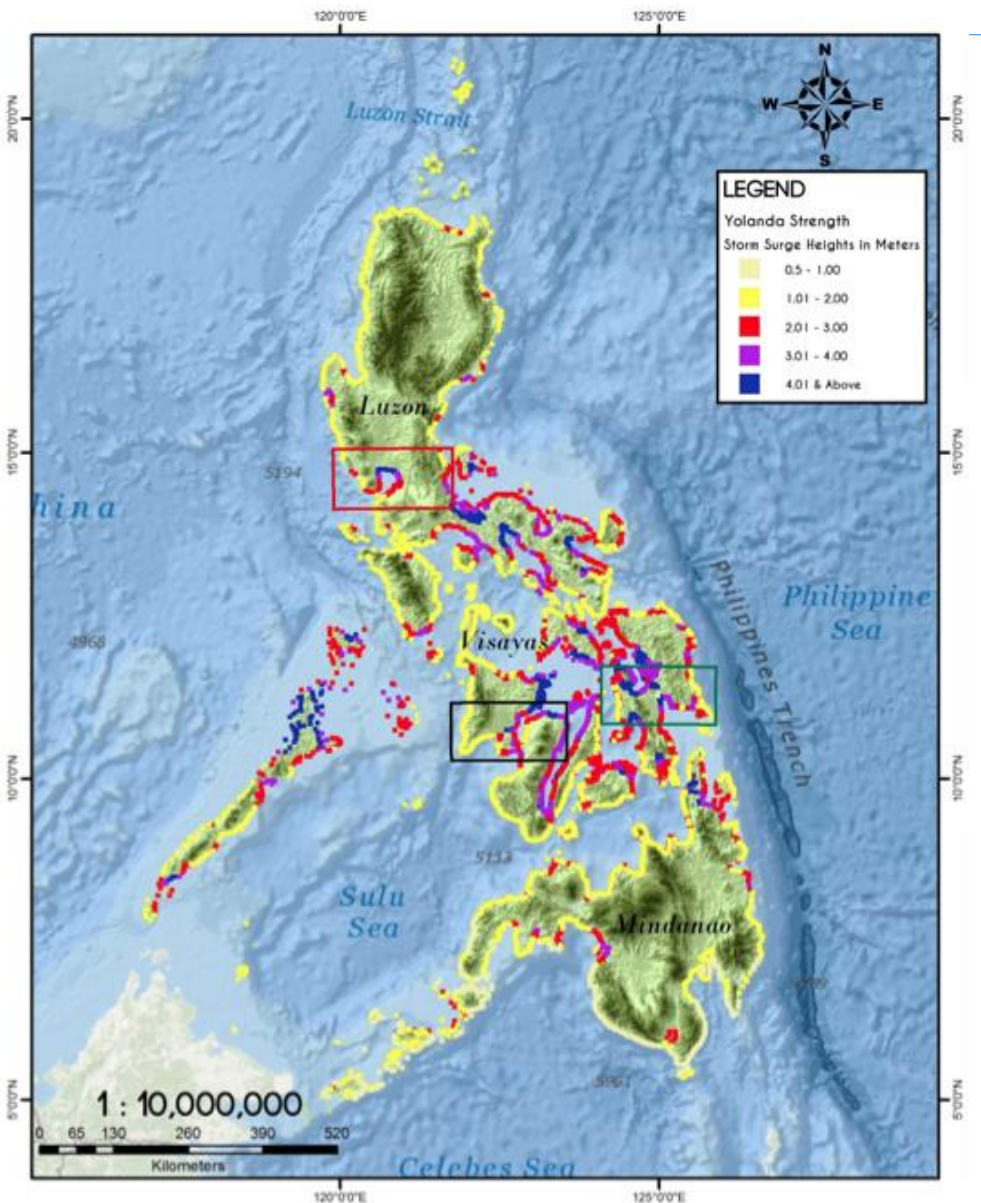
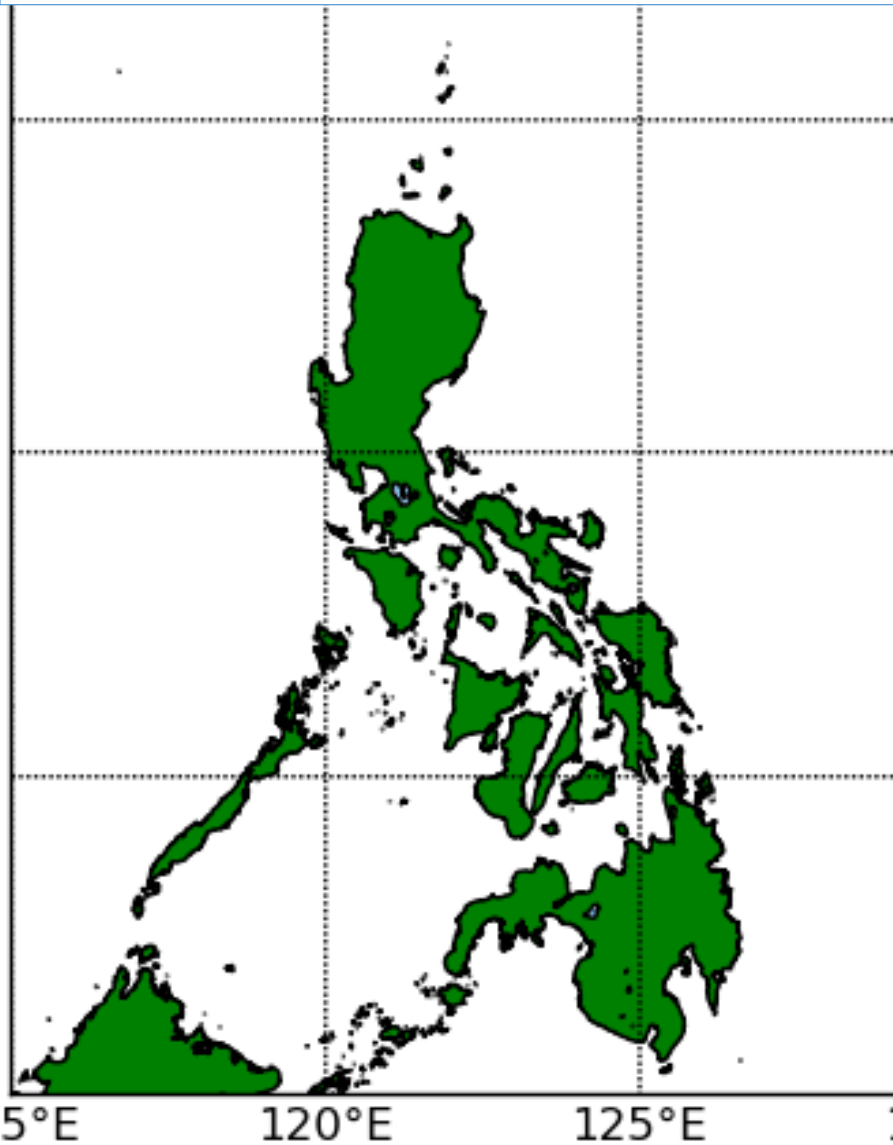
Observed, predicted and projected seasonal mean typhoon lifetime peak intensity ( $\text{ms}^{-1}$ ) denoted with the range of typhoon intensity from category 2 to 5 based on Saffir-Simpson hurricane scale (Mei et al., 2015).

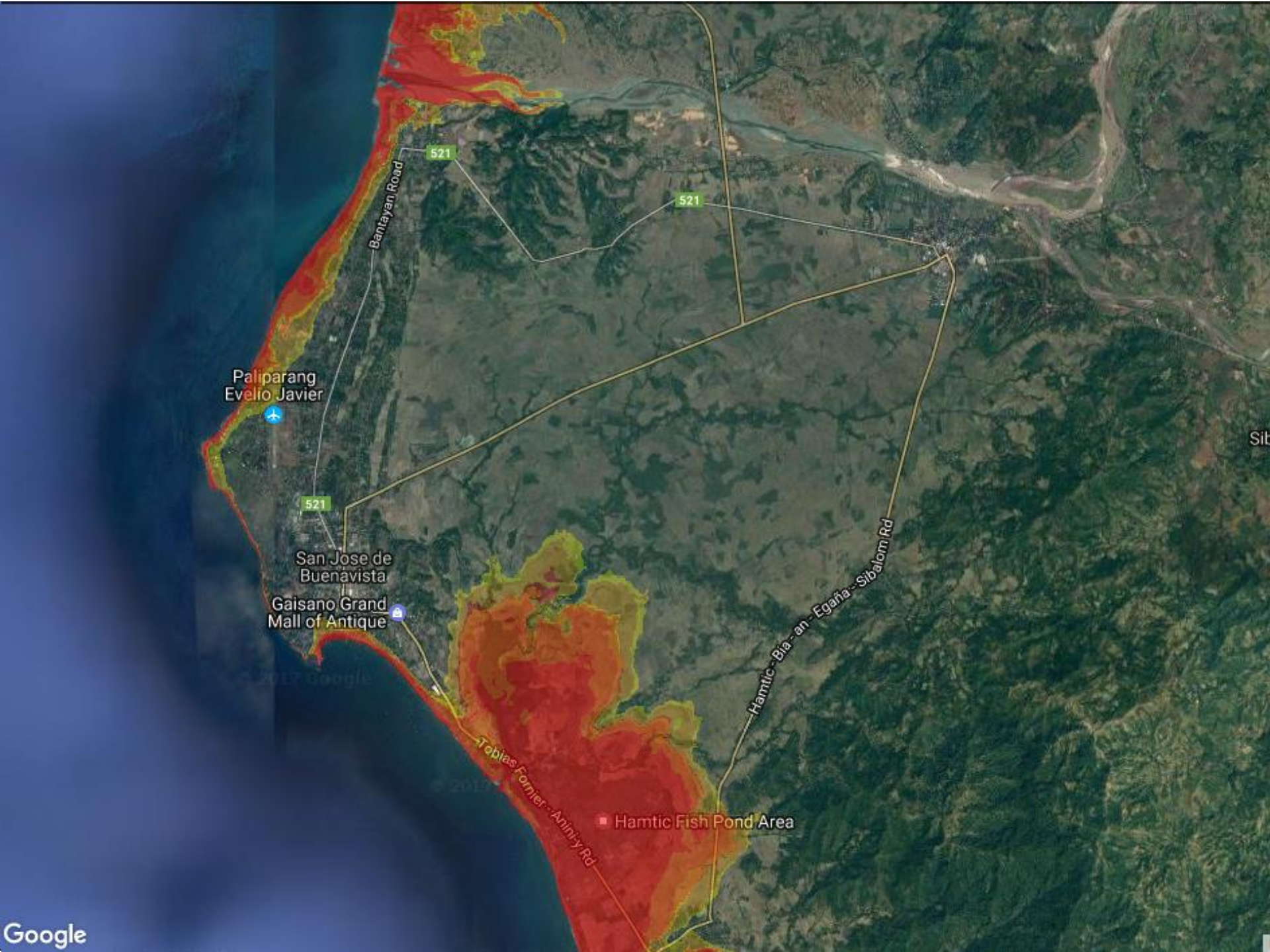


## Sea-level rise projection

Sea level hindcasts and projections for models with different temperature and sea level data (Rahmstorf et al., 2011), show increasing value of mean sea level that can reach up to more than 100 cm in 2100.

# Yolanda-type conditions but with tracks of tropical cyclones that entered PAR from 1948–2013 and corresponding storm surge height





Paliparang Evello Javier

San Jose de Buenavista

Gaisano Grand Mall of Antique

■ Hamtic Fish Pond Area

Bantayan Road

Hamtic-Bia-an-Egaha-Sibalom Rd

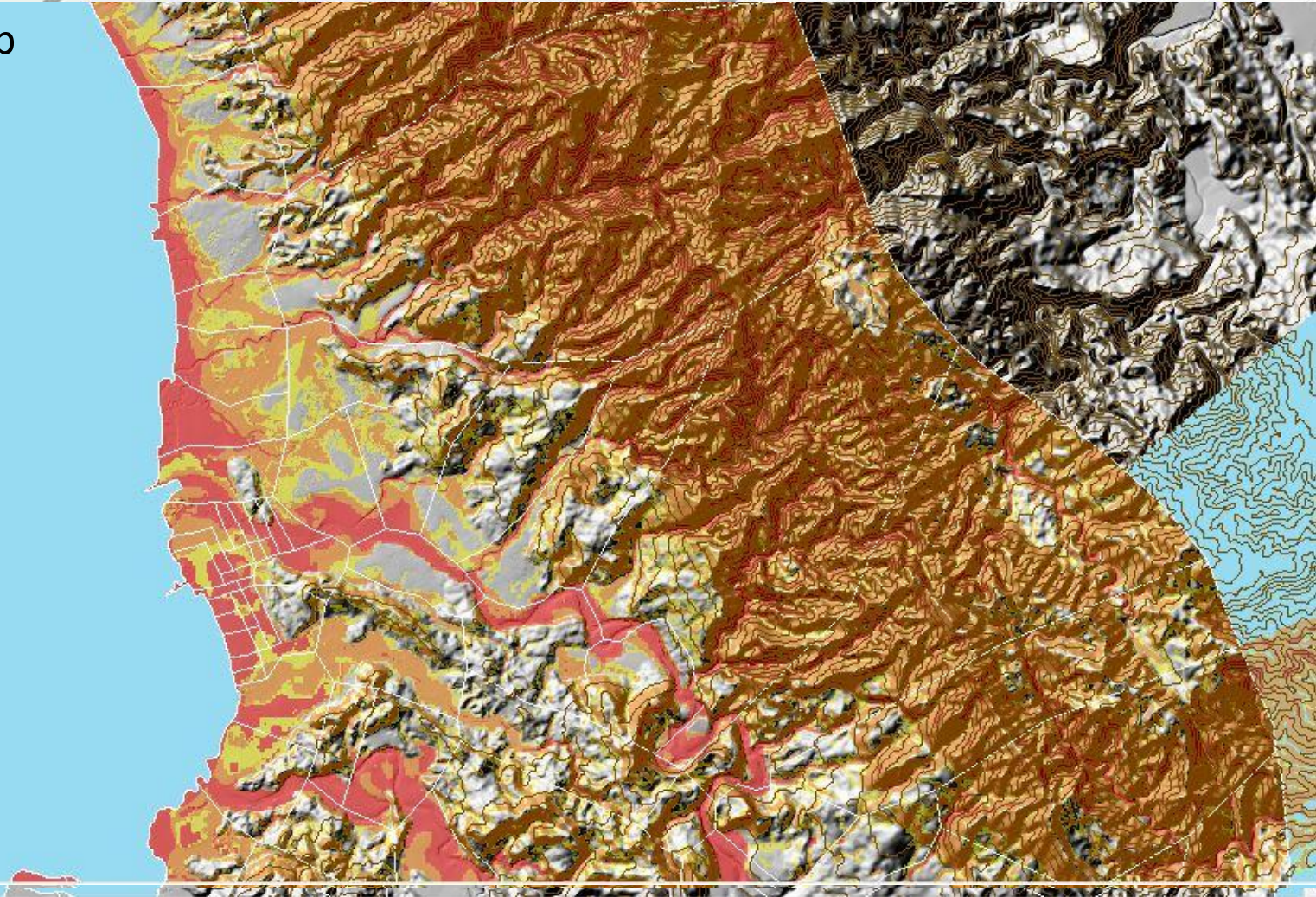
Tobias Forner-Aniniy Rd

521

521

521

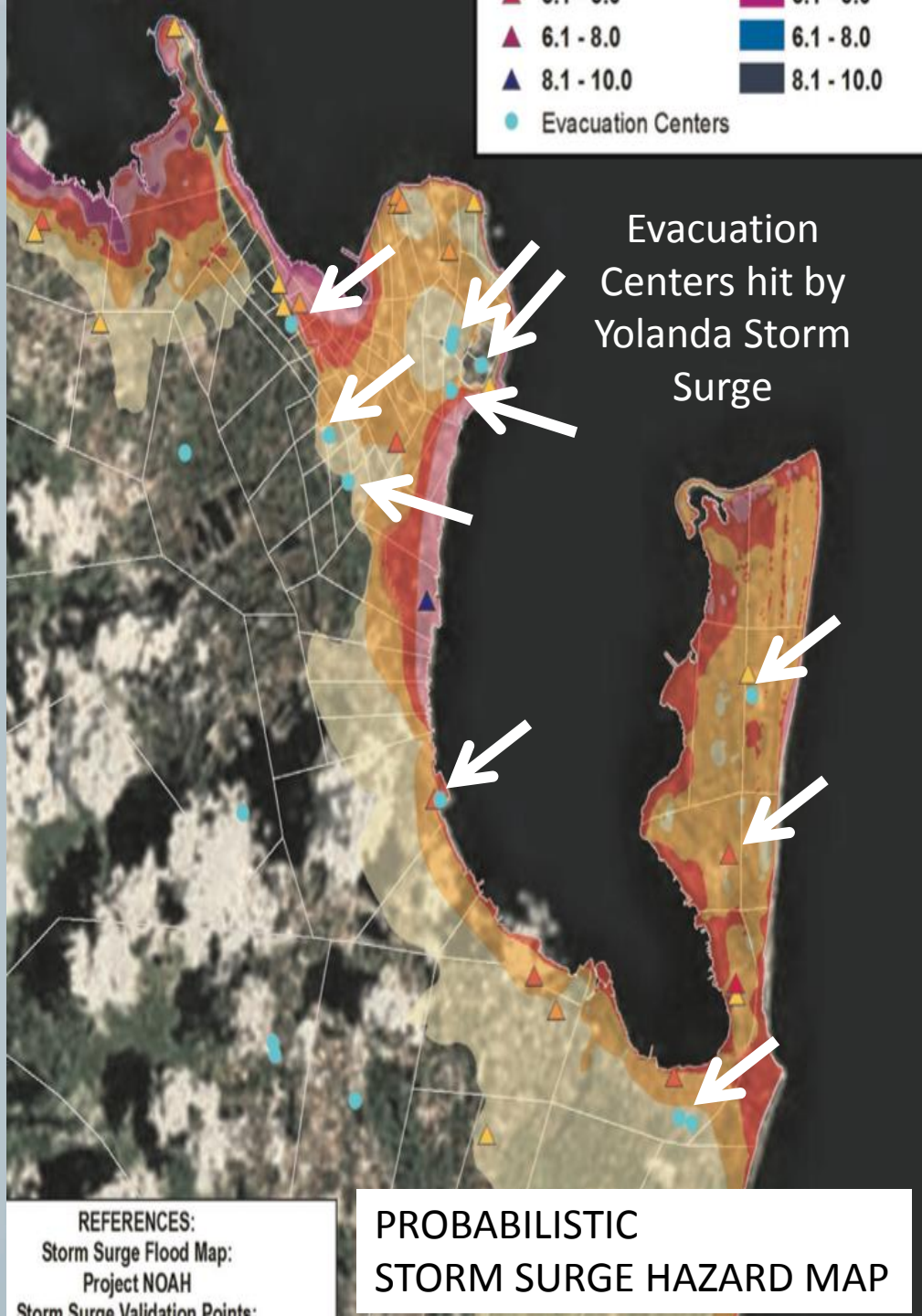
Multi-Hazard Map  
Scenario Based





# Why the need to model the rainfall and sea-level scenarios into hazard maps

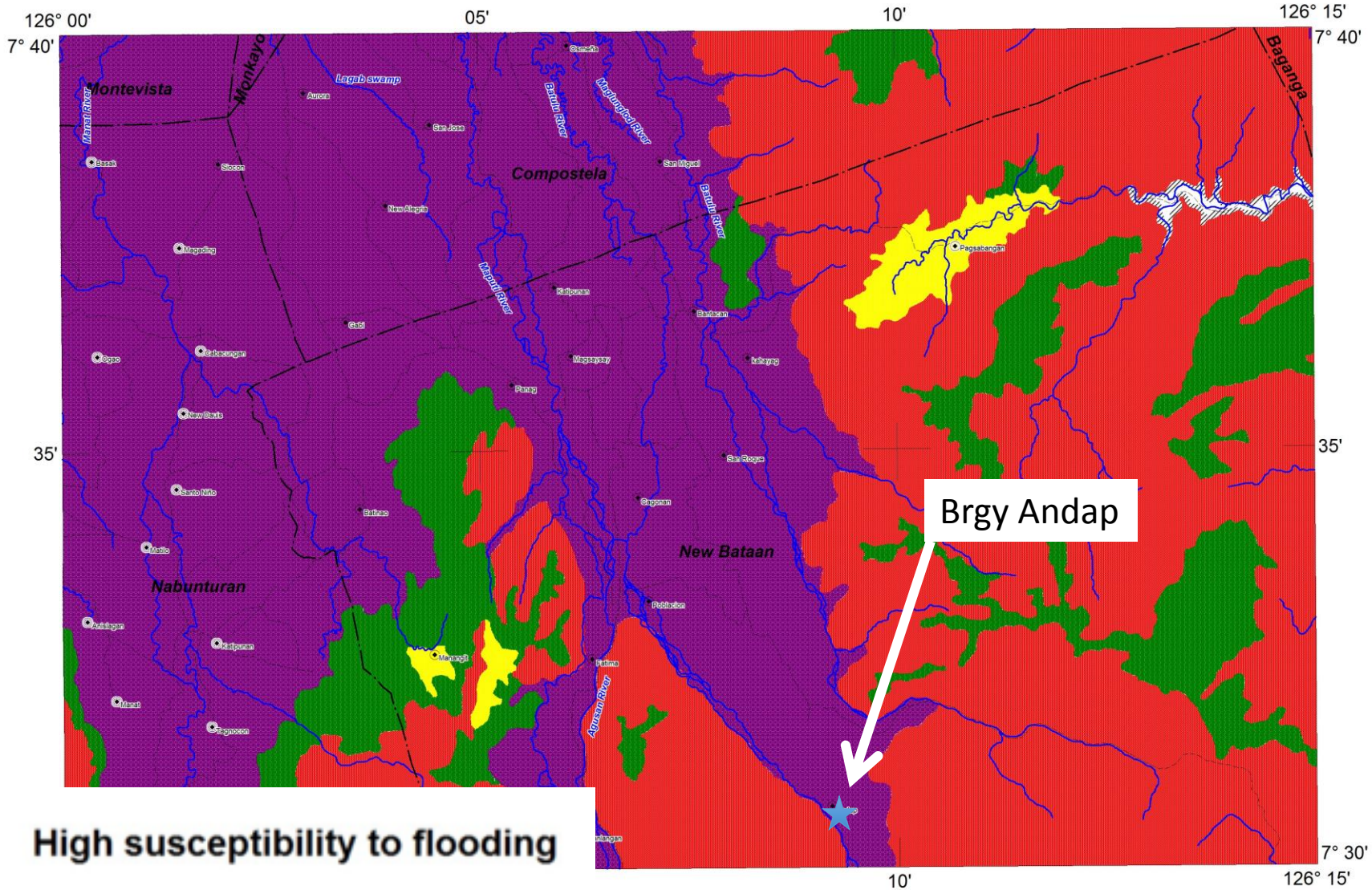
- Rainfall is not the hazard, the hazards are the consequent floods and landslides. Rainfall and sea-level needs to be in the form of multi-scenario (probabilistic) hazard maps
- For the municipality/cities to plan accordingly to the predicted impacts of Climate Change
- LCCAP, CDP, CLUP, etc
- Disaster Risk is an unresolved problem of development and proper planning reduces risk.



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

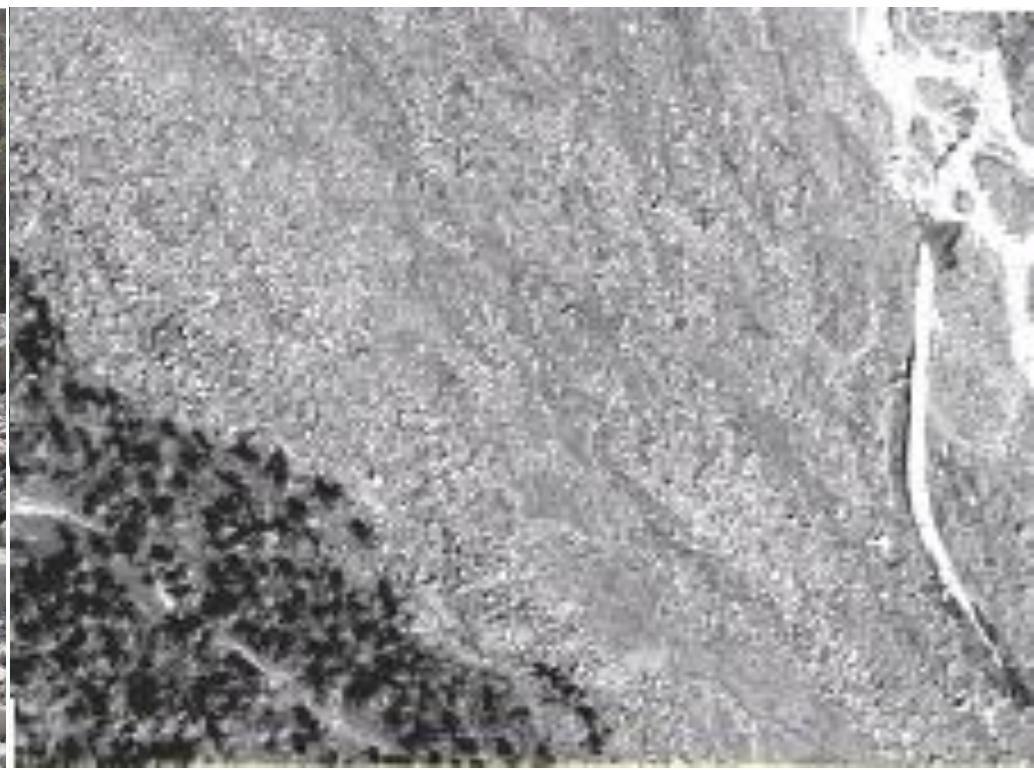


- LEGEND**
- High susceptibility to flooding
  - High susceptibility to landslides
  - Moderate susceptibility
  - Low susceptibility

**Brgy Andap**

**High susceptibility to flooding**





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



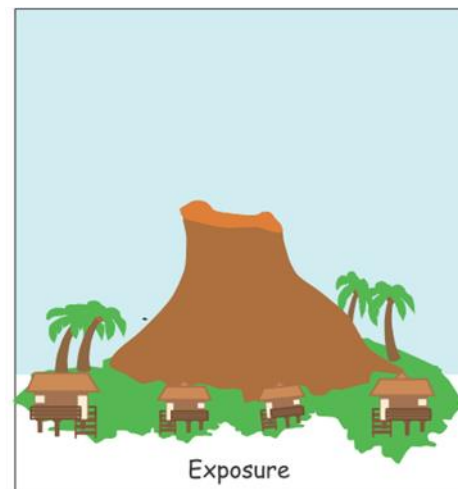
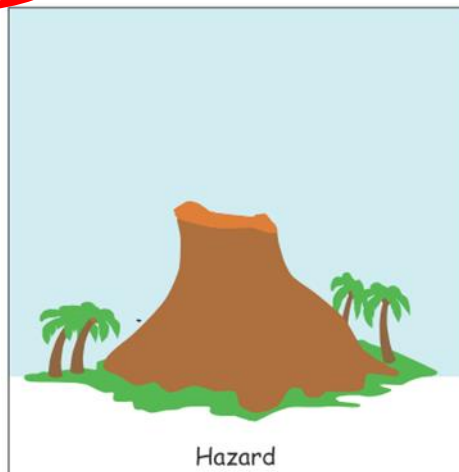
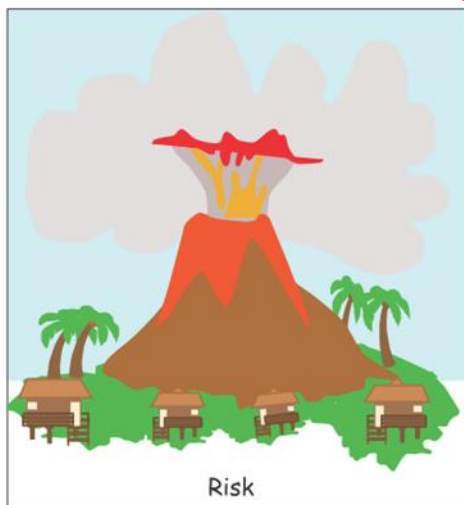
No amount of accurate warning will work if hazard maps are inappropriate

# Disaster Risk

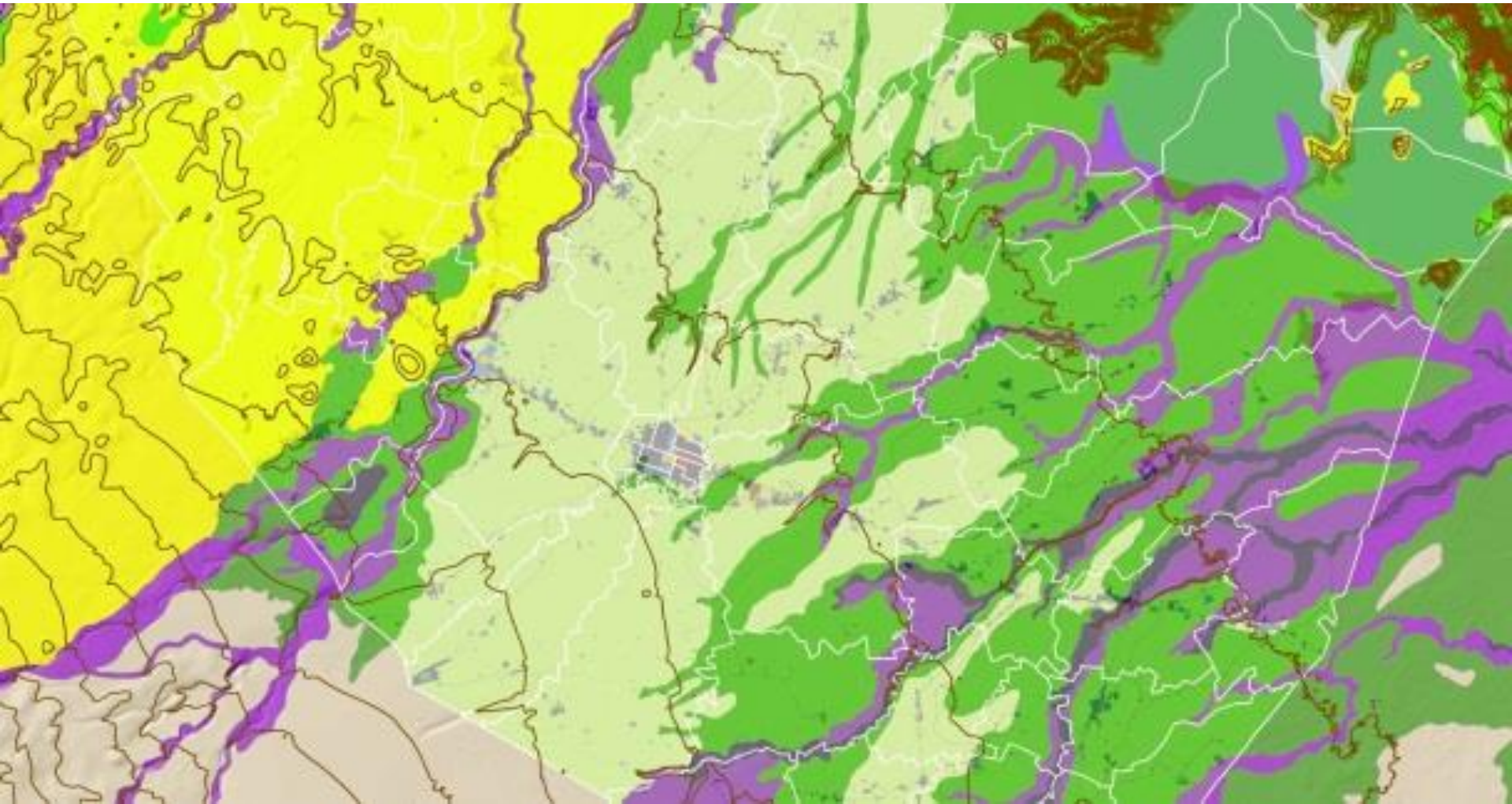
“A country’s risk of becoming the victim of a disaster is not determined solely by its exposure to natural hazards, but to a crucial extent also by the society’s state of development.”

- World Risk Index Report 2013

$$\text{Risk} = f(\text{Hazard}, \text{Exposure}, \text{Vulnerability})$$

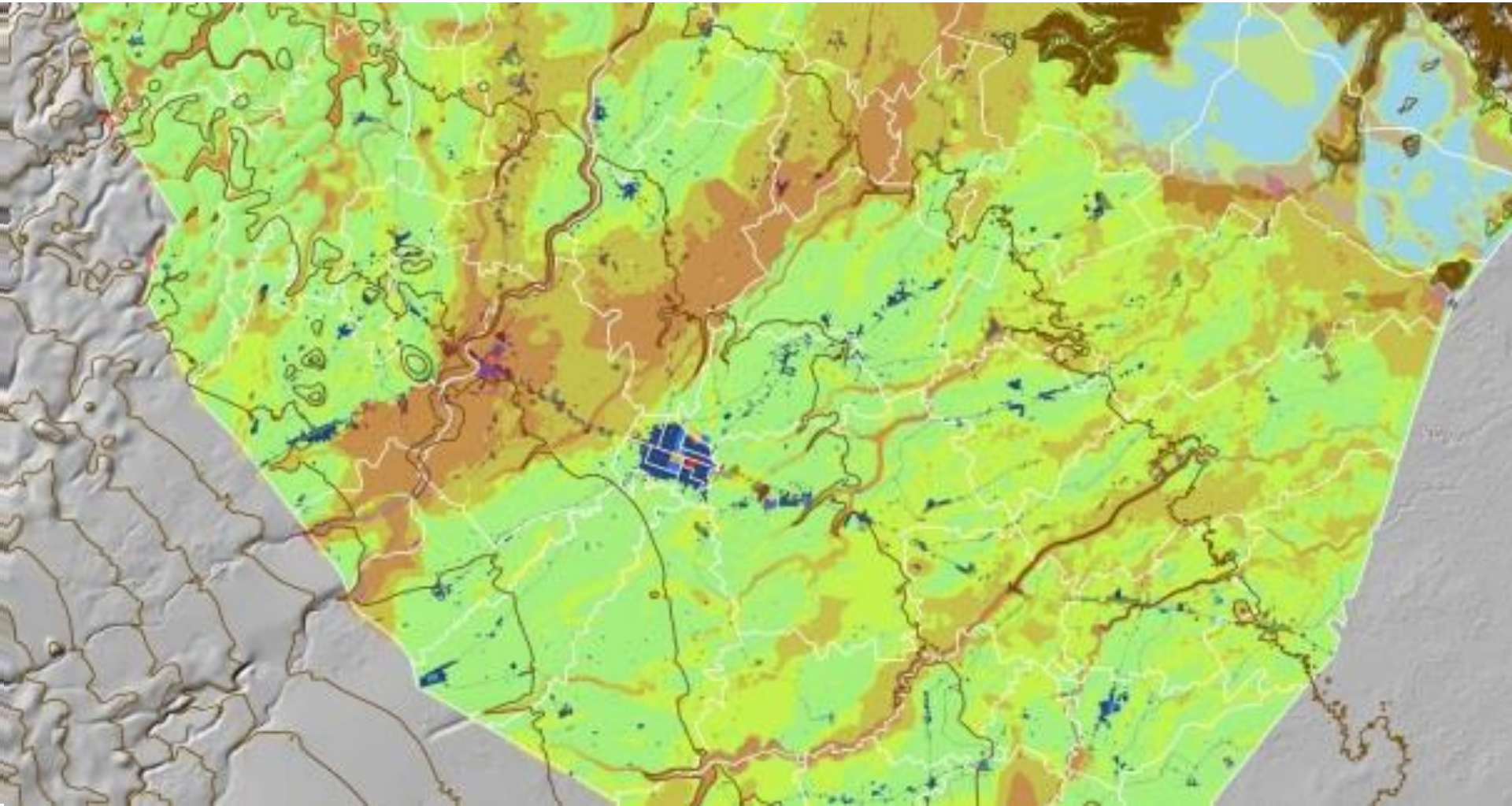


# MGB susceptibility map based on interviews and expert opinion





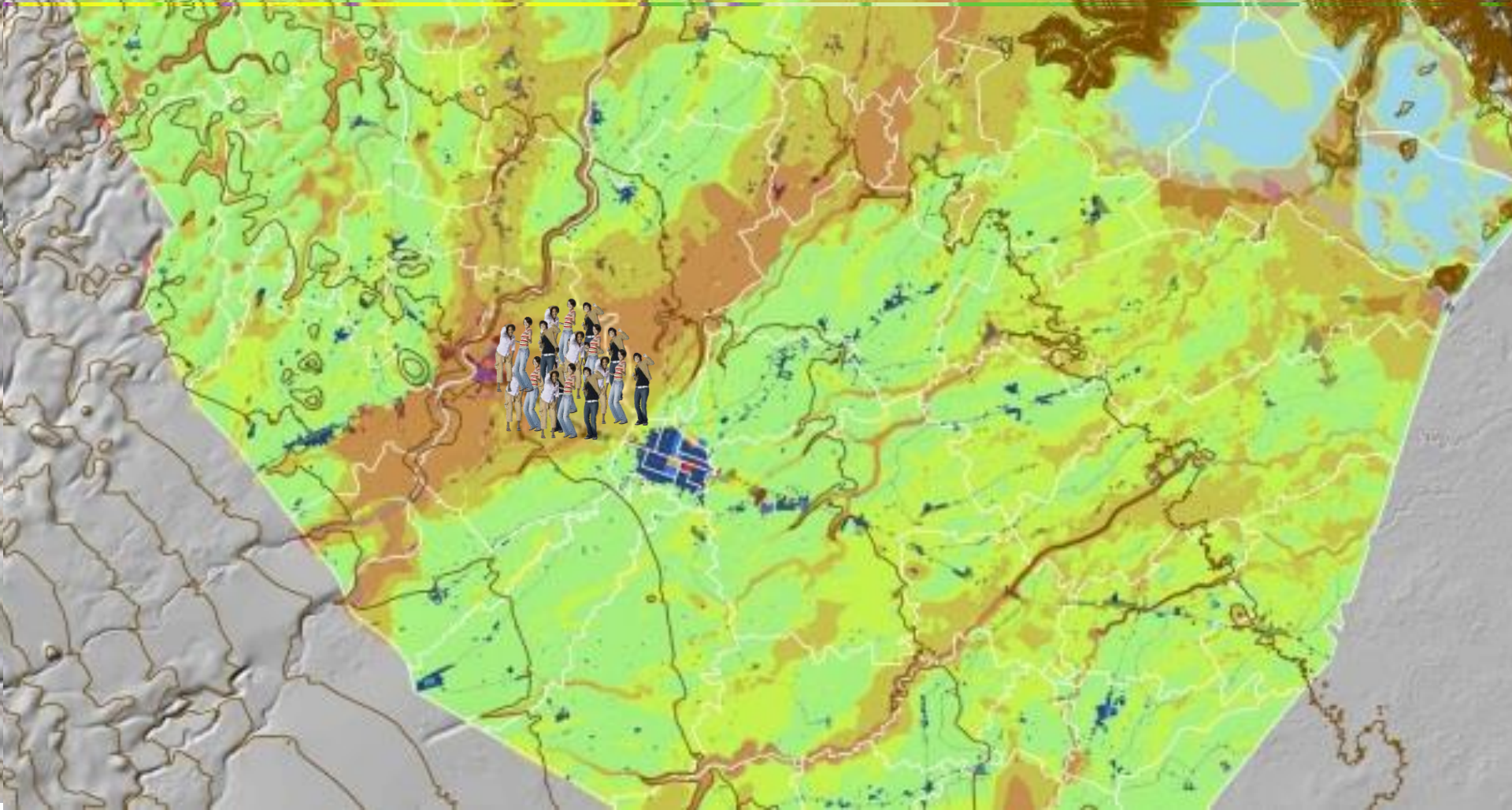
100-year rain  
return flood



# Example for development planning and locating evacuation centers

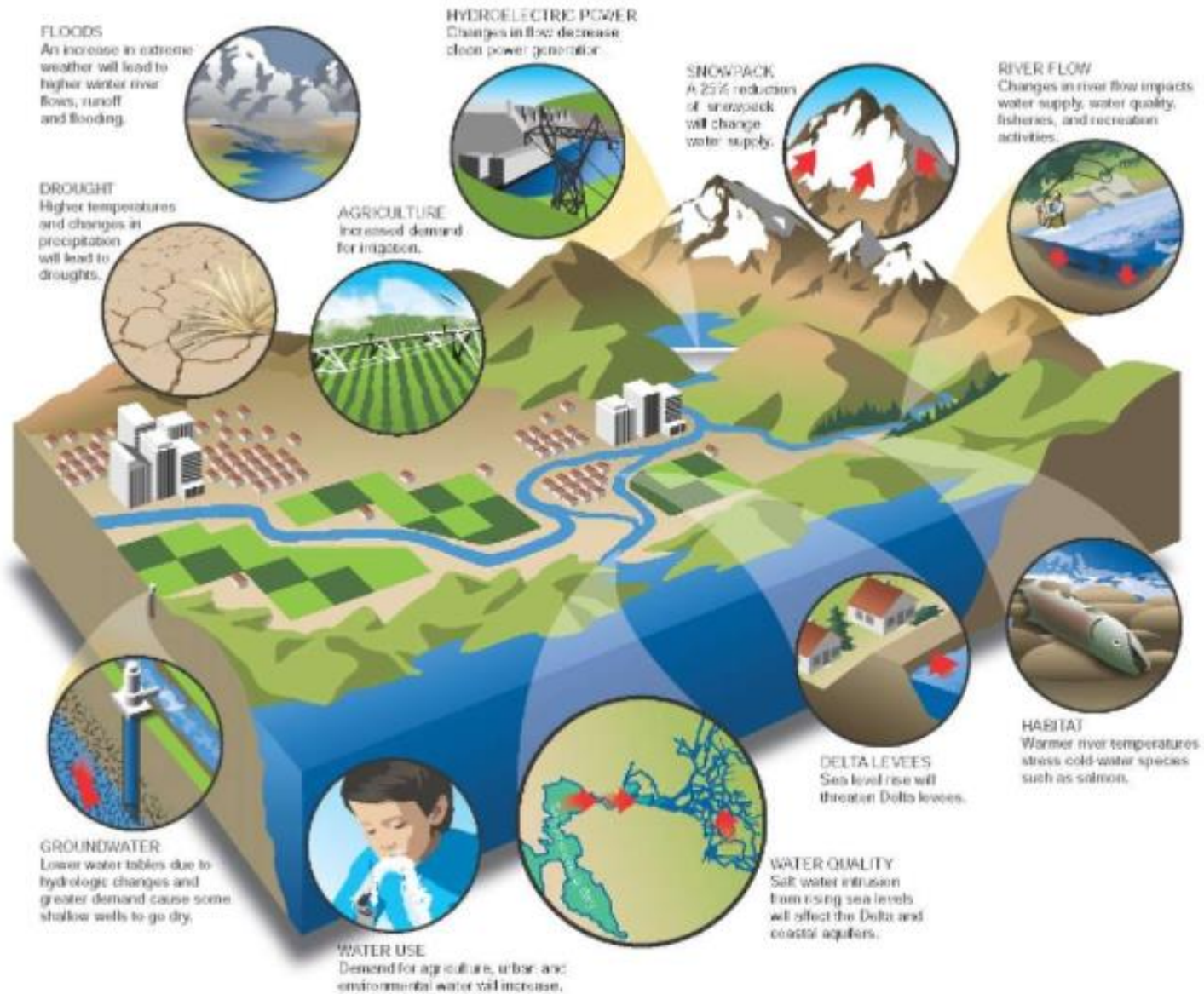
Municipality of Alang Alang, Leyte

# Multi-scenario-based probabilistic hazard maps



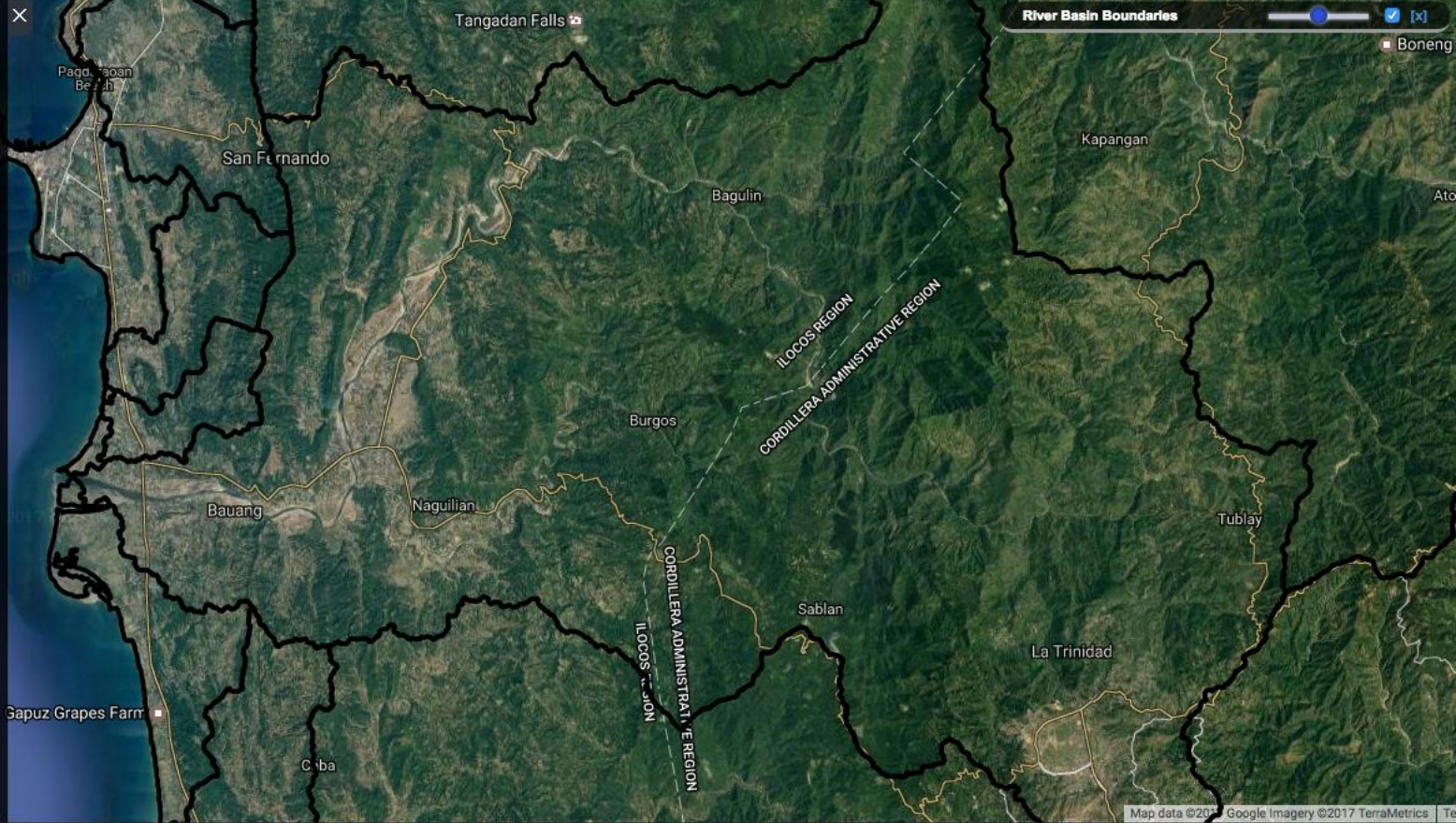
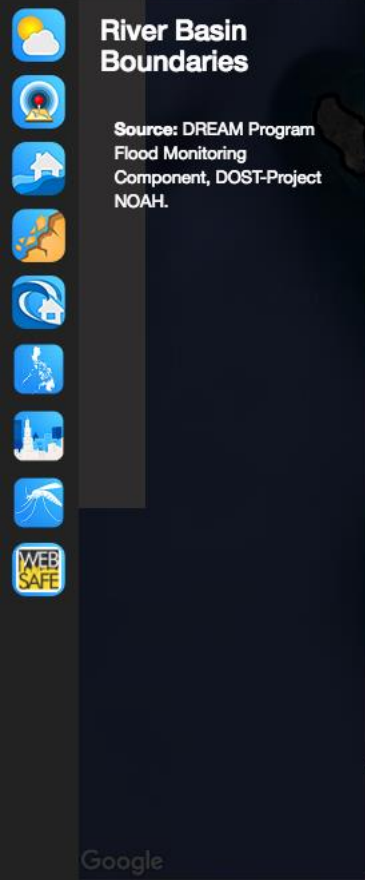
# Plans cut across all sectors

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



### River Basin Boundaries

Source: DREAM Program Flood Monitoring Component, DOST-Project NOAH.





Find a place...

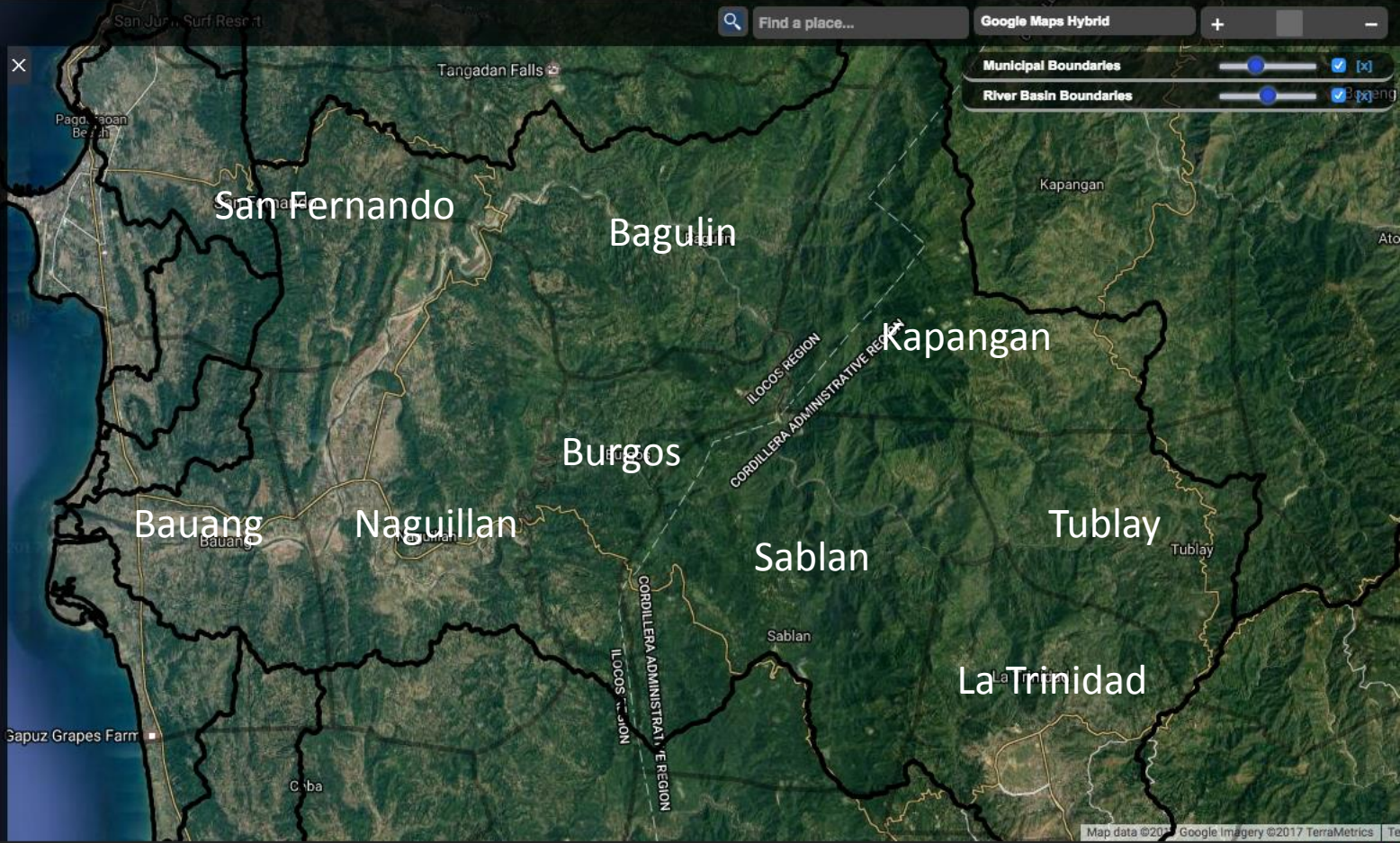
Google Maps Hybrid + -



### Municipal Boundaries

Shows municipal boundaries

NOTE: Administrative boundaries are from NSO (2015).



Municipal Boundaries  [x]

River Basin Boundaries  [x]

Google

Map data ©2017 Google Imagery ©2017 TerraMetrics



Find a place...

Google Maps Hybrid + -



# 100 Year Flood Hazards

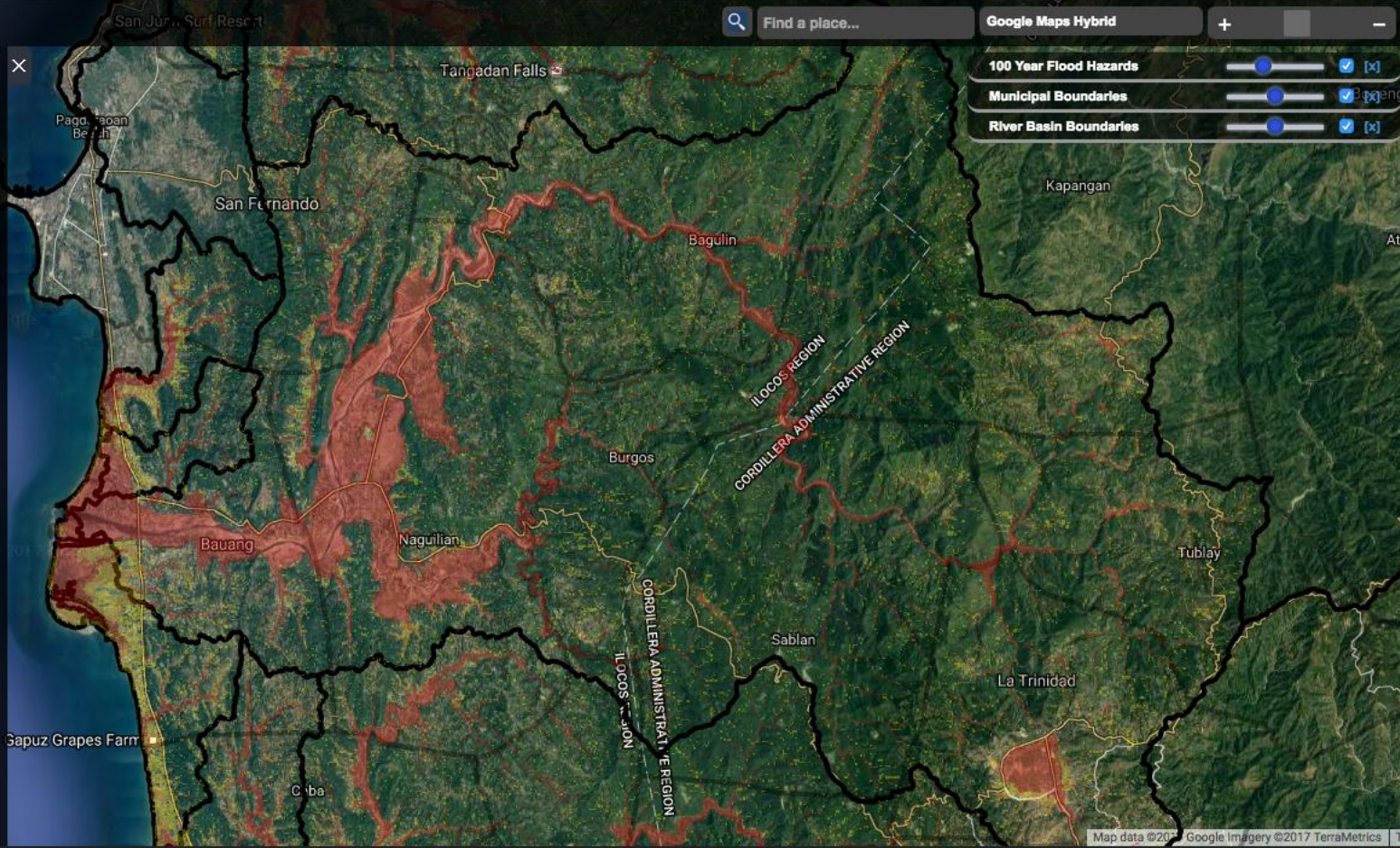
## FLOOD HAZARD



Flood Hazard maps based on different rainfall scenarios

**NOTE:** Administrative boundaries are from NSO (2015).

**Disclaimer:** Flood Hazard maps are incomplete. Municipalities with no flood data are still being prepared



100 Year Flood Hazards [checked] [x]

Municipal Boundaries [checked] [x]

River Basin Boundaries [checked] [x]



Find a place...

Google Maps Hybrid + -

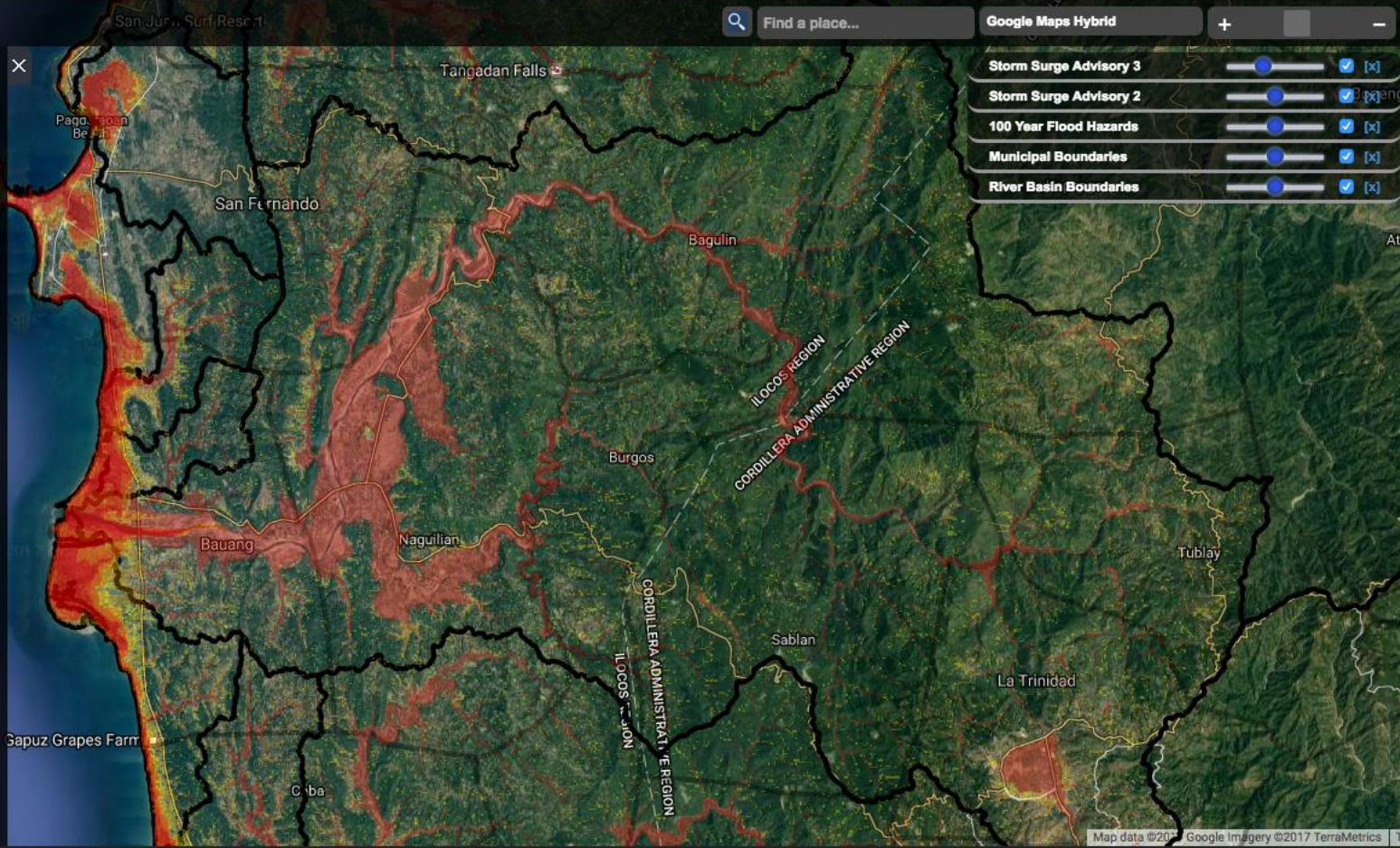


### Storm Surge Advisory 3



Storm Surge Hazard maps based on predicted storm surge height; SSA 3: 4m storm surge height

**NOTE:** Administrative boundaries are from NSO (2015).



- Storm Surge Advisory 3  [x]
- Storm Surge Advisory 2  [x]
- 100 Year Flood Hazards  [x]
- Municipal Boundaries  [x]
- River Basin Boundaries  [x]





### Landslide Hazard Maps

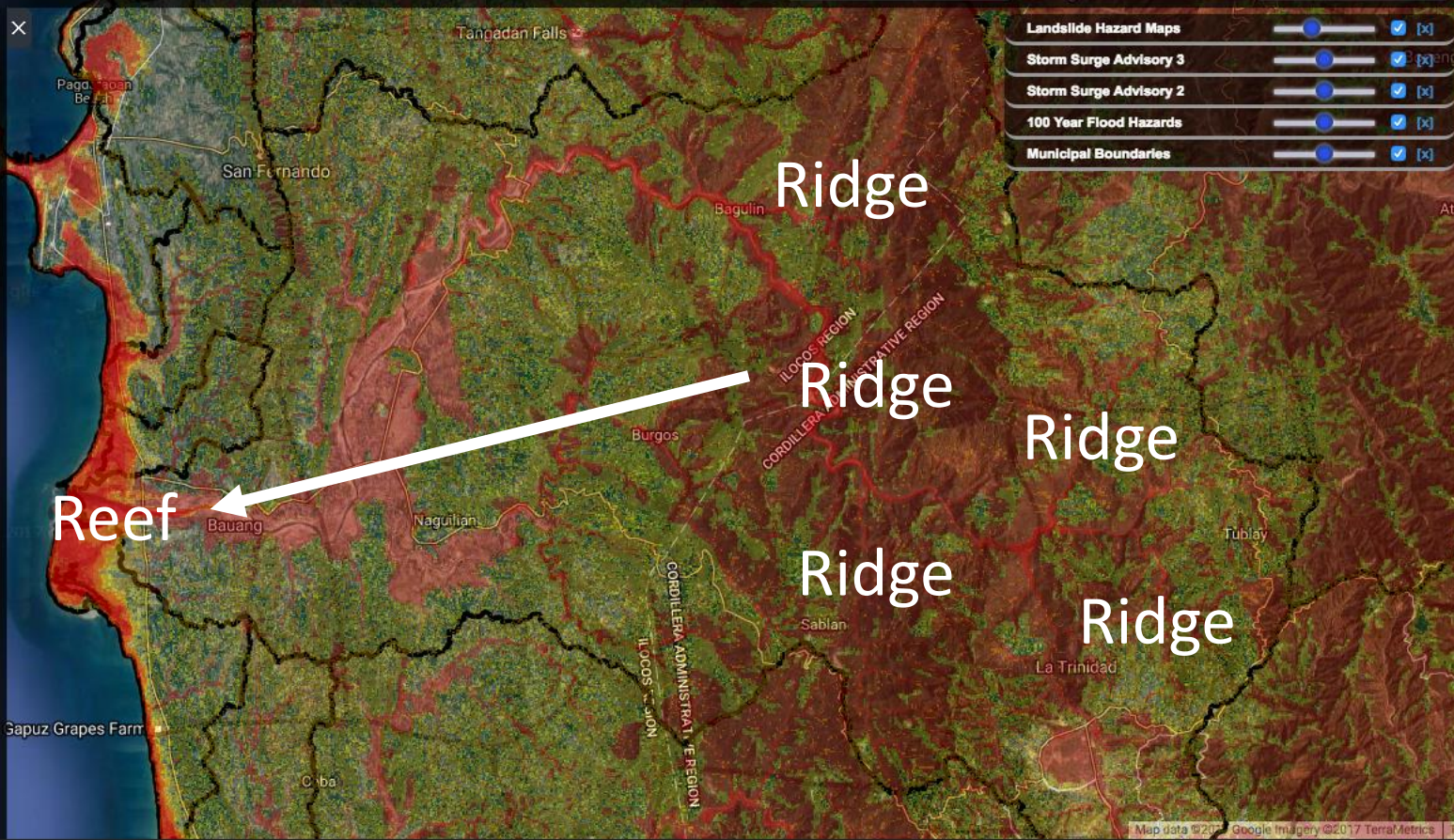
#### LANDSLIDE HAZARD

- NO DWELLING ZONE
- Build only with Slope protection and intervention; and continuous monitoring
- Build only with continuous monitoring

Hazard map showing unstable slopes and landslide extent NOTE: LANDSLIDE MAPS ARE BEING UPDATED. PLEASE BEAR WITH US

NOTE: Administrative boundaries are from NSO (2015).

Disclaimer: Long-runout



Landslide Hazard Maps	<input type="checkbox"/>	[x]
Storm Surge Advisory 3	<input type="checkbox"/>	[x]
Storm Surge Advisory 2	<input type="checkbox"/>	[x]
100 Year Flood Hazards	<input type="checkbox"/>	[x]
Municipal Boundaries	<input type="checkbox"/>	[x]



Find a place...

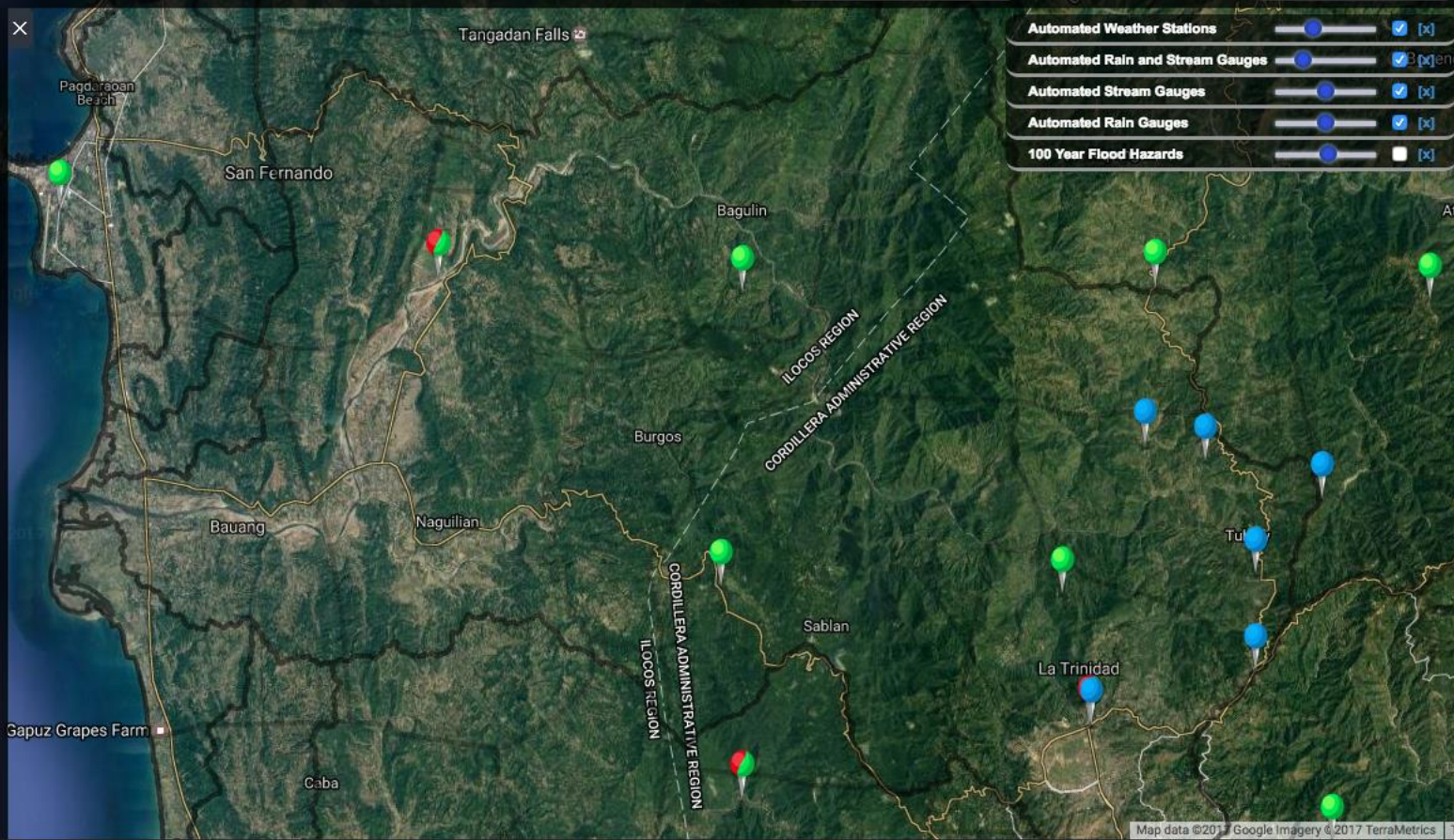
Google Maps Hybrid + -



### Sensors

Shows real-time information from the rain gauges, weather stations, and tide levels which also serves as flood early warning system.

- Rain Gauges
- Stream Gauges
- Rain and Stream Gauges
- Weather Stations
- Tide Levels



Automated Weather Stations  [x]

Automated Rain and Stream Gauges  [x]

Automated Stream Gauges  [x]

Automated Rain Gauges  [x]

100 Year Flood Hazards  [x]

Google

Map data ©2017 Google Imagery ©2017 TerraMetrics

Rainfall Data as of 02/27/17 07:15 AM: Surigao del Sur, MADRID MUNICIPAL HALL : 2.5 mm/hour

@dost\_pagasa Thunderstorm

# EXISTING LAND USE MAP

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

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13°45'30"N

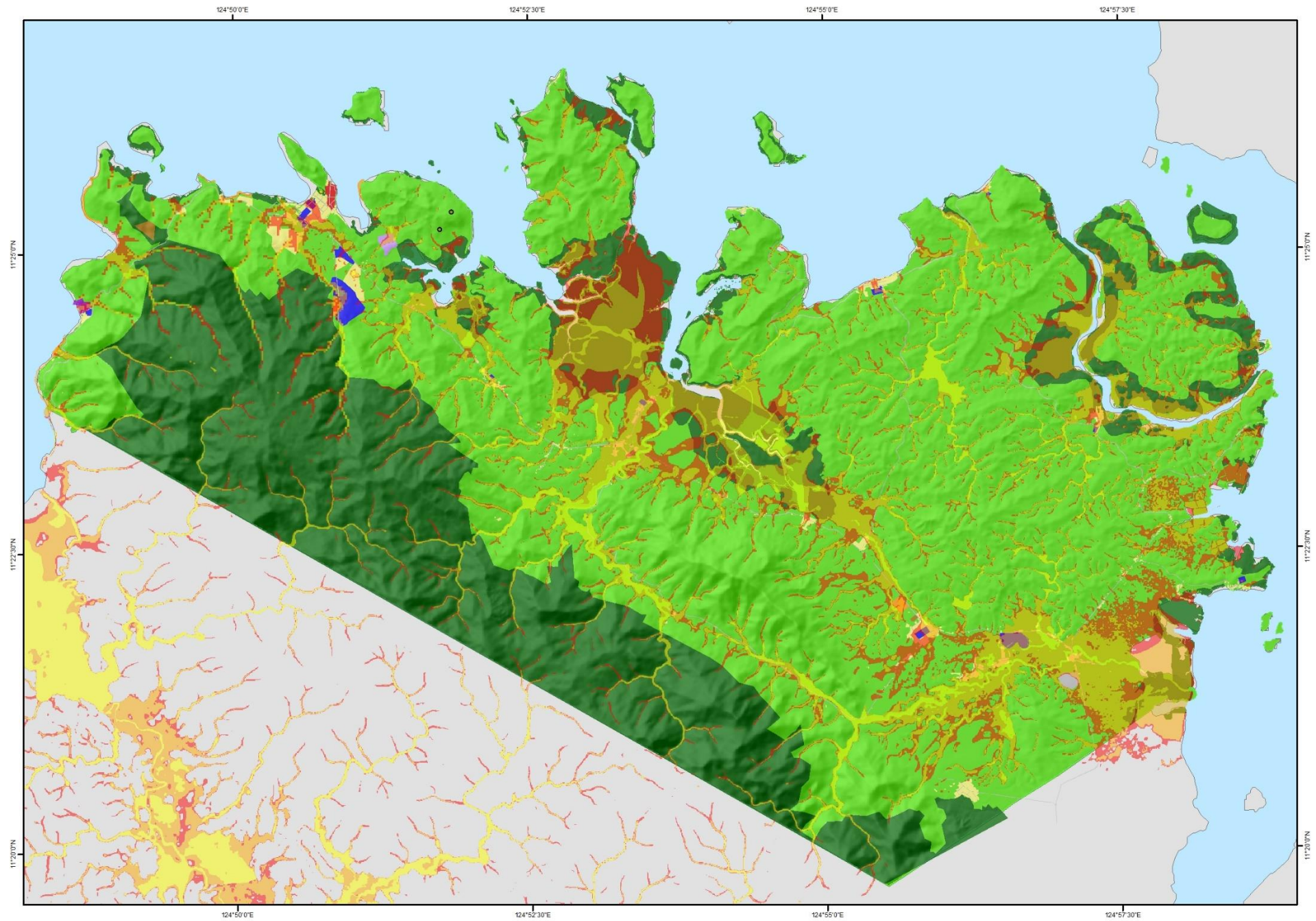
13°46'0"N

13°46'30"N

13°47'0"N

13°47'30"N

# EXISTING LAND USE OVERLAID WITH FLOOD HAZARD



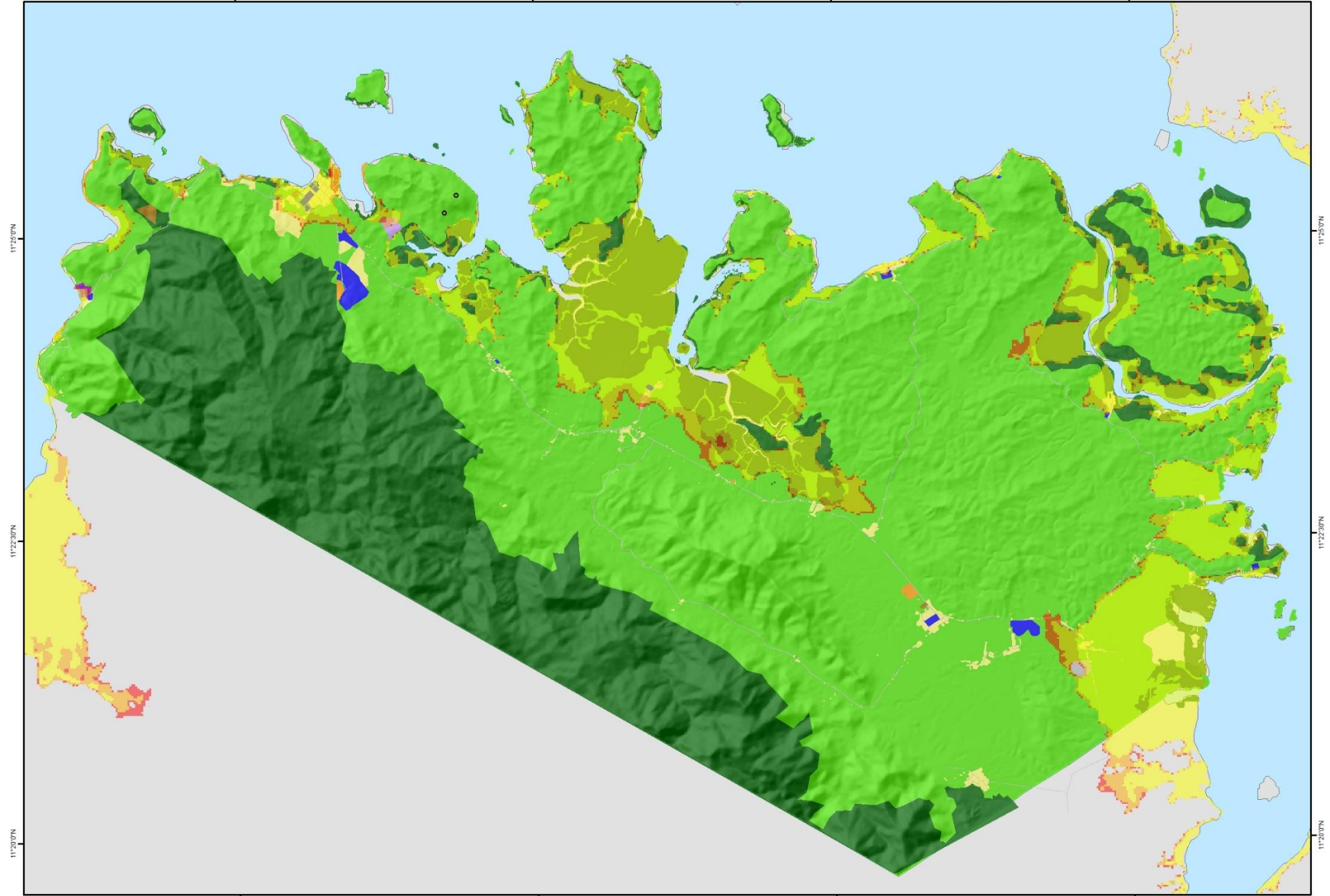
# EXISTING LAND USE OVERLAID WITH STORM SURGE HAZARD

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°20'0"N

11°22'30"N

11°25'0"N

# 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

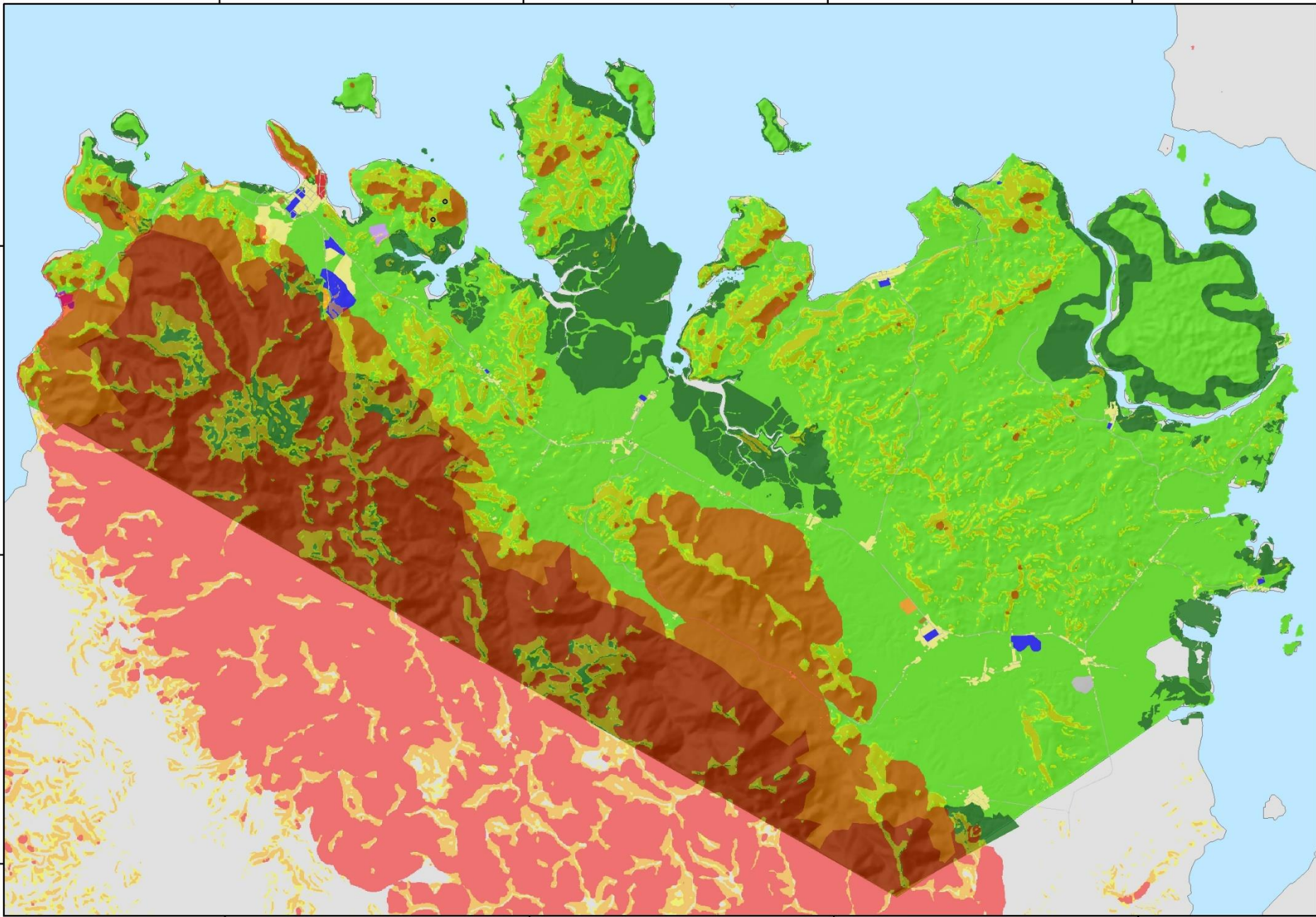
11°22'30"N

11°25'0"N

11°20'0"N

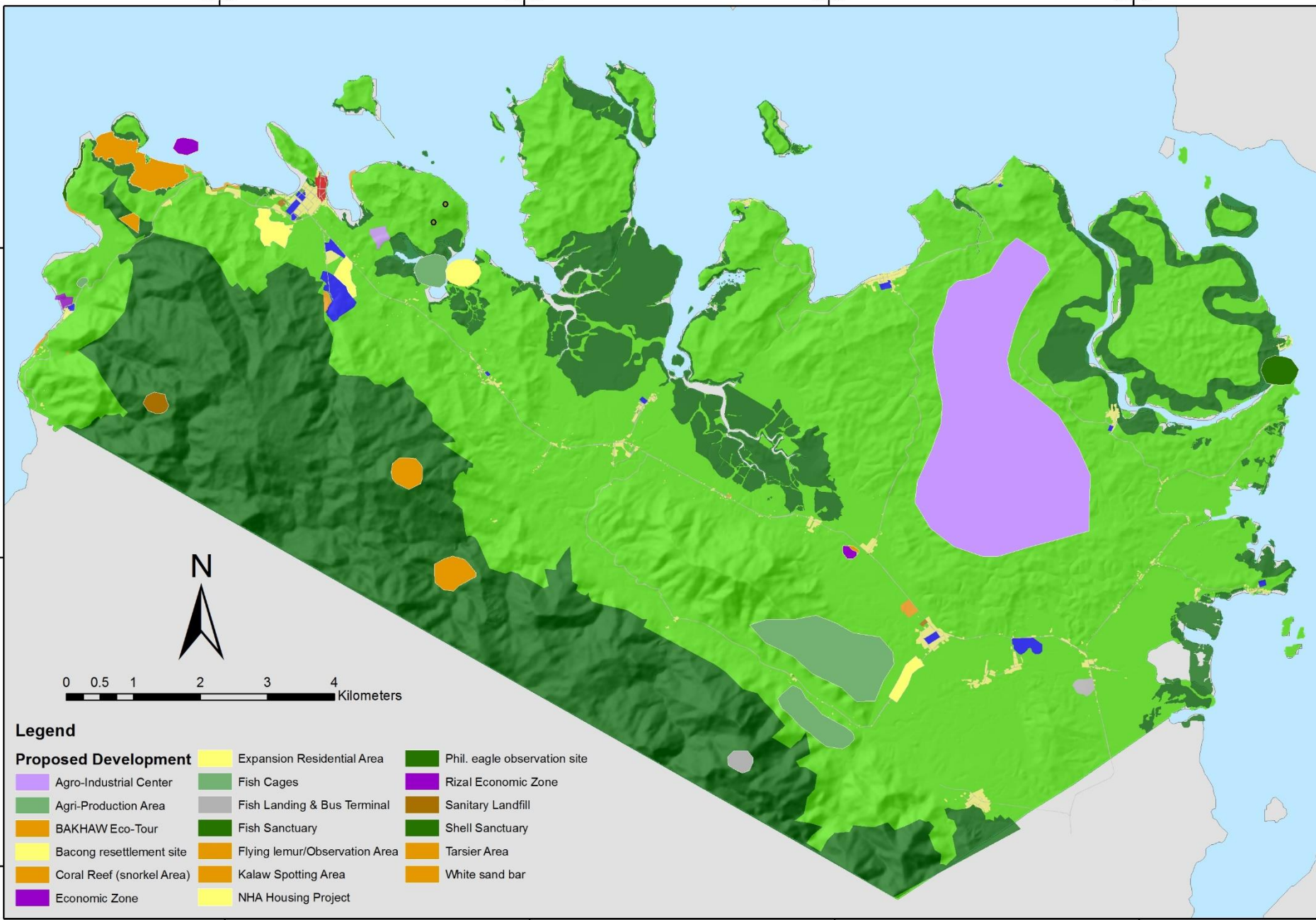
11°22'30"N

11°25'0"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

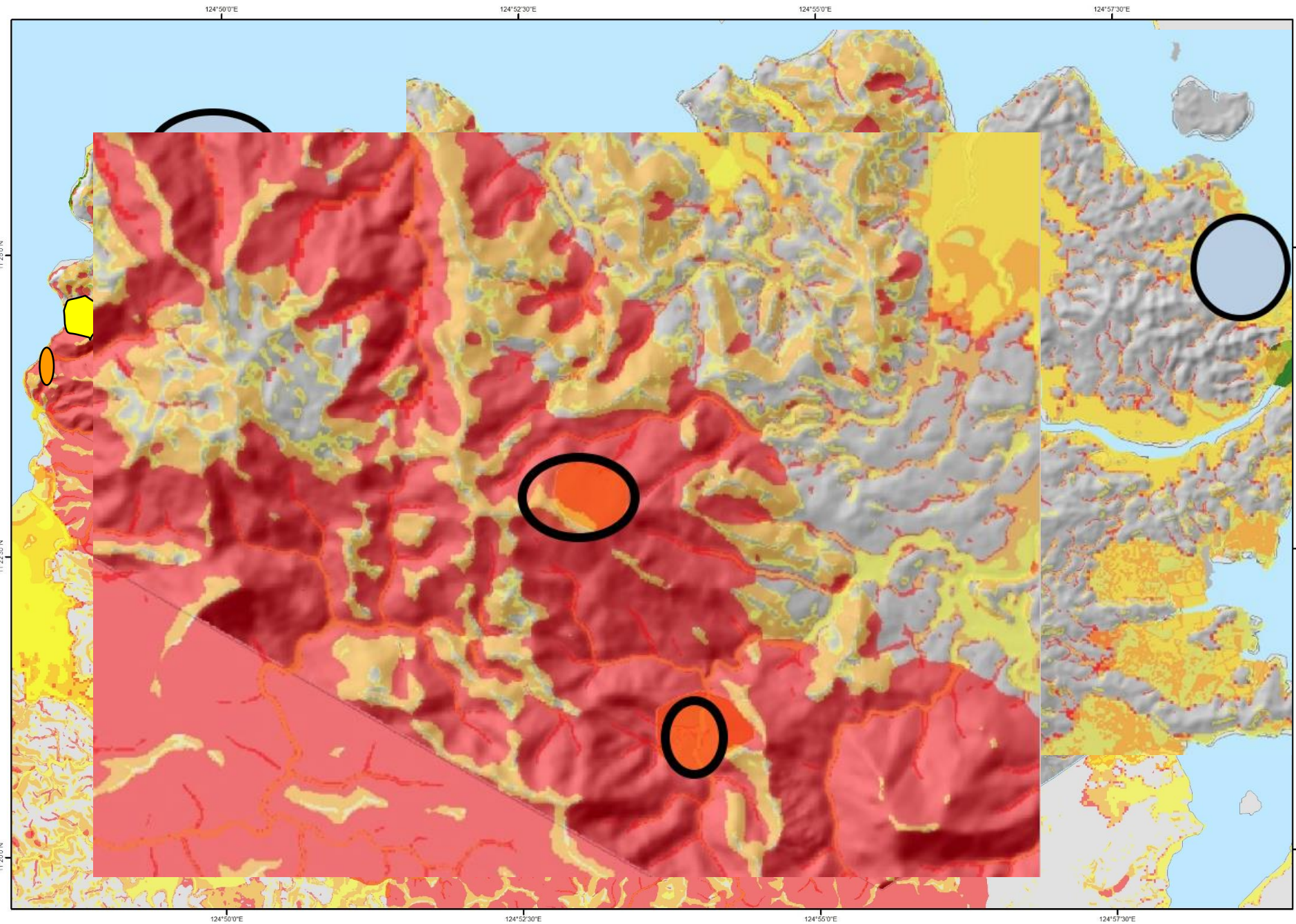
11°20'0"N

11°25'0"N

11°22'30"N

11°20'0"N

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









**Mahar Lagmay** @nababaha · Dec 25

Latest weather satellite image and forecast track of #NinaPH according to PAGASA. Stay safe everyone!



1 5 1



**PINOY BAE** @PINOYBAE · 26 Dec 2016

It's raining men. Kevin Redder 🌧️ #NinaPH



👉 5

🔄 277

❤️ 783





36



40



0



0



0



SCITECH

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# UP launches Resilience Institute, spearheads open data for disasters

Published June 21, 2017 7:15pm

By **TJ DIMACALI**, GMA News

 Follow



The University of the Philippines officially launched its Resilience Institute (UPRI) on Tuesday, June 20, at a formal ceremony at the UP Diliman Bahay ng Alumni.

In his opening speech, UPRI executive director Dr. Mahar Lagmay said that the Institute continues and expands on the work started by the Nationwide Operational Assessment of Hazards (Project NOAH), which he also previously headed.

The UPRI is tasked with providing the public with data for disaster prevention, response, and mitigation. Lagmay stressed that this data is, and should always be, free to the public.

"Ang disaster data at impormasyon ay dapat libre at accessible sa lahat," underscored Lagmay, to strong applause from the gathered audience.

# More powers for MMDA?

By Rio N. Araja

**T**HE 36-member Quezon City council supports two measures in Congress to expand the powers and functions of the Metro Manila Development Authority.

District 1 Councilor Peter Anthony "Onyx" Crisologo on Wednesday said Quezon City, and the other 15 cities and one municipality making up the National Capital Region, supports giving the MMDA more teeth to implement uniform policies, guidelines, and programs and projects.

"For example, there is Ordinance No. 559 in Mandaluyong City, allowing only spouses, par-

ents and siblings to be with motorcycle riders. On the other hand, Quezon City has its own, too, regulating child back riders on motor bikes. Both have different features," he told reporters.

Crisologo, a director of the Metro Manila Councilors League, represented group president and District 2 Caloocan City Councilor Carolyn Cunanan in the recent meeting of a technical working group created

by Quezon City Rep. Winston Castelo.

Castelo, as chairman of the House committee on Metro Manila development, wanted to thresh out and study the details of his own House Bill 4642 and Marikina City Rep. Bayani Fernando's HB 5057.

Under the proposed measures, the Metro Manila Council, MMDA's policy-making body, would ensure that the policies, guidelines, programs and projects of the 17 localities in the metropolis are consistent with one another and with the Authority.

"We welcome both bills aimed at coming up with a clear-cut role of the MMDA and that of the local government unit," Cris-

sologo stressed.

The technical working group is dissecting the provisions of HB 4642 to amend Republic Act 7924 that created the MMDA.

The proposals aim to give the agency the power to review development permits with metro-wide transport and traffic impacts, undertake the delivery of basic services in coordination with and authority of the local government, and ensure all 17 LGUs are well-informed of the MMC's approved ordinances with penal sanctions through publication in a daily newspaper.

HB 5057, on the other hand, aimed to strengthen the MMDA by amending its charter.

Under the proposal, the MMDA may deputize personnel from the

Philippine National Police, local traffic bureaus, duly licensed security guards, or any member from a non-government organization to enforce all traffic laws and regulations metro-wide.

The Authority would also promulgate rules and regulations, set policies and standards, and enact ordinances for metro-wide application, per the proposal of Fernando, a former MMDA chairman.

"The beauty of both proposals is that their issues are not confined to traffic concerns alone. Both bills would address many other important issues, such as problems on waste management and disposal and flooding," Crisologo said.

Turn to C2



**RESILIENCE ART.** Albay 2nd District Rep. Joey Salceda receives the 'Artwork of Commitment' during the launching of the University of the Philippines Resilience Institute at the Bahay ng Alumni at the LIP Diliman campus in Quezon City on Tuesday. Also in photo (from left) are professor Leonilo Doloricon, LIP president Danilo Concepcion, and LIPRI executive director Dr. Alfredo Mahay Francisco Lagmay, Neiman Cruz.



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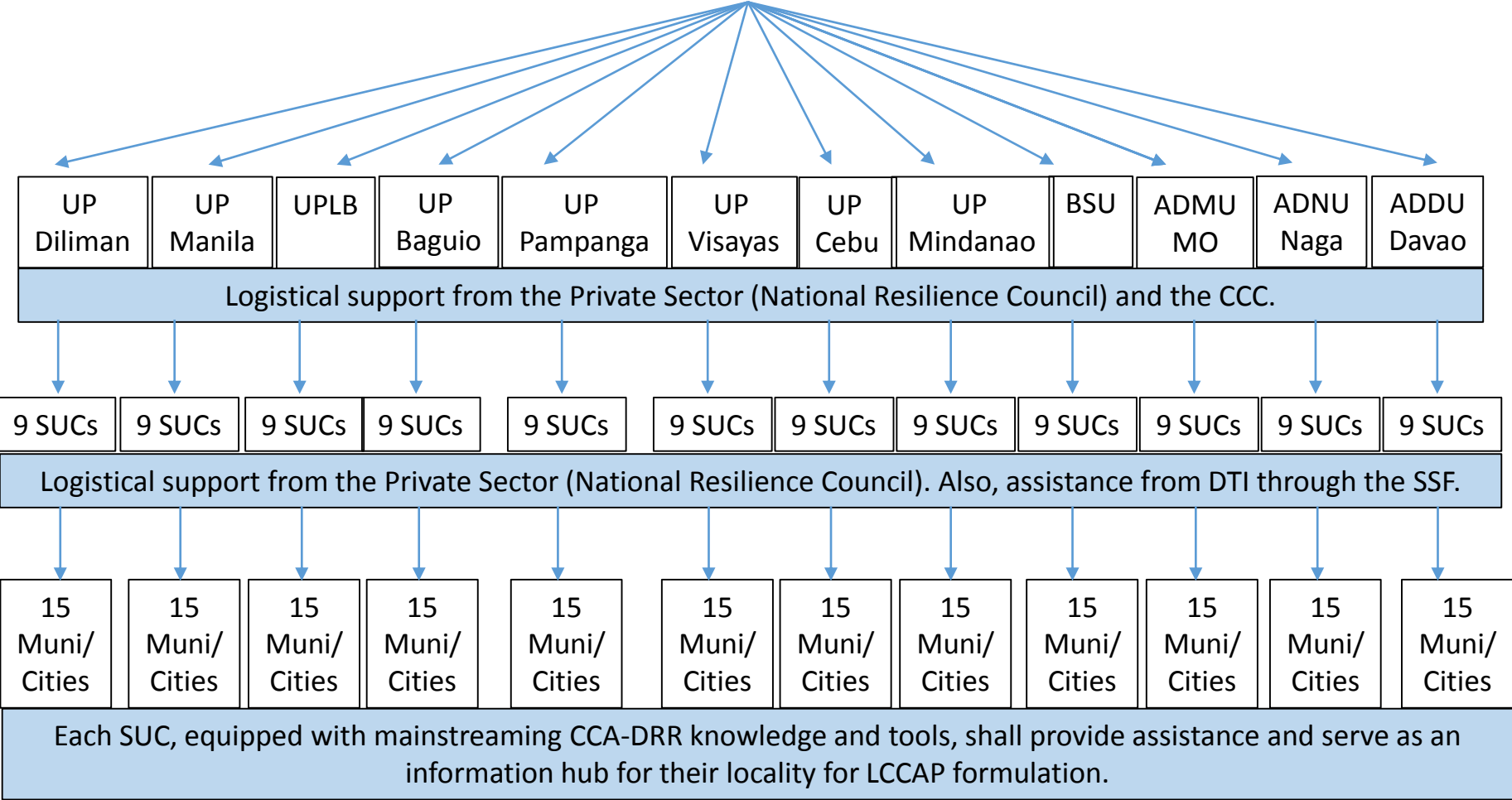


# Sen. Loren Legarda's statement

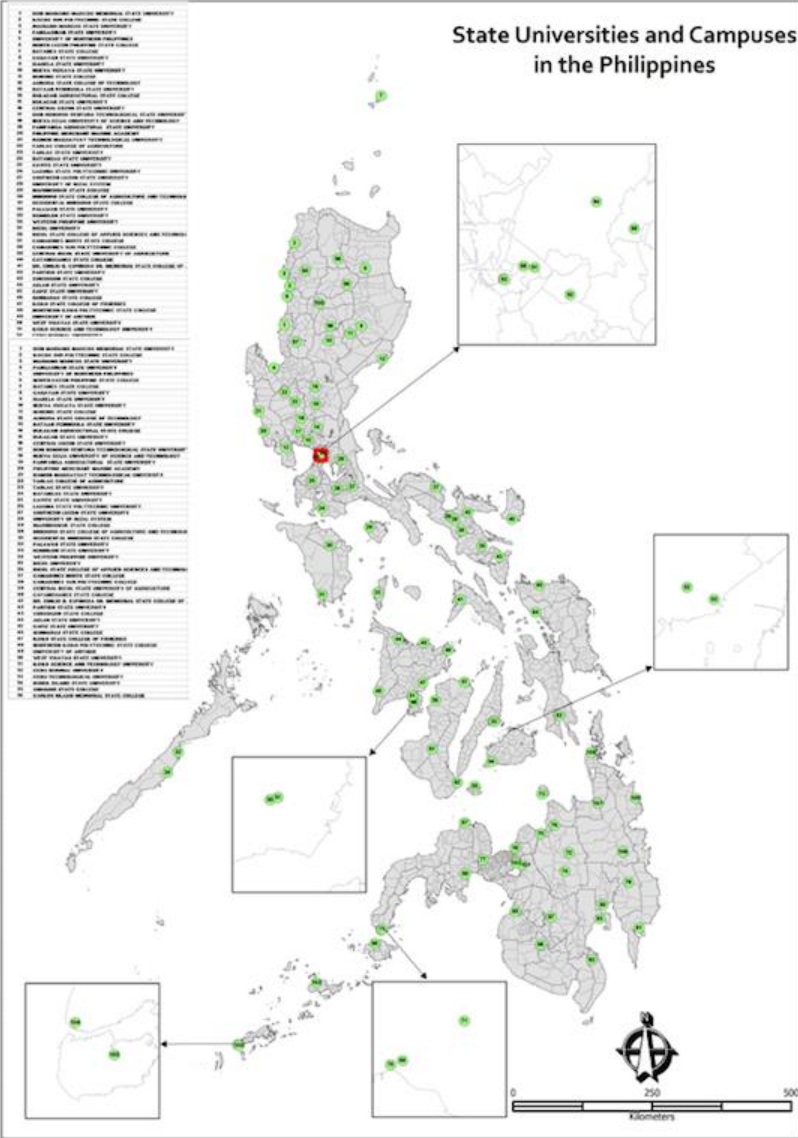
- "If all the SUCs (State Universities and Colleges) will help the LGUs (Local Government Units) in the respective areas, *mapapabilis* (it will be expedited), we'll finish it by 2018. '*Yan ang target natin* (That's our target), but I need a shepherd; I need a lead, and that lead will be UP Resilience Institute. That's part of your mandate. So, may I request UP to lead all other SUCs to help CCom teach local governments to complete their LCCAPs (Local Climate Change Action Plan)." –

# Plan of UPRI – Cascade Knowledge

UP, CCC, Rebuild (w/ UNDP), Rapid (w/ UNDP), ADB projects:  
 Combined learning by doing experience in mainstreaming CCA-DRR in  
 more than 40 municipalities in Leyte, Samar, Iloilo and Cagayan



# SUC distribution in the Philippines



# Sectoral planning assistance

- UPRI, BSU and Ateneo will leverage on UP's centers of excellence in different fields (sectors)
  - UP Manila – Health Sector
  - UP Los Banos/FEU – Agricultural and Forestry Sector
  - UP Diliman – Transport, Energy, Water
- Municipal planning offices/departments
- DENR (PENRO, CENRO)
- NEDA
- Other local government agencies (DA, DSWD, DILG, DPWH, DOE etc)

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

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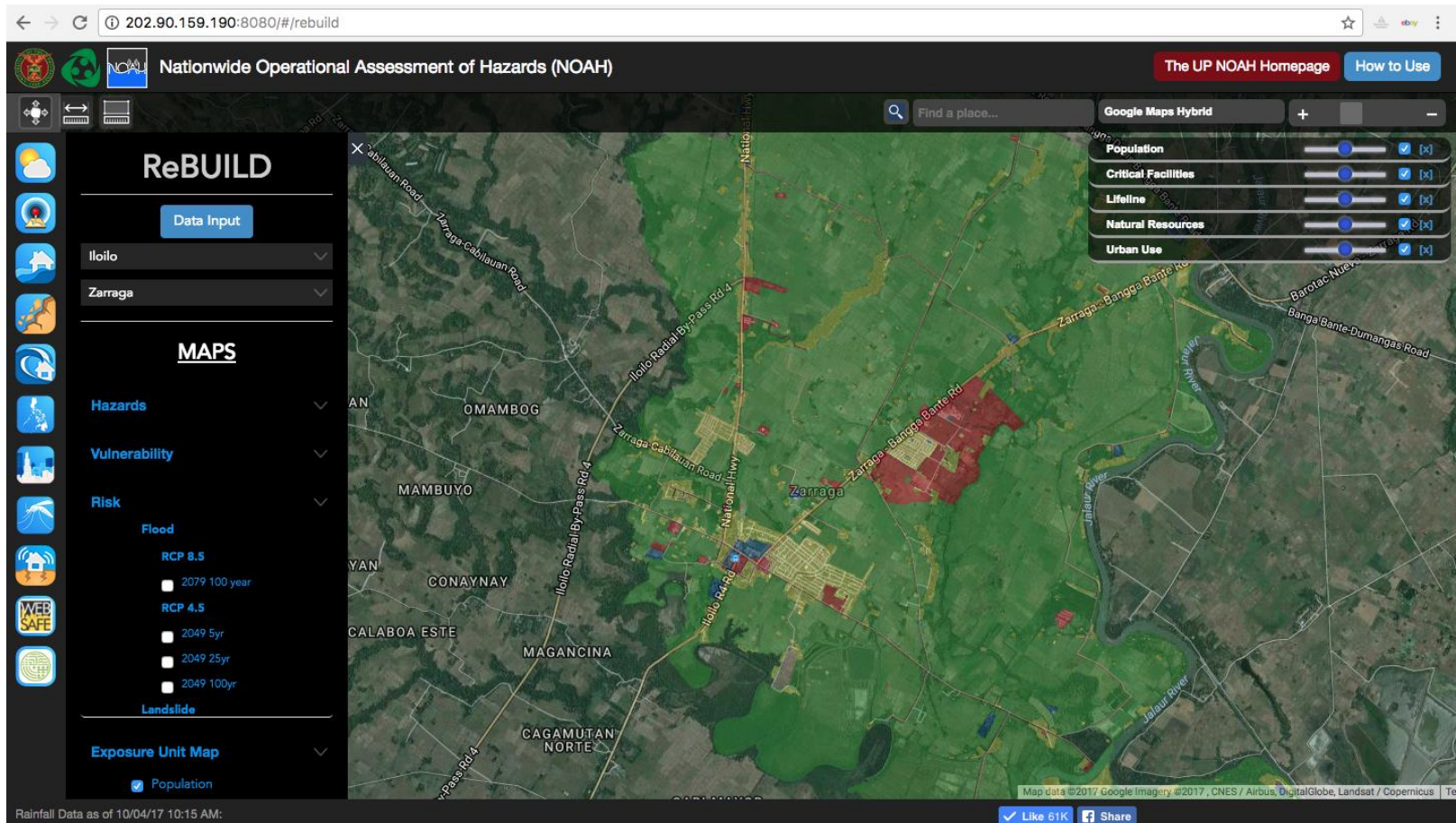
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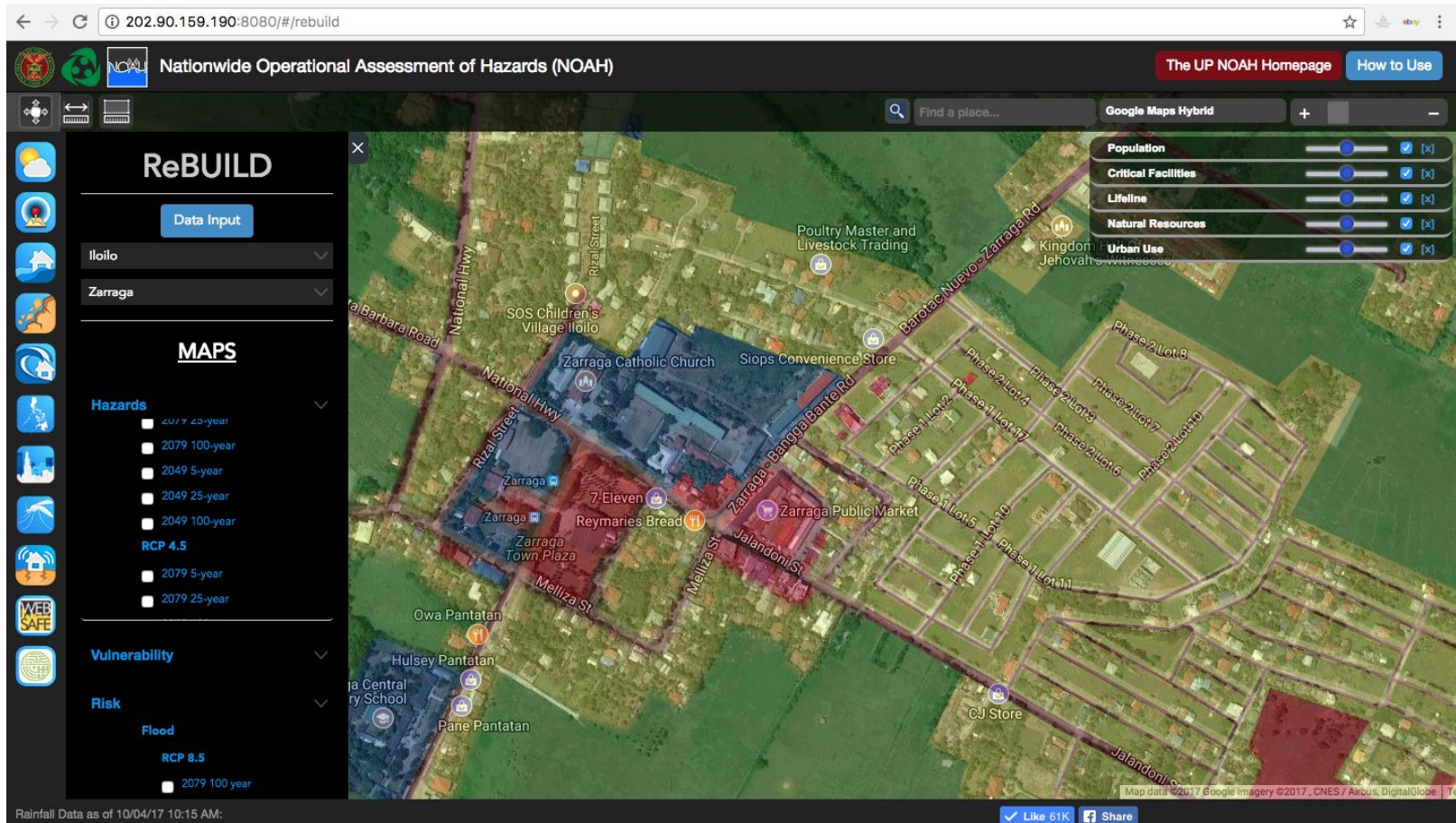
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# Creation of an online analytics platform and repository for LCCAP and other development plans of the community



# 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 at the URL `rebuild.noah.up.edu.ph`. The page header includes a dark navigation bar with the text `[[{ selectedAssessment }]]`, `[[{ SELECTEDSCENARIO }]]`, and a user profile for `DUMANGAS` with a `Log Out` link. Below the header, there are two tabs: `Vulnerability Assessment` and `Disaster Risk Assessment`. The `Disaster Risk Assessment` tab is active and contains 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](#)



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**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

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**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	Assistanc	3	3	3	3

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**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	<input type="checkbox"/> Baran	Jalud Nor	0.57	100000C	25534.2	15185.6	0	0	59.47
Balud II	<input type="checkbox"/> Baran	Brgy Balud	0.53	100000C	14577.2	10329.5	0	0	70.86
Balud Lilo-i	<input type="checkbox"/> Baran	Brgy Balud	0.38	100000C	35993.1	23081.2	0	0	64.13
Dawis Cent	<input type="checkbox"/> Baran	Dawis cent	0.03	100000C	13341	1715.47	0	0	12.86
Dawis Nort	<input type="checkbox"/> Natio	Dawis Nort	0.6	100000C	7785.6	3364.41	0	0	43.21
Dawis Sur	<input type="checkbox"/> Baran	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

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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 KALAHI-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

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Wednesday, July 5, 2017

## Open Data Save Lives Mahar Lagmay

Director, University of the Philippines NOAH Center

Watch Live in  
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\*You will leave the NHK website.