Participatory coastal land-use management (PCLM) project

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PCLM
Land use planning solution

About: Participatory Coastal Land-use management (PCLM) project

Objective

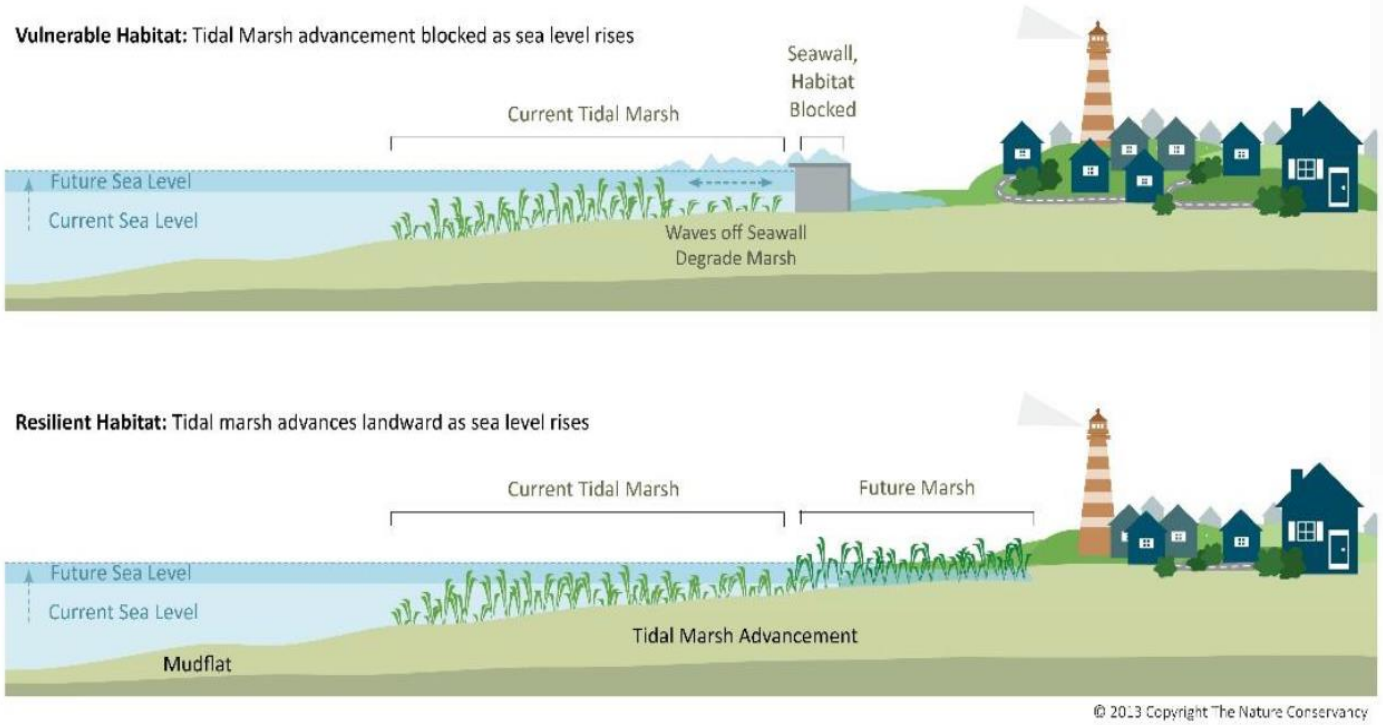
- Help make local government units more resilient to climate change.

Support provided to local governments

- Land-use change and climate change impact assessments
- Helping identify climate change adaptation measures
- Assisting with updating/improving of local plans and policies
- Technical assistance for developing climate change adaptation funding proposals

Coastal land-use management for mitigating climate (change) hazards

Inward migration of coastal ecosystems if undeveloped land is available



Benefits of coastal ecosystems for hazard mitigation



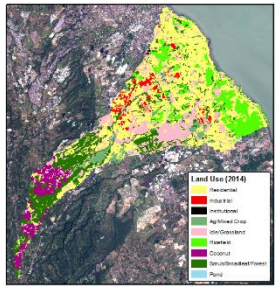

Vegetated Features	Oyster and Coral Reefs	Barrier Islands	Maritime Forests/Shrub Communities
Benefits/Processes	Benefits/Processes	Benefits/Processes	Benefits/Processes
Breaking of offshore waves	Breaking of offshore waves	Wave attenuation and/or dissipation	Wave attenuation and/or dissipation
Attenuation of wave energy	Attenuation of wave energy	Sediment stabilization	Shoreline erosion stabilization
Slow inland water transfer	Slow inland water transfer		Soil retention
Increased infiltration			

The Paris Agreement called on countries to integrate ecosystem-based adaptation into their national climate action plans

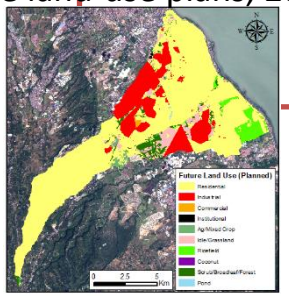
Participatory Coastal Land-use Management (PCLM) approach

- Participatory land-use mapping to understand future plans

Land-use, 2015



Future land-use plans, 2030 (BAU)

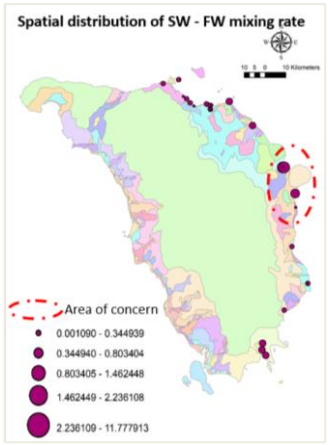


Step 1: Scenario development

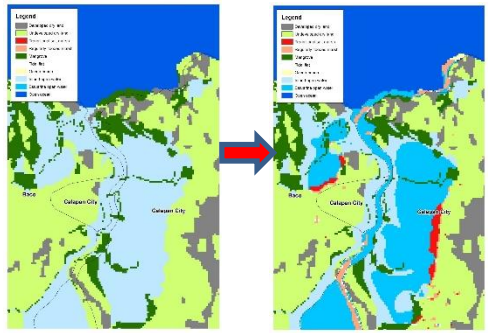
Step 2: Impact assessment

- Geospatial modeling to estimate future impacts on groundwater, sea-level-rise, and storm surge.

Groundwater modeling



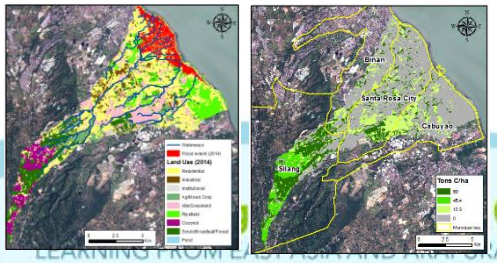
Sea-level-rise modeling



Step 4: Climate-resilient land-use planning

Step 3: Identify countermeasures

Identifying benefits of adaptation/ mitigation actions, mainstreaming them into local policies



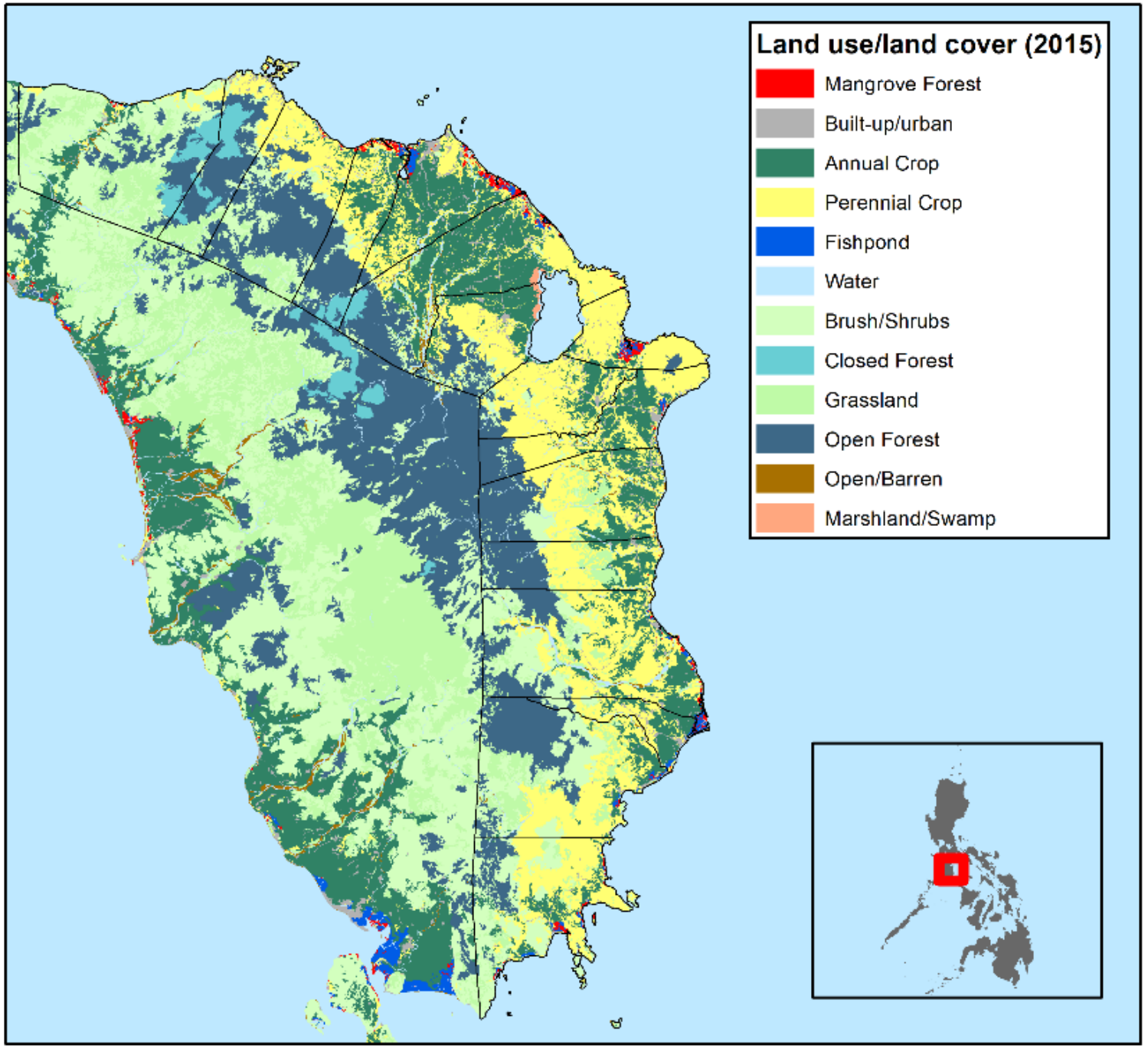
- Land-use plan
- Climate change plan
- Developing funding proposals

- Stakeholder consultations to identify priority countermeasures

Identifying countermeasures with local governments

Case study site: Oriental Mindoro, Philippines

- Mainly agricultural land, with urban areas concentrated along the coastline.
- Exposed to various climate change hazards



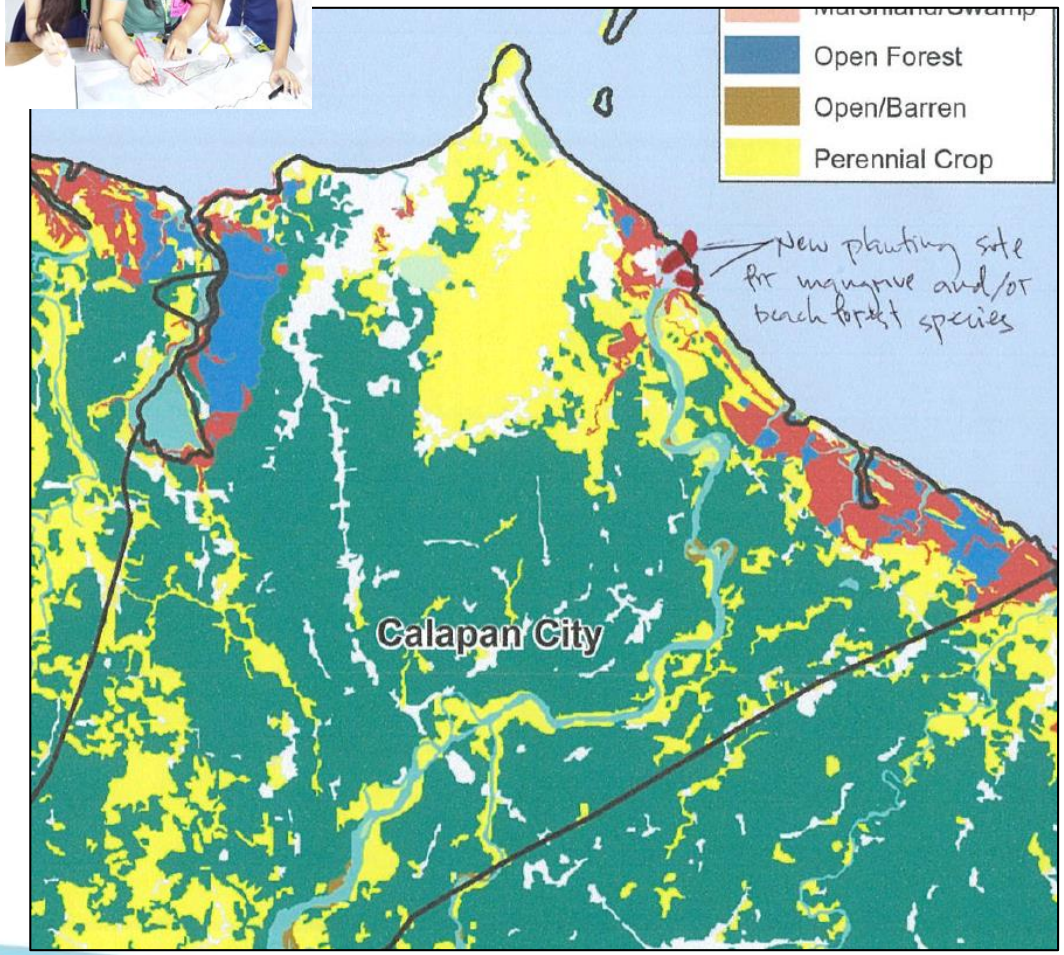
Step 1: Scenario Analysis

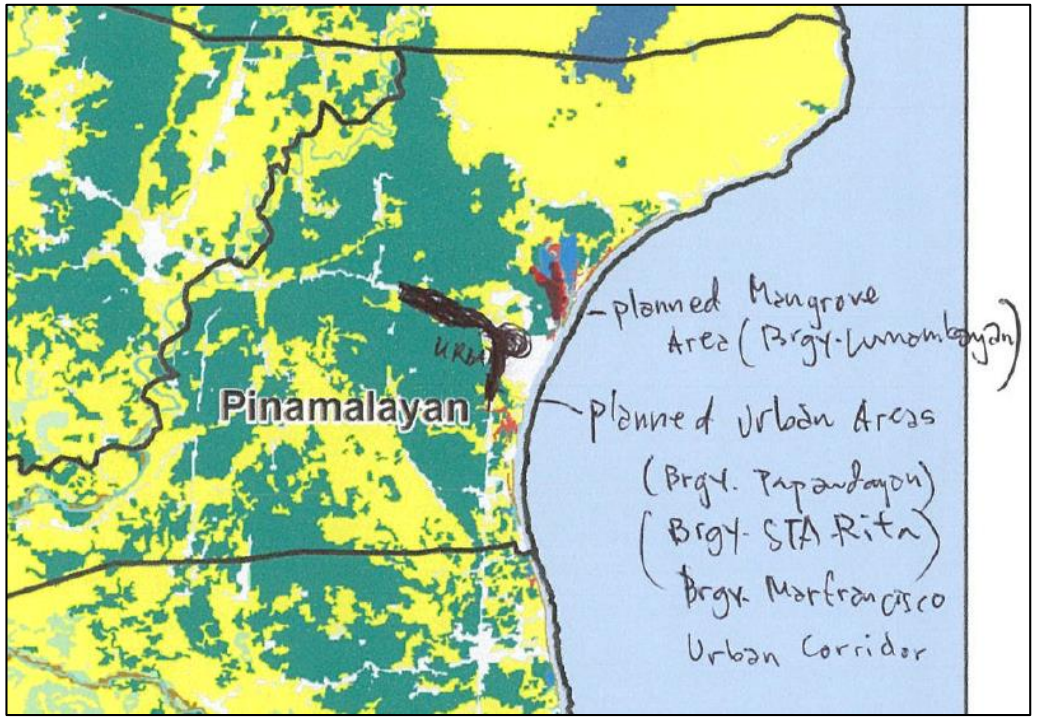
Participatory mapping

-Areas marked in red indicate new mangrove planting sites

-Areas marked in black indicate planned urban development sites.

-digitized using QGIS software.





Freely-available models/tools for impact assessment

Climate-related hazard	Model used for impact assessment
1. Storm surge and coastal erosion	InVEST coastal vulnerability model (http://data.naturalcapitalproject.org/nightly-build/invest-users-guide/html/coastal_vulnerability.html)
2. Sea-level rise	Sea level affecting marshes (SLAMM) model (https://coast.noaa.gov/digitalcoast/tools/slamm.html)
3. Groundwater salinization	Water Evaluation and Planning (WEAP) tool (https://www.weap21.org/)

Coastal vulnerability impact assessment using InVEST software

InVEST Coastal Vulnerability Index

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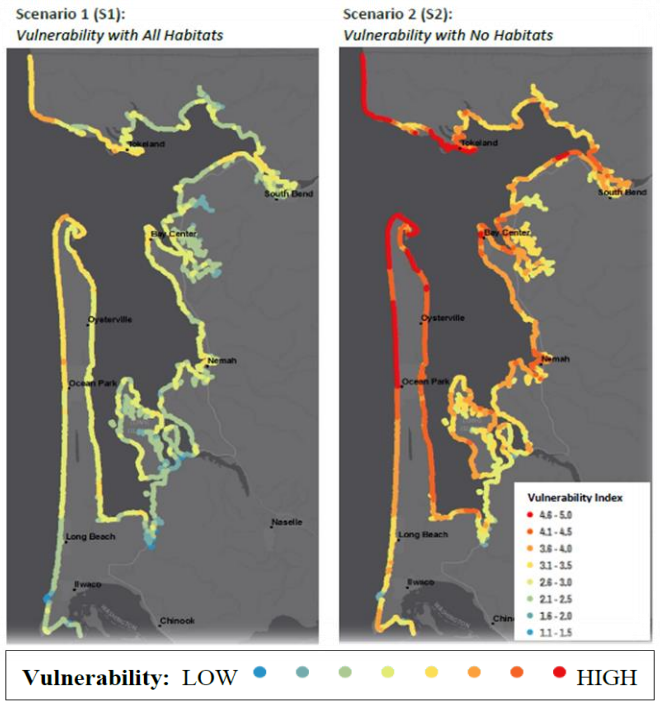
InVEST
integrated valuation of ecosystem services and tradeoffs

For coastal communities/policy planners to better understand **how modifications of the biological and physical environment** can affect their exposure to ***storm-induced erosion and flooding (inundation).***



The model calculates the exposure index using the following bio-geophysical variables:

1. Elevation
2. Natural habitat locations
3. Wind Exposure
4. Wave Exposure
5. Surge potential depth contour
6. Geomorphology
7. Sea level change

Scenario planning with InVEST CVI Model

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It is possible to use Scenario planning tool to evaluate adaptation options

Scenario 1 (S1): ***Exposure with all coastal habitats.*** This scenario reflects current conditions, where all terrestrial and estuarine habitats are included.

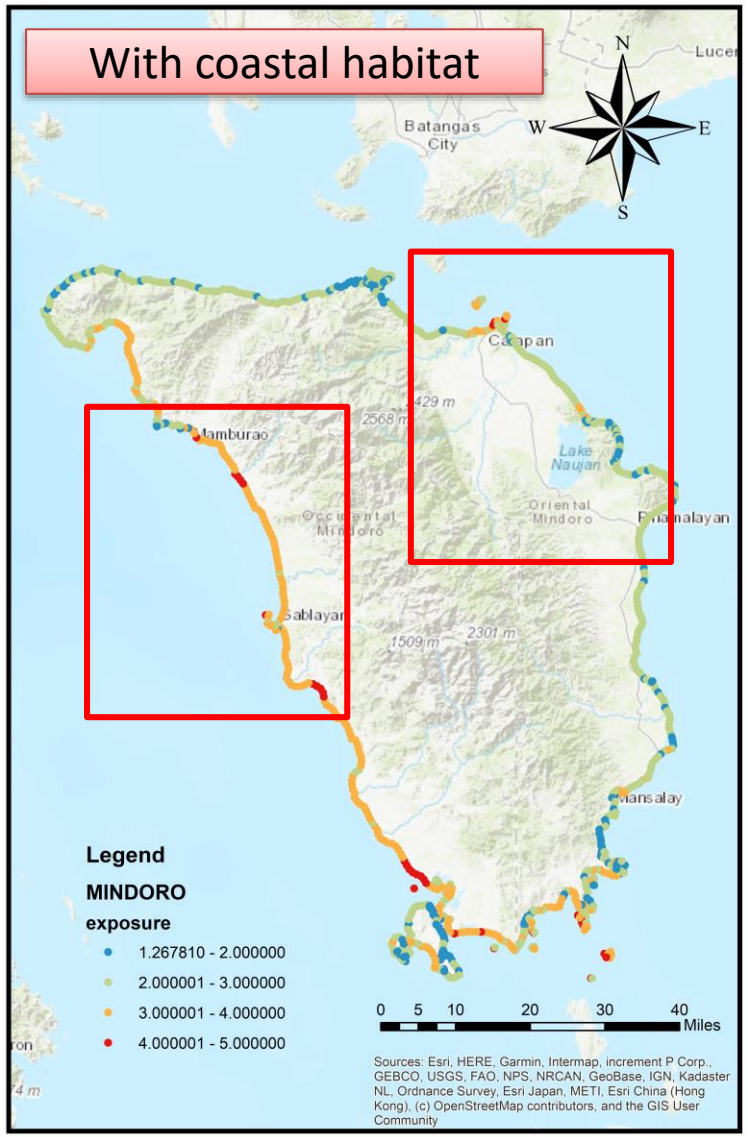
Scenario 2 (S2): ***Exposure with no coastal habitats.*** In this scenario, all terrestrial and estuarine habitats are excluded from the model run. In other words, this is a model of vulnerability of the shoreline if all habitats were lost or degraded.

Scenario 3 (S3): ***Exposure with only Estuarine Habitats***. Here, model shows how vulnerable shorelines would be if only estuarine habitats are present, but without any terrestrial habitats. In other words, this is a model of vulnerability if terrestrial habitats are lost or degraded.

Scenario 4 (S4): ***Exposure under participatory land-use change scenario (2015-2030)***.

These can be further clubbed with futuristic land use/socio-economic scenarios to provide diverse range of futures

Results (as of 2020)



Modelled at 100 meter resolution

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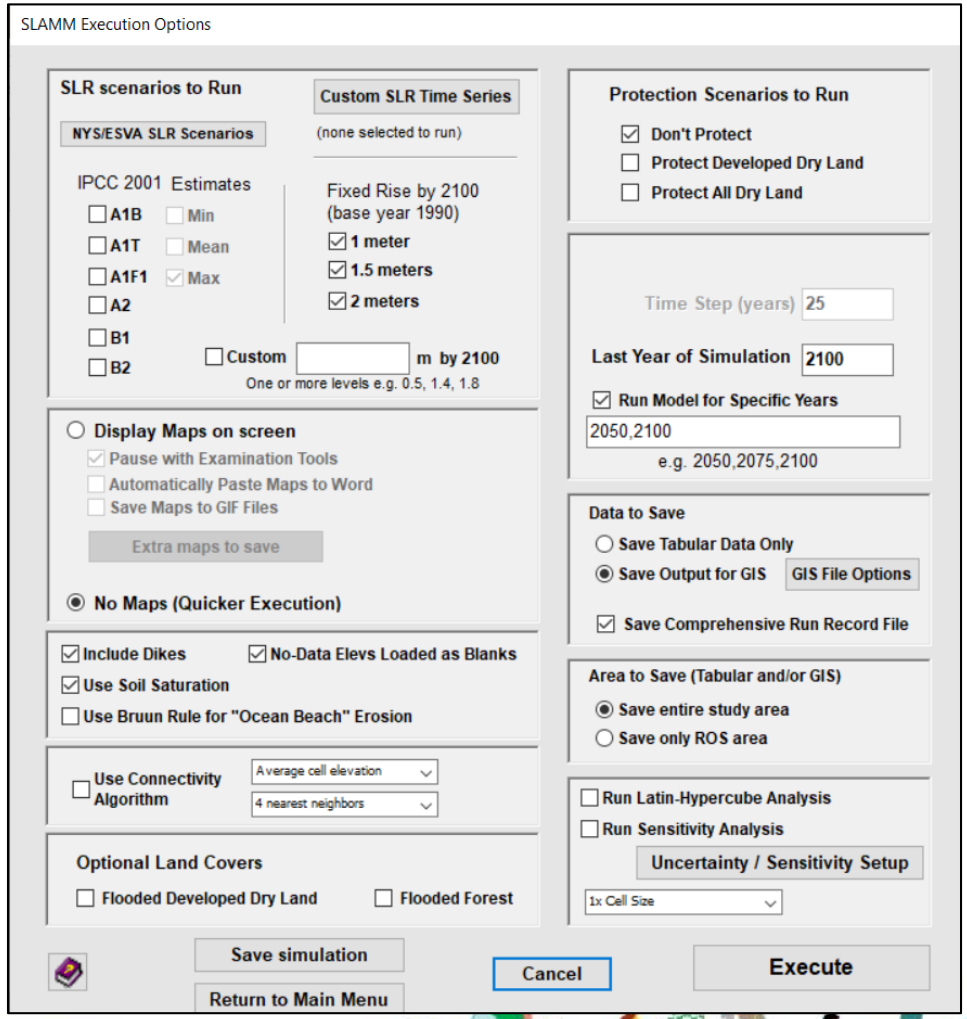
Sea-level rise impact assessment using SLAMM (sea level affecting marshes) model

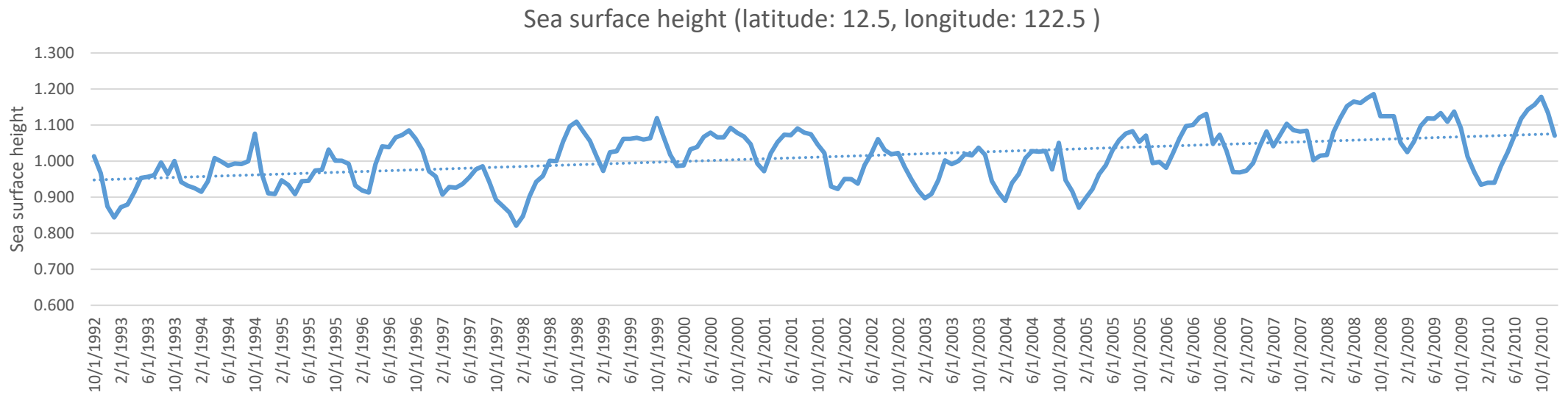
SLAMM model

- Simulates the main coastal processes occurring under sea level rise
  - Inundation, erosion, accretion, soil saturation, overwash
- Model Inputs:
  - land-cover, elevation, slope, other local information (sea-level rise rate, soil accretion/erosion rates)
- Model output: maps of future land-cover, considering sea-level-rise impacts



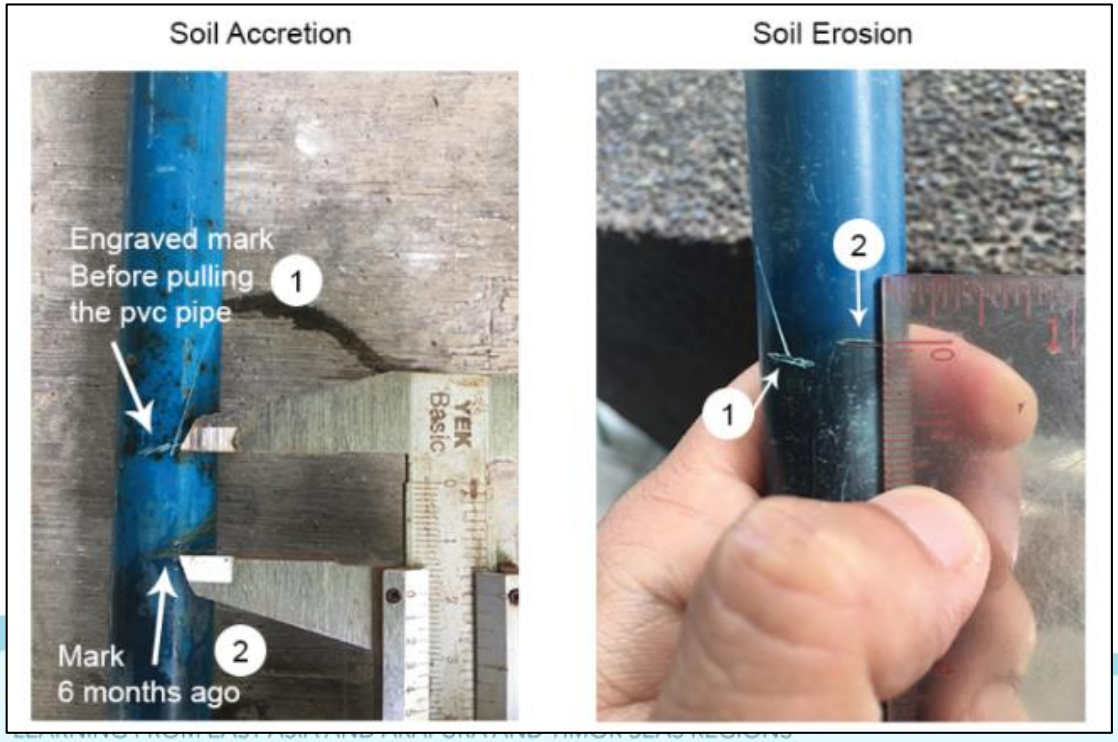
Sea surface height change based on satellite radar altimetry data

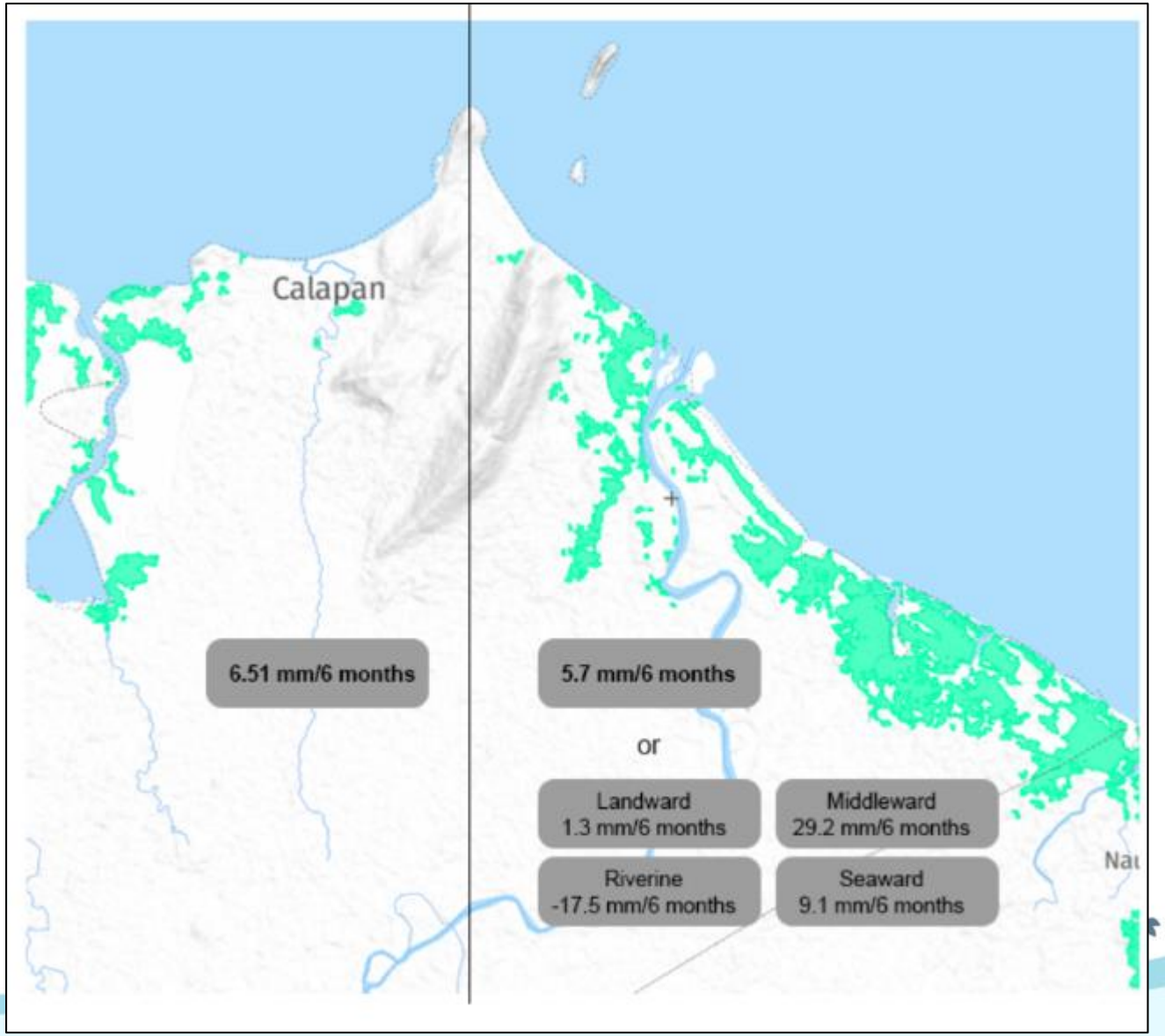
- Satellite measurements of sea surface height indicate ~7.2mm year of sea-level-rise off the coast of Oriental Mindoro



Calculated based on: https://climatedataguide.ucar.edu/climate-data/aviso-satellite-derived-sea-surface-height-above-geoid

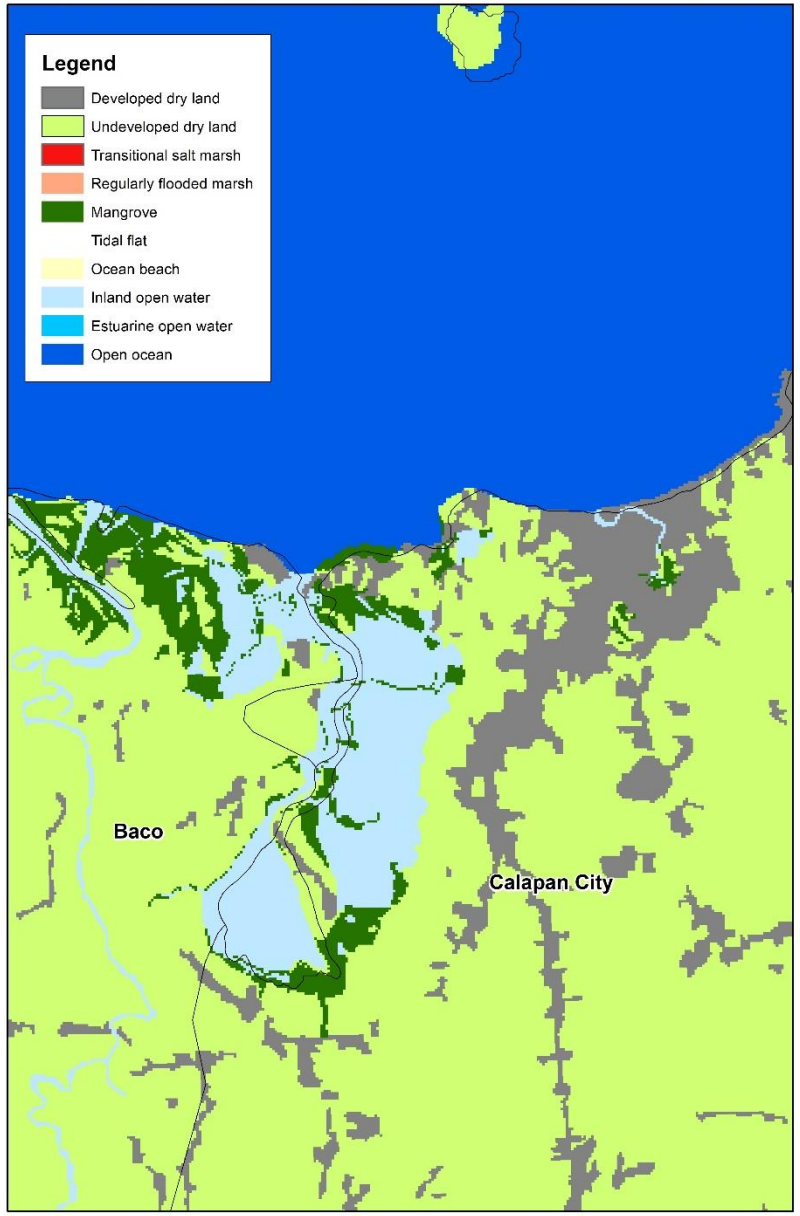
Measuring soil accretion in mangrove habitats



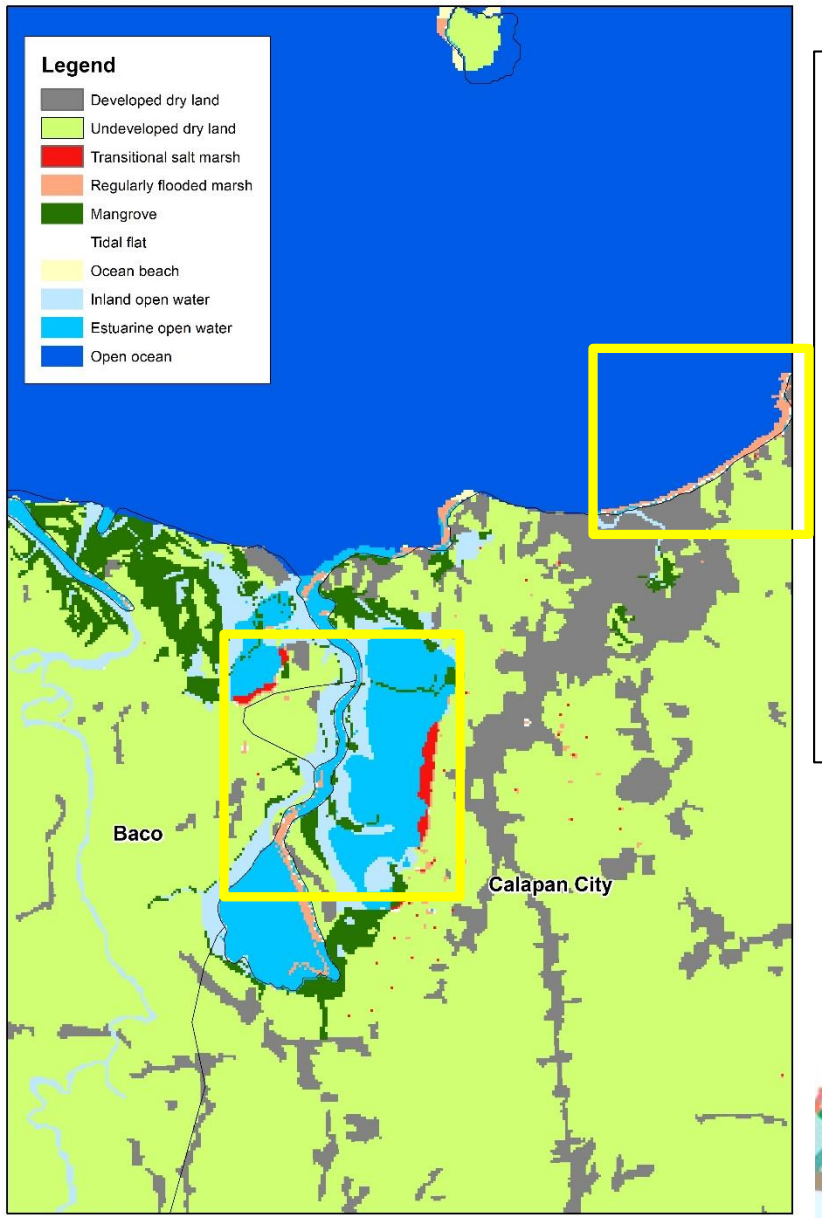


Results

Current (2015) land cover



Future (2050) land cover considering 8mm/year sea-level-rise*



Results for Calapan City/Baco area

-Coastal urban areas may be regularly inundated by 2050.

-Conversion of agricultural land (undeveloped dry land) to wetland (transitional salt marsh)

*Assuming 0.5m sea-level-rise as compared to 1990 level. (~8 mm/year)

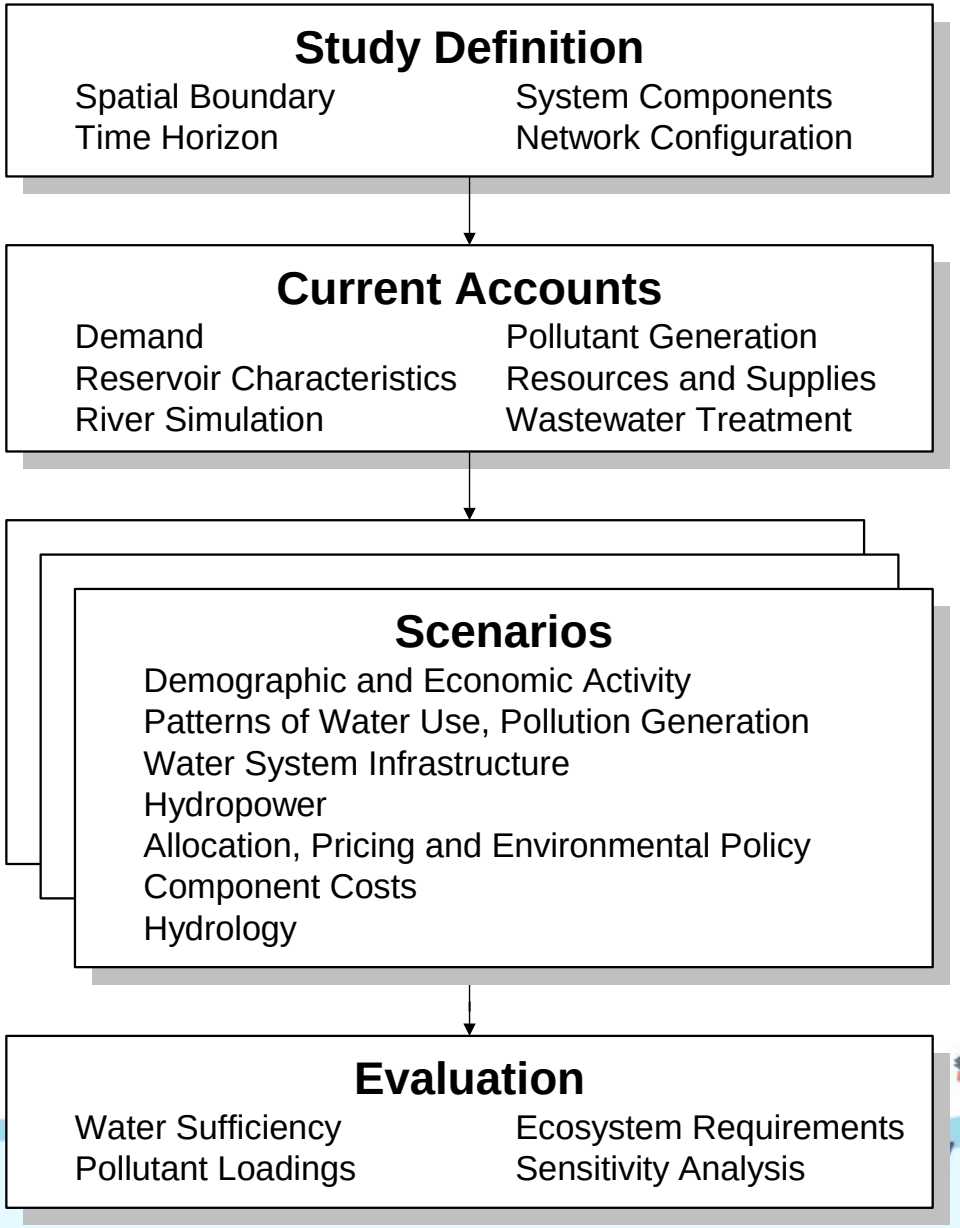
Groundwater quality impact assessment using WEAP tool

WEAP tool

Hydrological simulation for contaminant fate and transport considering key drivers of population growth, land use change, and climate change.

- Highly flexible hydrologic-water quality model
- Can model large number of pollutants
- GIS-based, graphical drag & drop interface
- Mass balance equations are the foundation of WEAP model
- Scenario management capabilities

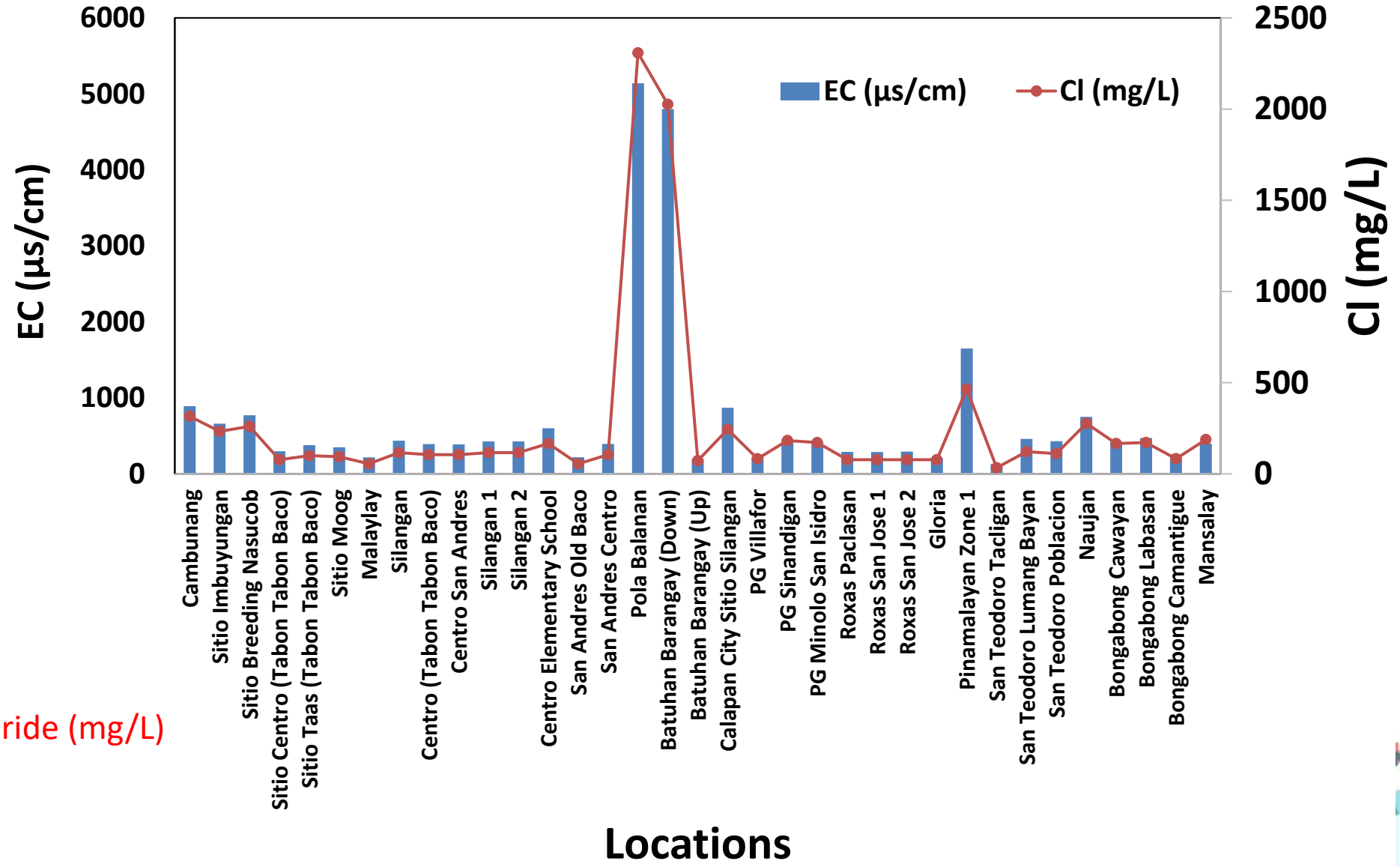
Hydrologic modeling- Rainfall-runoff method used in this study



Groundwater sample analysis

- Well samples collected by local government staff
- Parameters analyzed- pH, electrical conductivity (EC), total dissolved solids (TDS), Chloride (Cl), and temperature

- **26% of water samples exhibited higher values EC values than WHO limit (500 µs/cm), and 23% had Cl values above WHO limit (250 mg/l))** implying that consuming the water for long periods of time may pose a serious threat to human health.



Salinity (ppt)=0.00180665 Chloride (mg/L)

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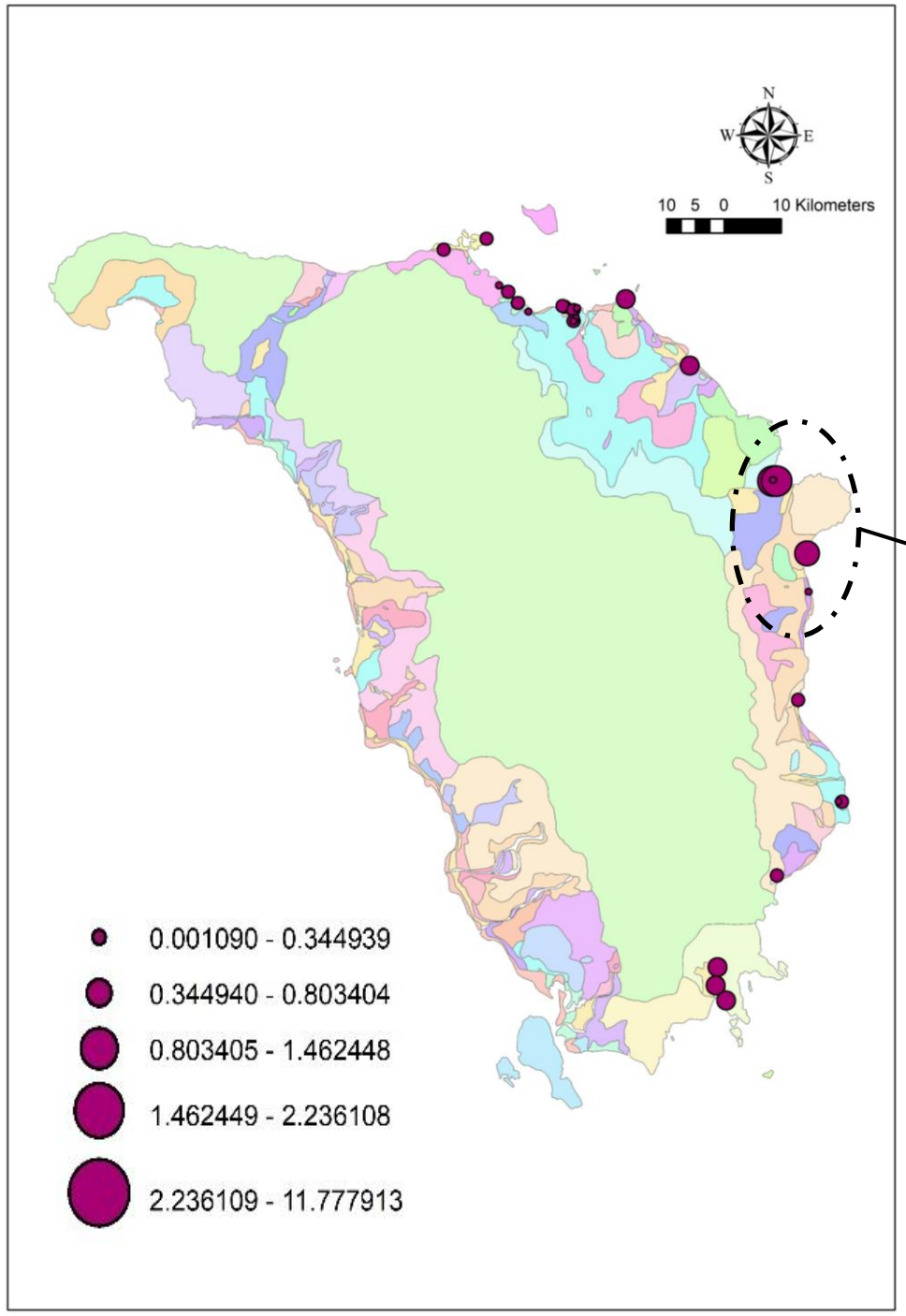
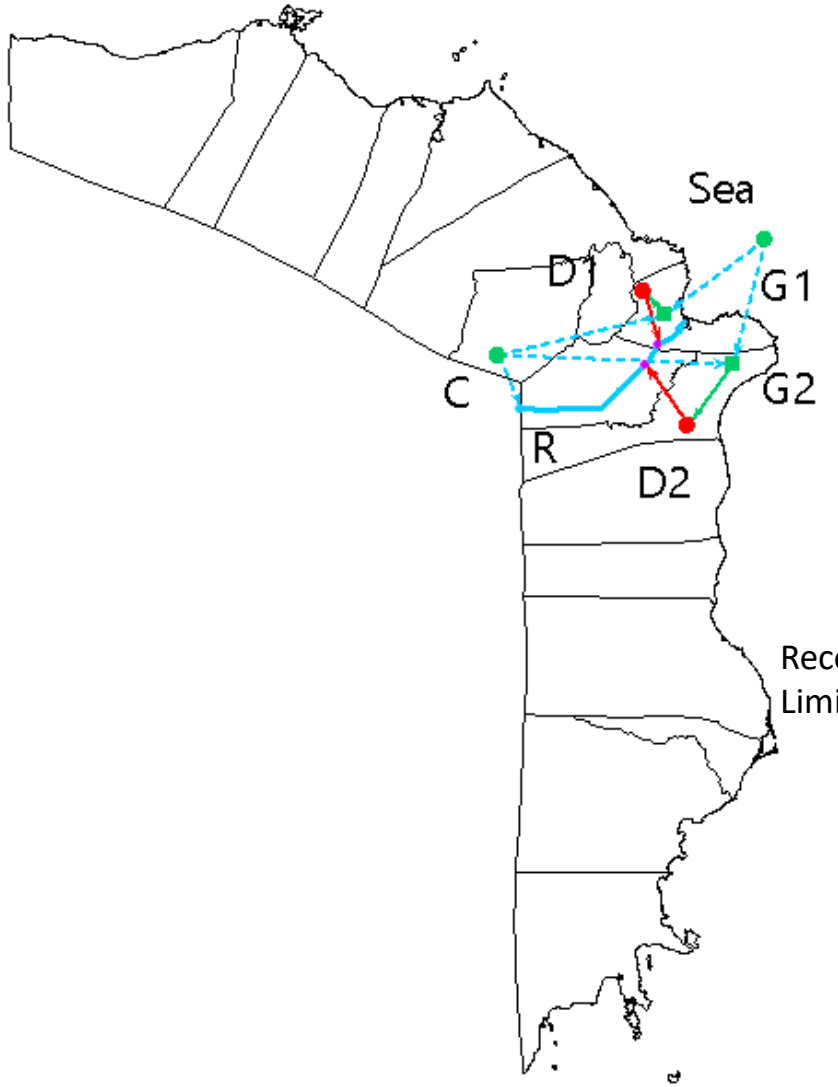


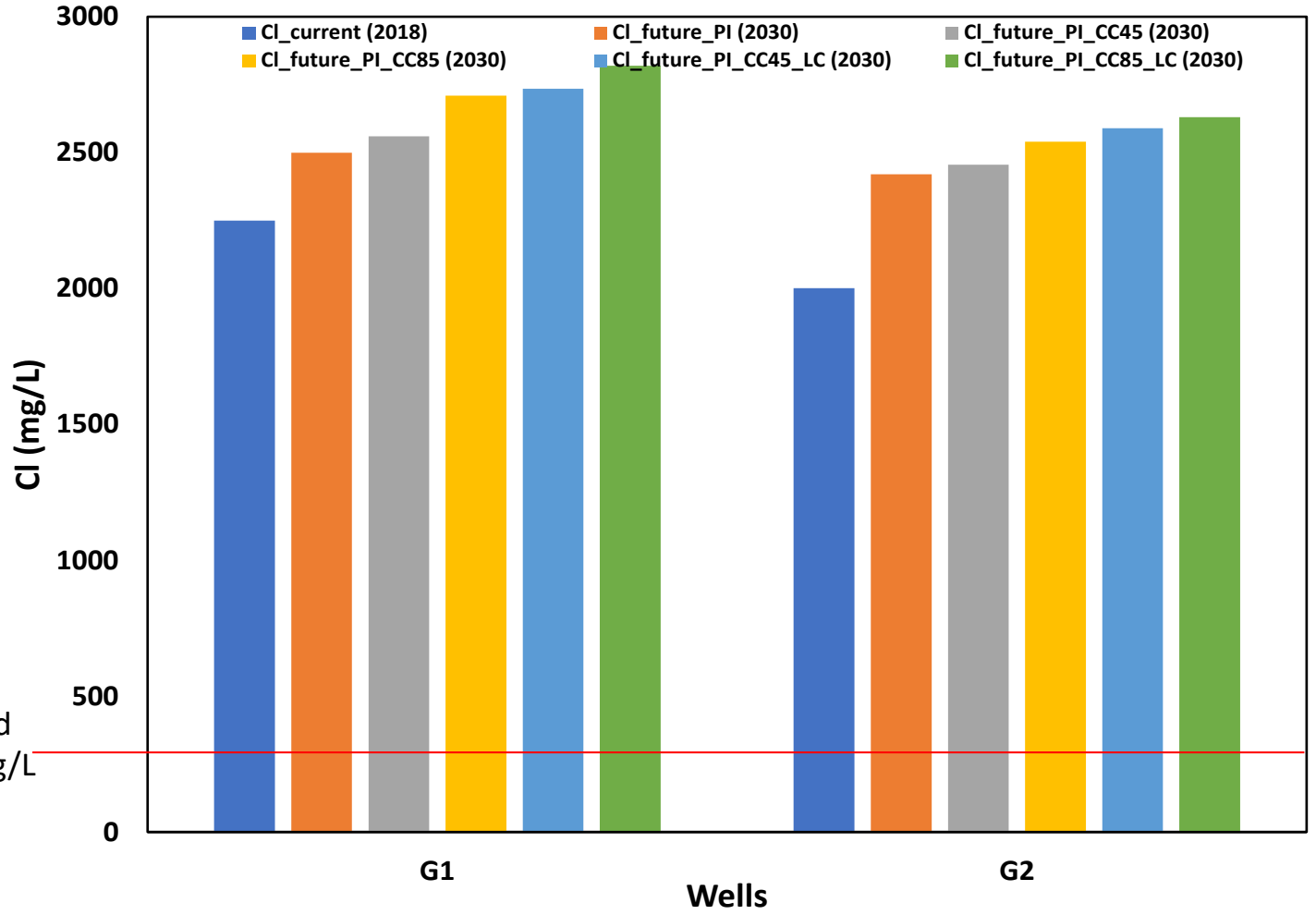
Spatial distribution of SW - FW mixing rate on the top of soil map

Area of major concern having **sandy or sandy loam soil types**

Salt water intrusion impact assessment

WEAP simulation result





Step 3: Countermeasures for coastal area (Calapan City)

Proposed adaptation measure	What type(s) of hazards are targeted?	How will the project directly benefit poor communities?	How will the project help conserve key biodiversity?
Strengthen the management system of the existing marine protected areas	storm surge, sea-level-rise, coastal erosion	Protection against storm surge, coastal erosion and sea level rise	Implementing actual protection strategies physically helps conserve the ecosystems of our marine sanctuary, mangrove forests and coral-seagrass areas.
Production of educational and information materials for local communities, schools and commercial establishments on the benefits of marine protected areas	Coastal erosion, sea level rise, storm surge, flooding, typhoons and saline water intrusion	Raising public awareness is raising public participation and involvement.	Information is education - illegal activities in the protected areas will be minimized if everyone is knowledgeable on the importance of
Capability Enhancement of the local communities thru trainings and planning-workshops	Coastal erosion, sea level rise, storm surge, flooding, typhoons and saline water intrusion	Knowledge transfer and skills development in conservation and protection	Conservation planning and training will make stakeholders equipped withmore knowledge and experiemce to eliminate habitat and species extinction/loss
Mangrove tree planting	Coastal erosion, sea level rise, storm surge, flooding, typhoons and saline water intrusion	Protection against storm surge, coastal erosion and sea level rise	Ecosystem enrichment thru propagation of mangrove species.
Strengthen community organization responsible in the protection and conservation of the protected areas.	Coastal erosion, sea level rise, storm surge, flooding, typhoons and saline water intrusion	Community participation will be enhanced.	More MPA's protection wa protection efforts

Domestic and international funds for climate change adaptation

People's Survival Fund (PSF)

- Adaptation fund provided by Philippine Government to LGUs
- Up to a few million USD, relatively short process to prepare proposal

Green Climate Fund (GCF)

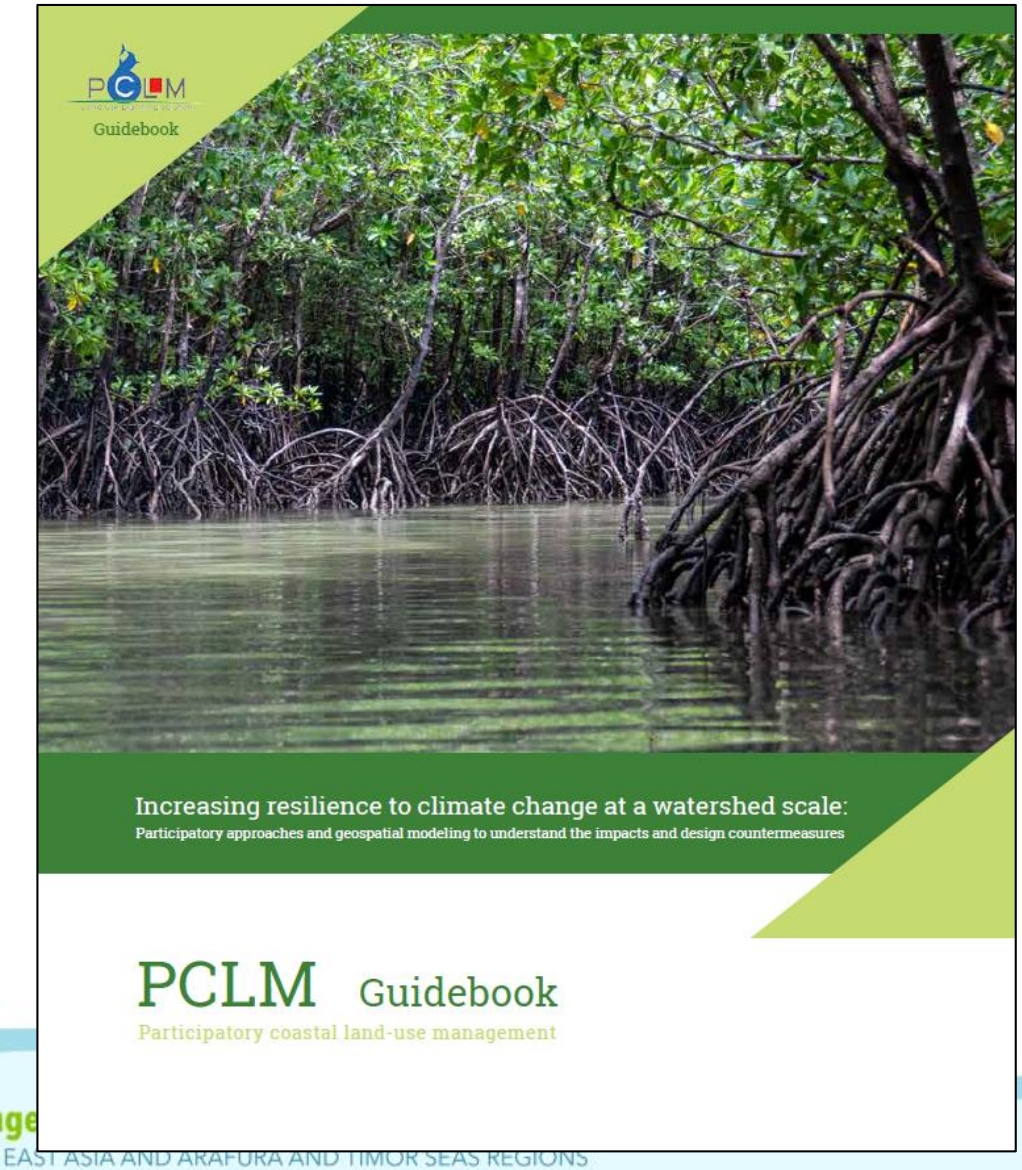
- International adaptation fund provided by GCF. Funds dispersed to GCF-Accredited Entity (e.g. Landbank, ADB, JICA), may be passed on to an implementing partner (e.g. LGU or consulting firm).
- Takes more coordination to prepare proposal, but grant size is larger

Step 4: Climate resilient land-use planning (Calapan City)

Goals	Activities	Success indicators
1. Mangrove area conservation and enhancement	**1.1.1. Establish nurseries for growing multiple species of mangrove seedlings**	Number of seedlings produced at the established nurseries.
	1.1.2. Planting seedlings in existing mangrove habitats to increase tree density.	Mangrove density (# trees per ha.) in areas where ecosystem enhancement was performed, after 1/2/3 years
	1.1.3. Mangrove restoration/tree planting in priority locations	Number of mangrove trees planted, and survival rate after 1/2/3 years
	1.1.4. Establishment of new Marine Protected Area	Marine Protected Area established.
2. Education and awareness raising on the benefits of mangroves for mitigating climate-related coastal hazards	**1.2.1. Development of educational and training materials**	Educational materials developed (~50 pages)
	1.2.2. Conduct quarterly workshops with local stakeholders for education and outreach activities.	Number of workshops organized and number of attendees
	1.2.3. Establish a "Mangrove learning hub" to promote learning about the importance of mangroves for climate change resilience.	"Mangrove learning hub" established and learning activities conducted (including workshops from Activity 1.2.2.).

Free Guidebook with hands-on tutorials

https://www.iges.or.jp/en/pub/pwlm-guidebook/en



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Thank you!

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