Coastal Flood Risk

Philippines case study

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Coastal flooding in the Philippines

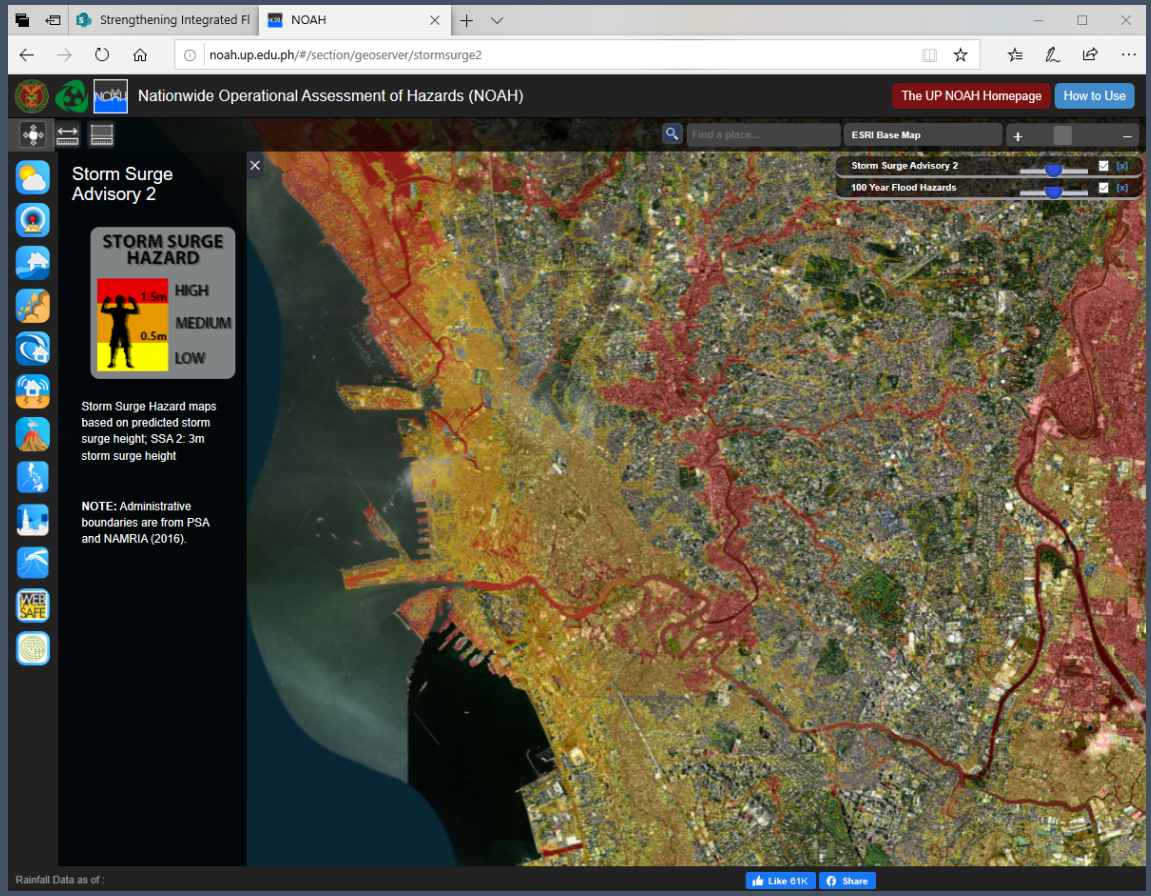
- On average 19 typhoons enter the Philippines area of responsibility each year and 9 make landfall
- Some of these cause coastal flooding
- An extreme example of this, was Super Typhoon Haiyan (Yolanda) which in 2013 generated a storm surge estimated to be over 5m high, which flooded Tacloban and killing over 6,000 people.

Image from Japan Meteorological Agency's MTSAT of Haiyan over the Leyte Gulf, Philippine Sea

Nov. 10, 2013, in Tacloban city

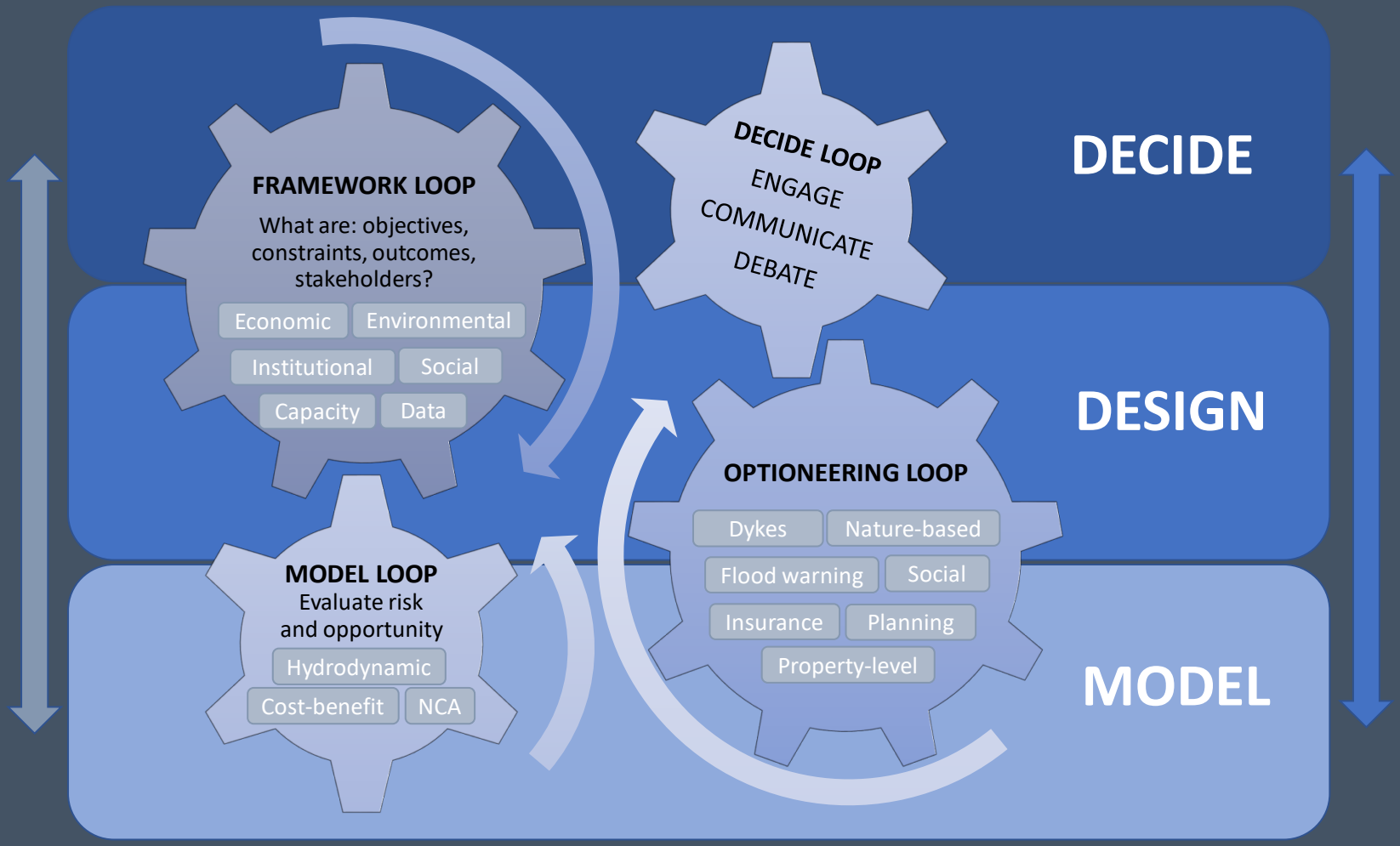
Data required to manage coastal flood risk

- Informed decisions require good data
- Risk managers need to know which areas are susceptible and how likely it is
- Flood maps exist for different water levels, which can be used in forecasting, but the likeliness of these flood events is unknown.



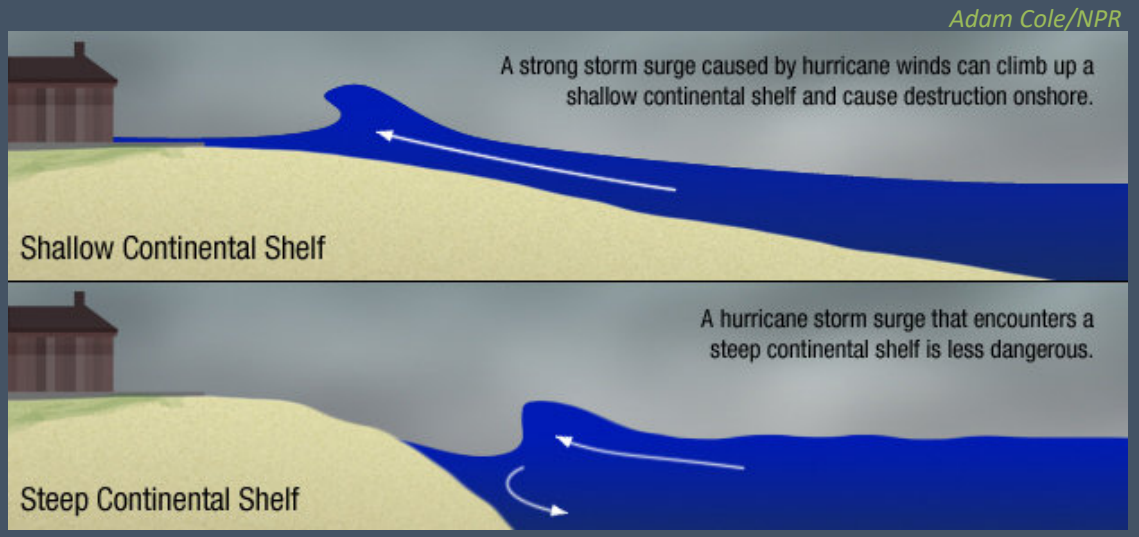
Manila, 3m storm surge

Data required to manage coastal flood risk

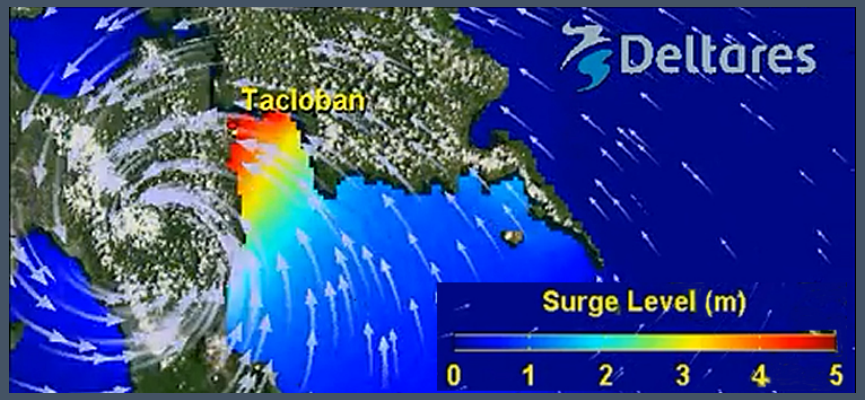


Factors which cause coastal flooding

- Exposure to storms especially typhoons
- Bathymetry:



- The shape of the coastline
- People
- Infrastructure
- Environment



Assessing coastal flood risk

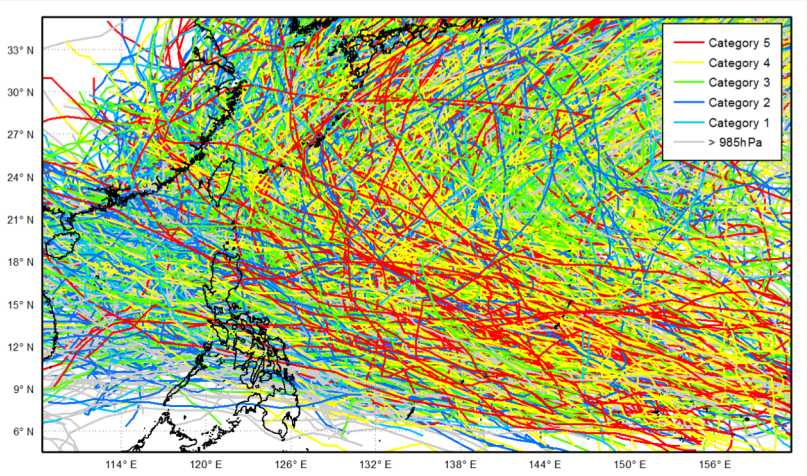
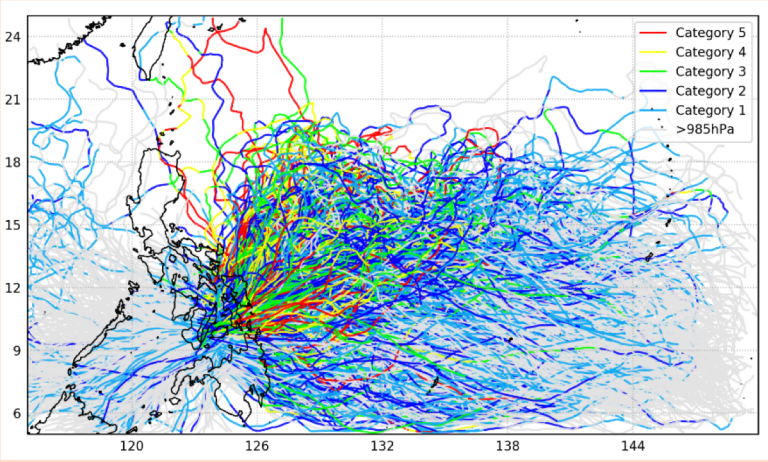
We are working with PAGASA, to evaluate coastal flood risk to Iloilo, Philippines.

This involves evaluating:

- Typhoons
- Extreme sea levels
  - Storm surge
  - Mean sea level
  - tides
- Flood inundation
- We are not assessing waves, but for some areas this is also essential

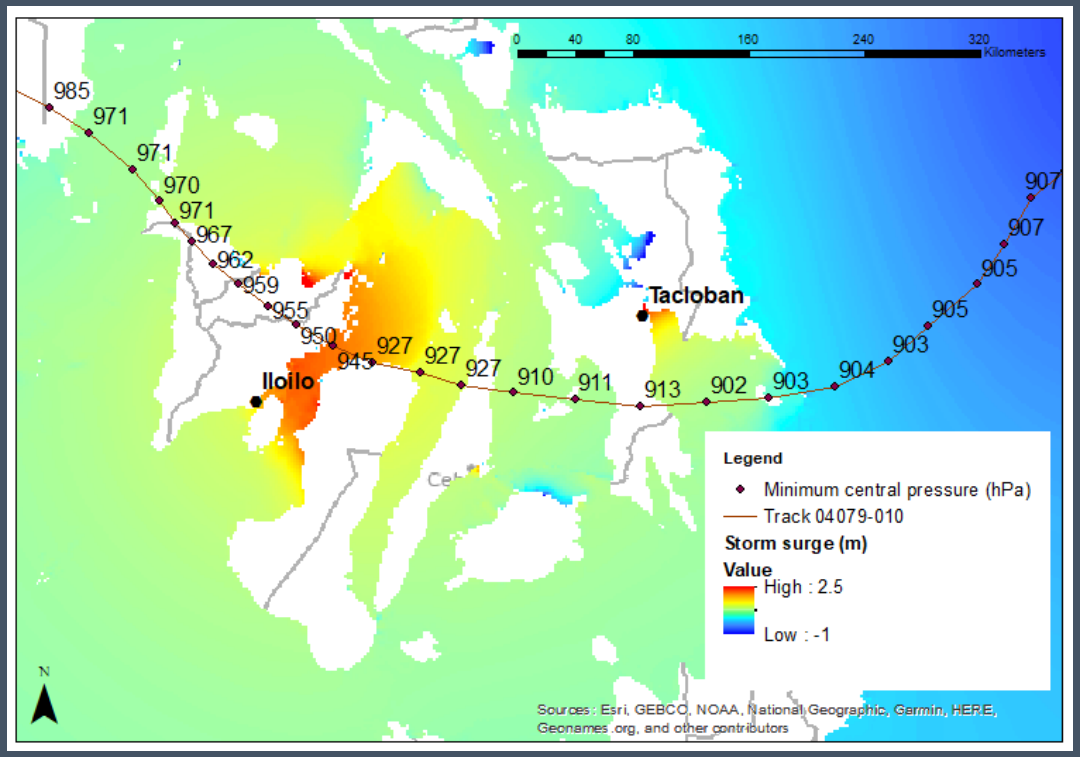
Typhoons

Statistical models have been fitted to historic typhoon data (tracks, central pressure etc) to generate a synthetic dataset of typhoons that could occur over 10,000-years

Historic tracks – all Philippines	Synthetic tracks – affecting Iloilo
	

Extreme Sea Levels – storm surges

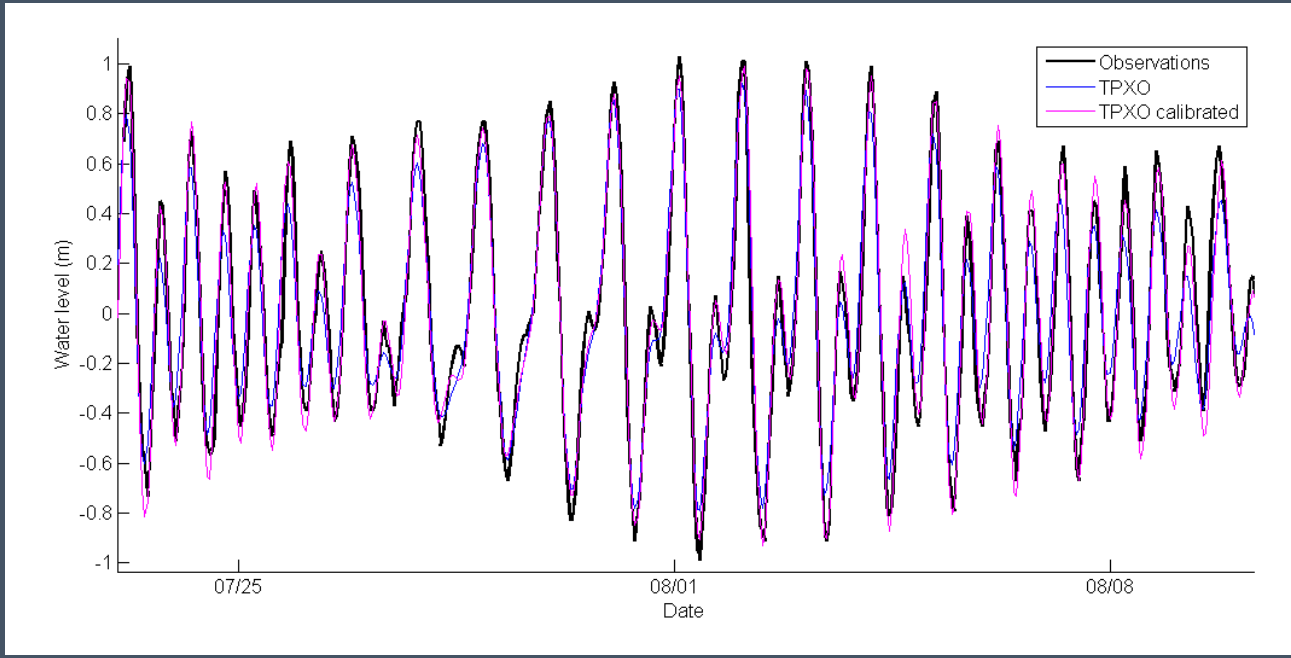
Storm surges that could occur are being evaluated by modelling those associated with the synthetic typhoons



Worst case storm surge for Iloilo

Extreme Sea Levels

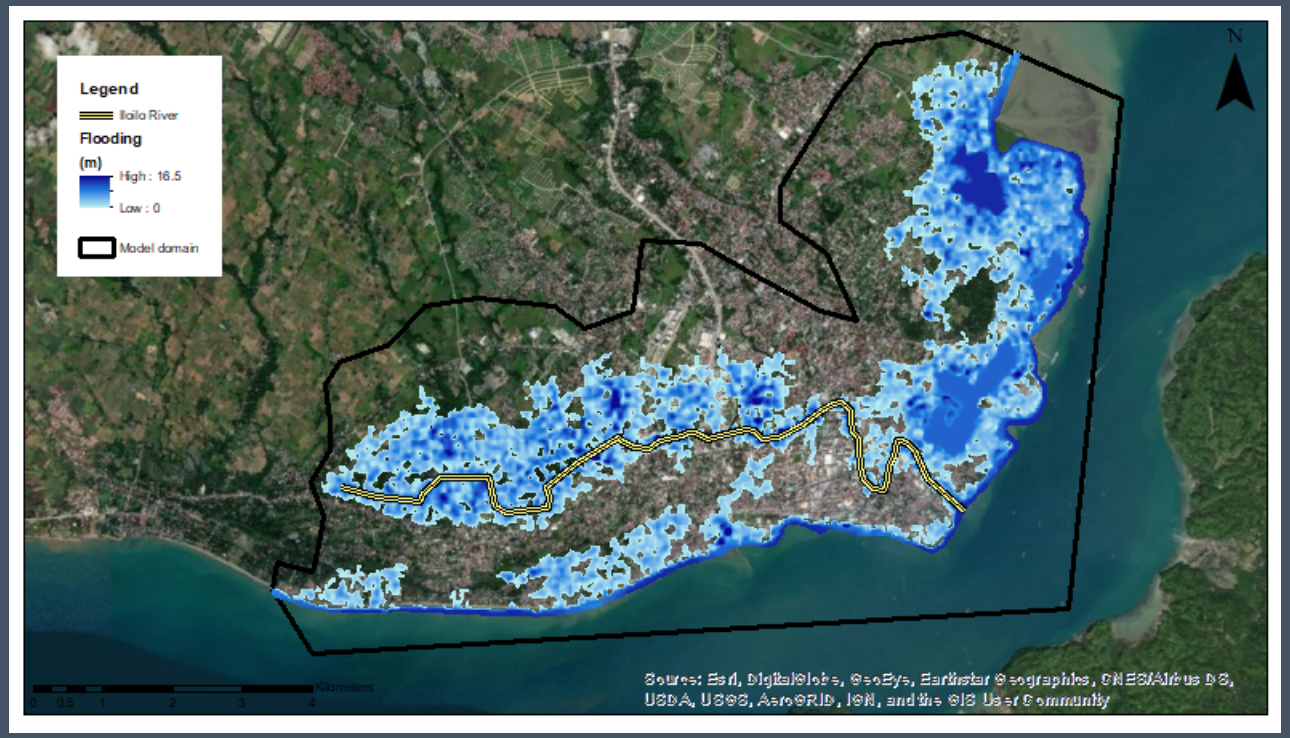
To evaluate the likelihood of extreme sea levels a statistical analysis of the likelihood of storm surges and astronomical tides must be undertaken. Changes in mean sea level must be taken into account.



Tidal range at Iloilo

Inundation modelling

We are going to undertake hydraulic modelling to propagate extreme sea levels inland and calculate the flooding.



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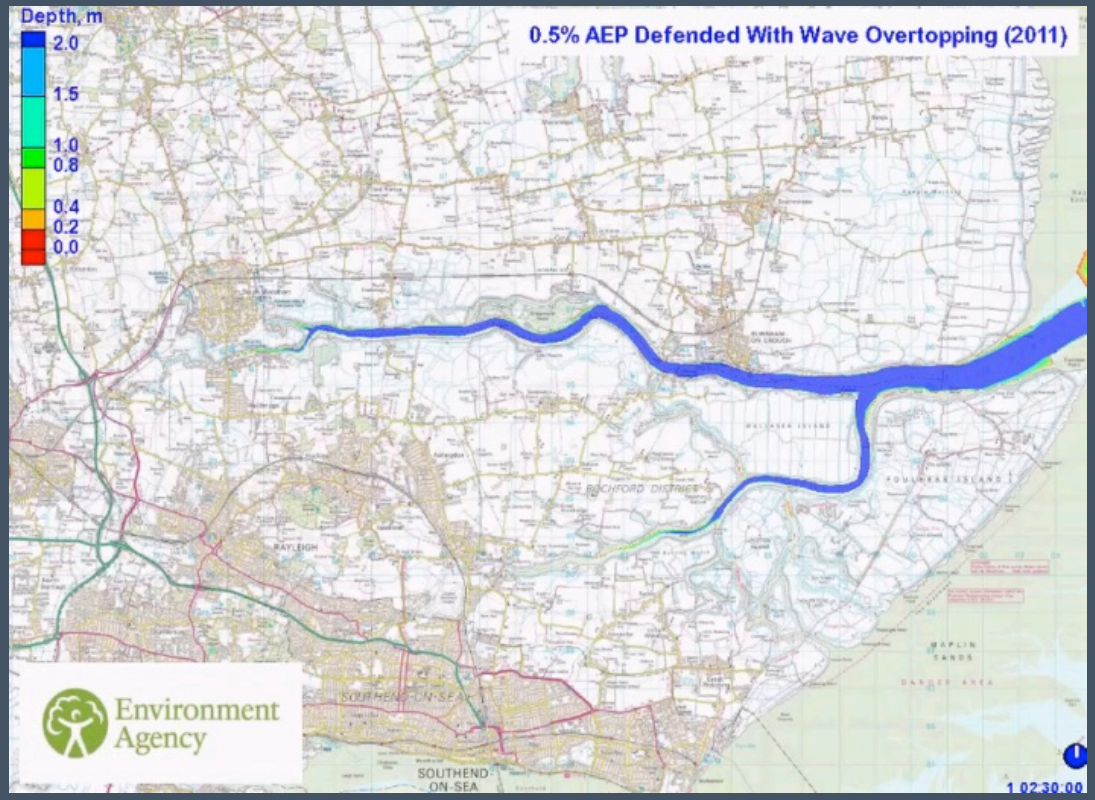
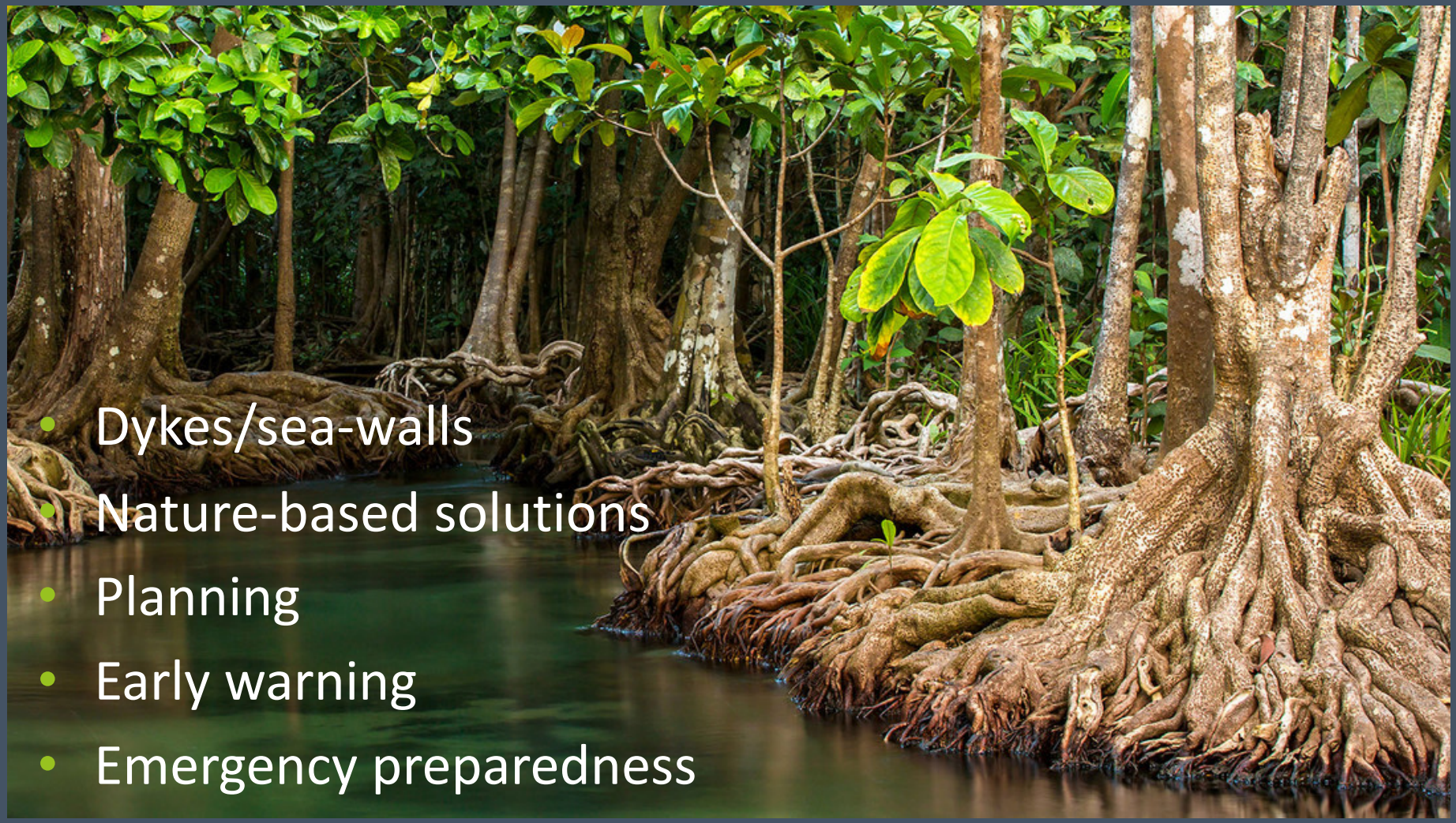
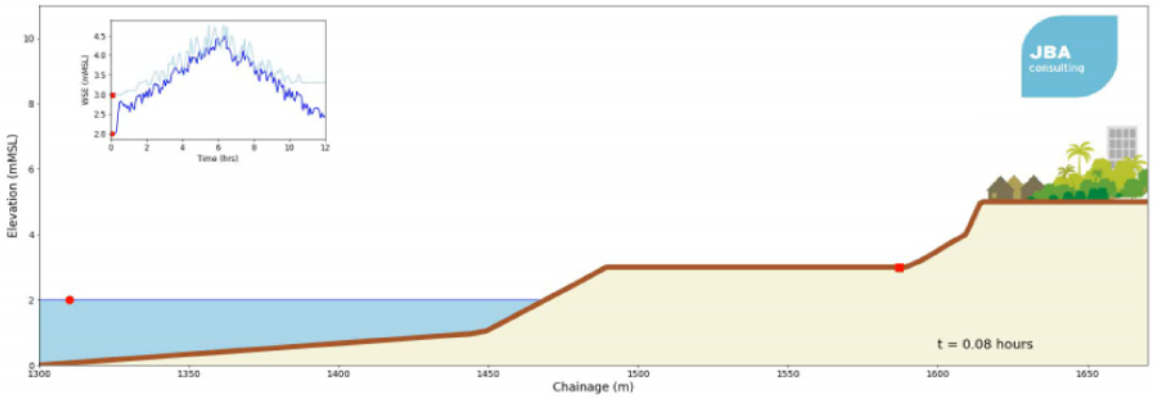
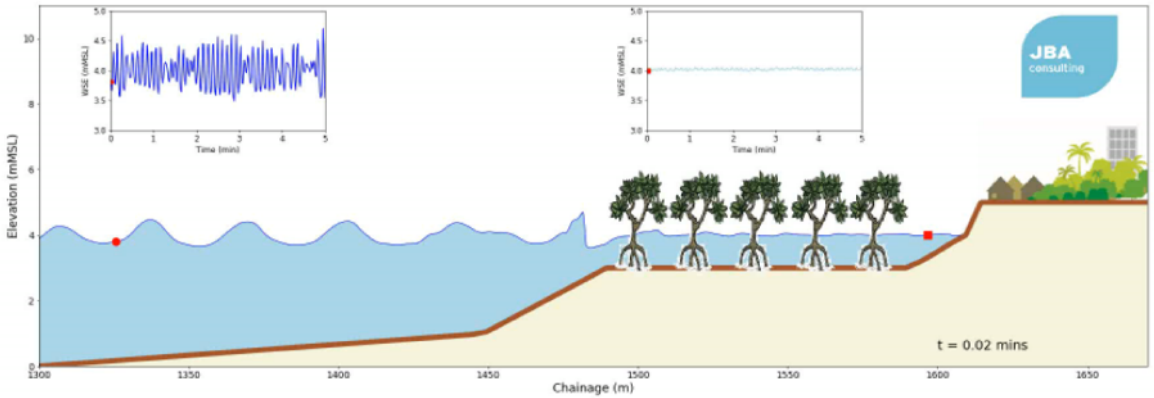


How to manage the risk



- Dykes/sea-walls
- Nature-based solutions
- Planning
- Early warning
- Emergency preparedness


JBA consulting
WSE (mMSL)
Time (hrs)
Elevation (mMSL)
Chainage (m)
t = 0.08 hours


JBA consulting
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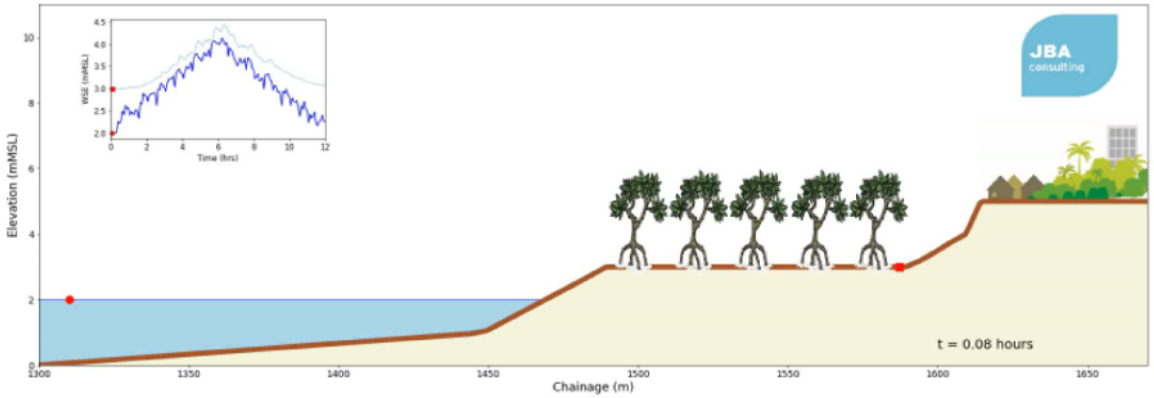
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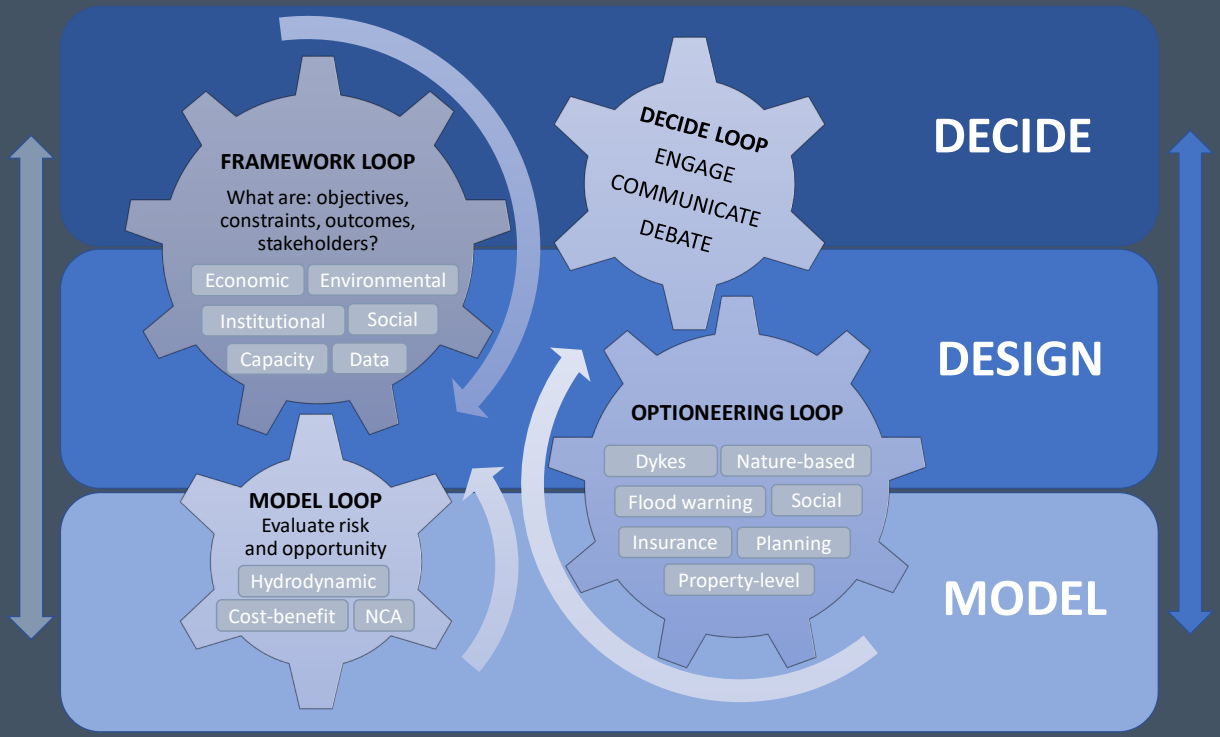


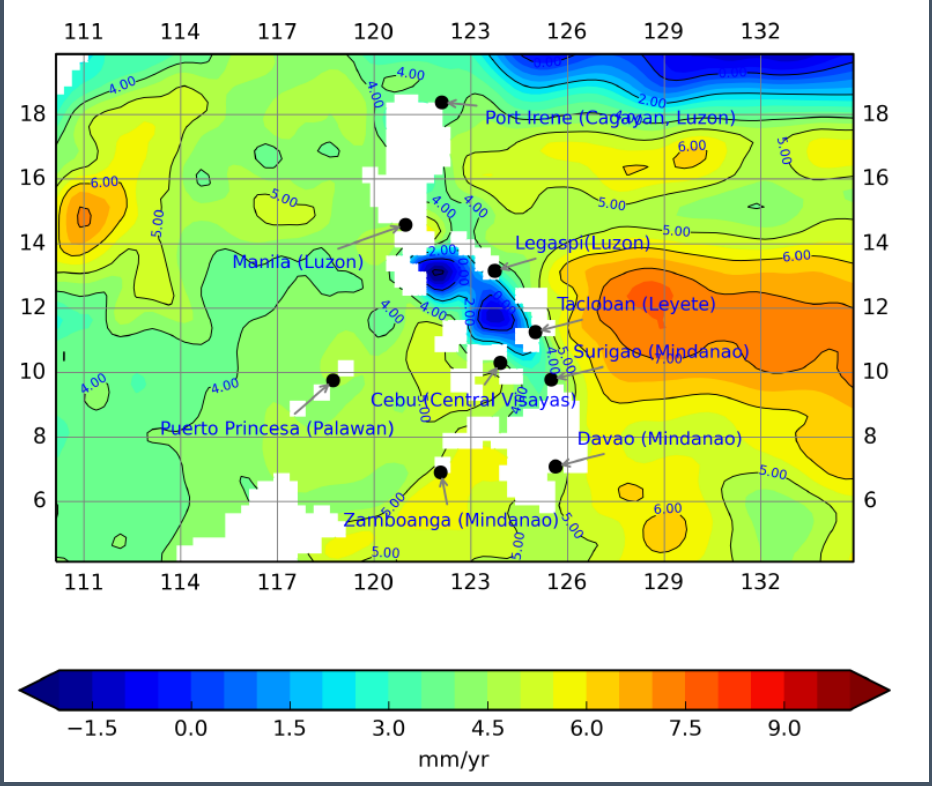
Fisherman:

City Government

Hospital Manager:

How the risk is changing

The dominant driver of change in coastal flood risk is rising mean sea level.



Sea level changes in the Philippines region from 1993-2015, produced from the AVISO Satellite observations

Future sea level rise (Met Office, 2016)

Location	RCP	Mean sea level rise by 2081-2100 relative to 1986-2005
Surigao	4.5	0.48 m
Surigao	8.5	0.65 m