



Climate Change and the Aveiro Port Infrastructures

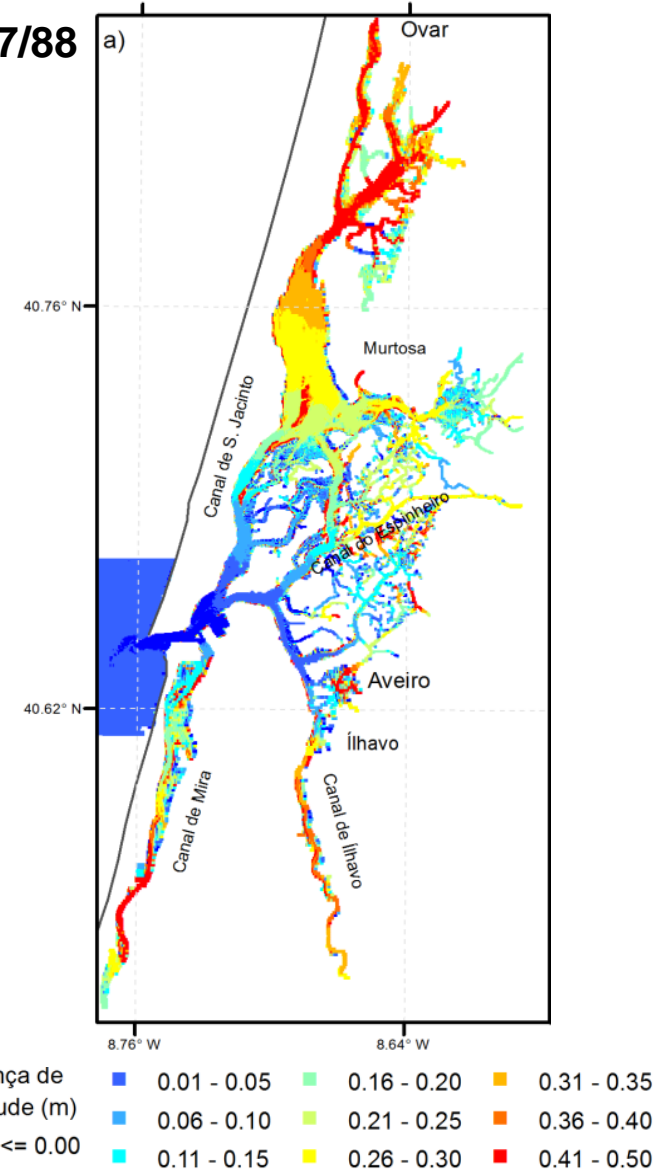
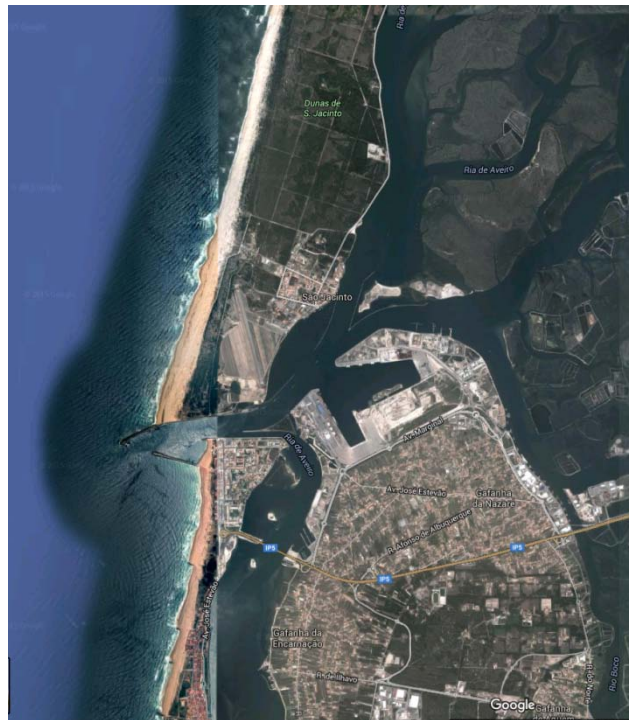
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Location

- ✓ Aveiro Port is located in the Atlantic Coast of the Iberian Peninsula, in the inner areas of Aveiro lagoon
- ✓ Aveiro lagoon dynamics is mainly ruled by a semidiurnal tide of 3.2 m of amplitude at spring tide

2012/13 – 1987/88



Socioeconomic Characteristics

- ✓ The Aveiro lagoon has a population of 250,000 inhabitants in the watershed area (INE, 2011)
- ✓ It has considerable regional and national economic importance:



- industries
- aquaculture
- shellfish collection
- salt-production
Ovar
- artisanal fishing
Murtosa
- agriculture
Estarreja
Albergaria-a-Velha
- sport activities
Aveiro
Ílhavo
- tourism
Vagos
- port facilities
Mira



Aveiro Port

- ✓ With an annual throughput of around 3.5 million tonnes, Aveiro is a multi-functional port which plays a crucial role in serving a wide range of industries in its hinterland



- Ceramics
- Chemical
- Winemaking
- Metallurgic
- Wood and derivatives industries
- Agricultural food and construction sectors



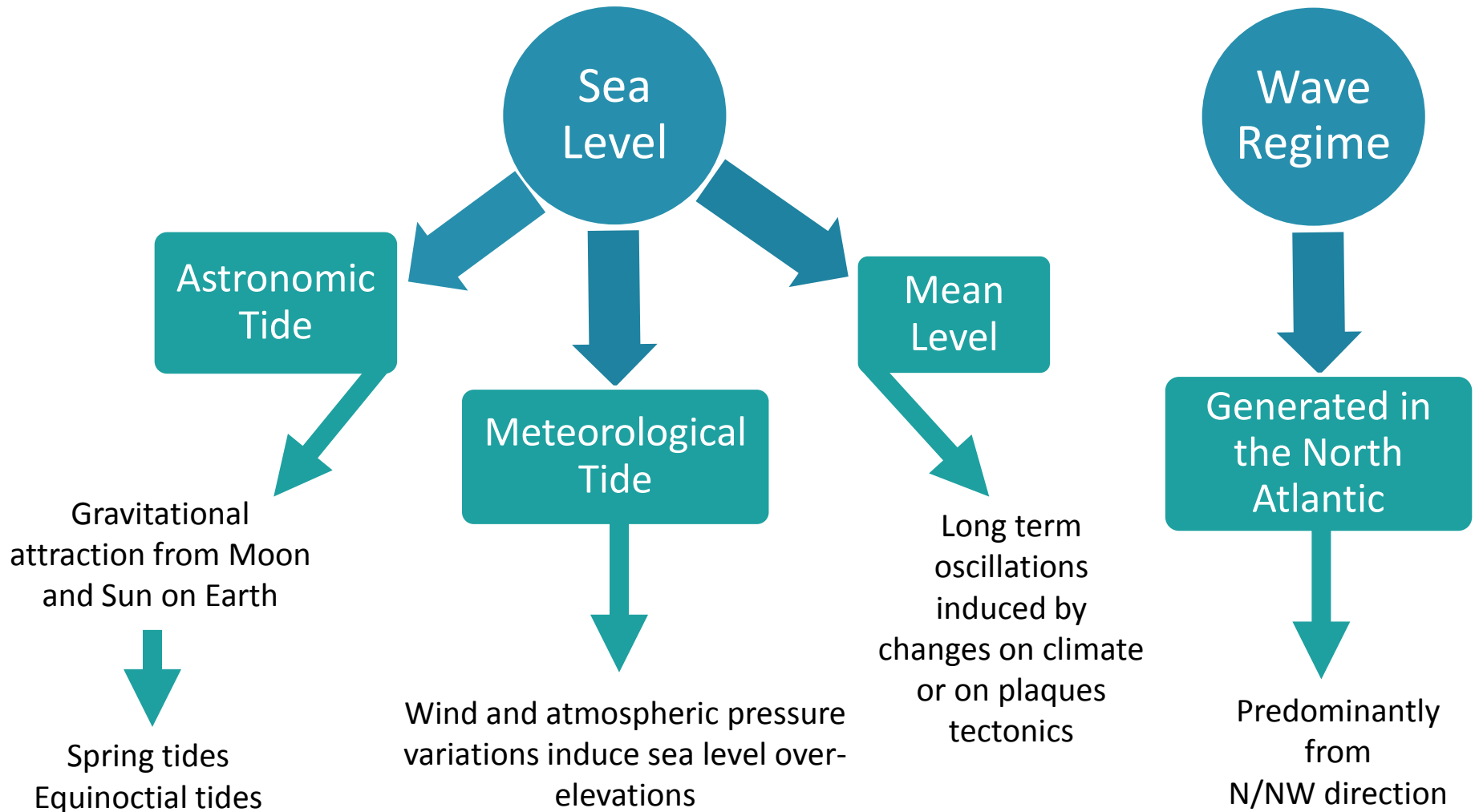
Aveiro Port

✓ Aveiro Port is the most recent national port infrastructure, and for this reason is today a well-organised and integrated port area from the territorial point of view, without any congestion issues, and furnished with

- 5 Terminals set up to transport all kinds of goods
- 2 specialized Terminals for fisheries
- One of the highest mooring capacities for multiuse terminals of national ports
- A large flattened land surface area



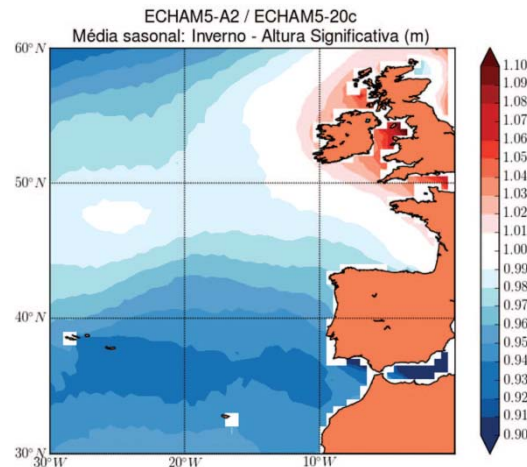
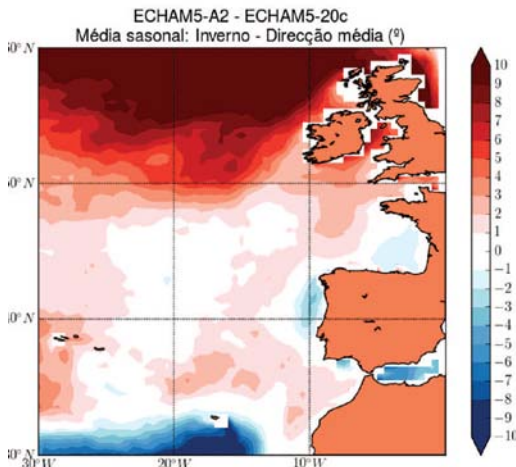
Climate Change Forecasts for 2100



Climate Change Forecasts for 2100

✓ Storm characteristics

- Slight reduction in the cyclones intensity and a displacement northward (about 3° of latitude) of the maximum of their zonal average in winter period
- Increase in the number of cyclones of thermal origin

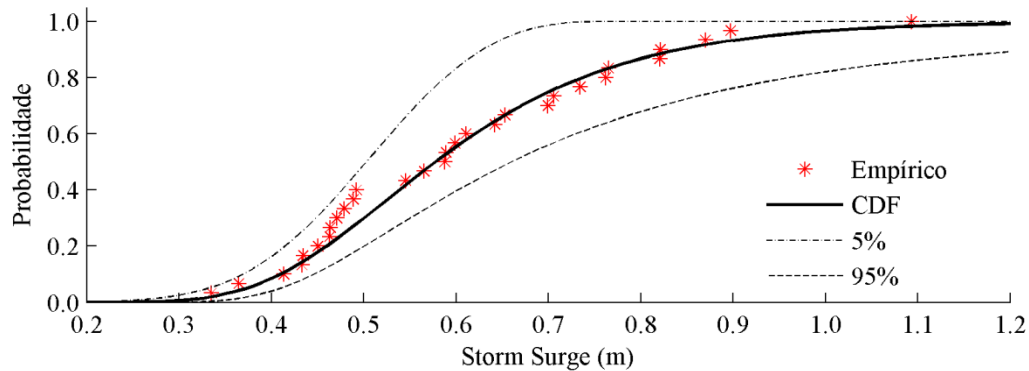


✓ Wave regime

- A counterclockwise rotation of 3° in winter and a clockwise rotation of 2°, 0.6° and 2.4° in spring, summer and fall, respectively
- Decrease in the average significant height of ~4%

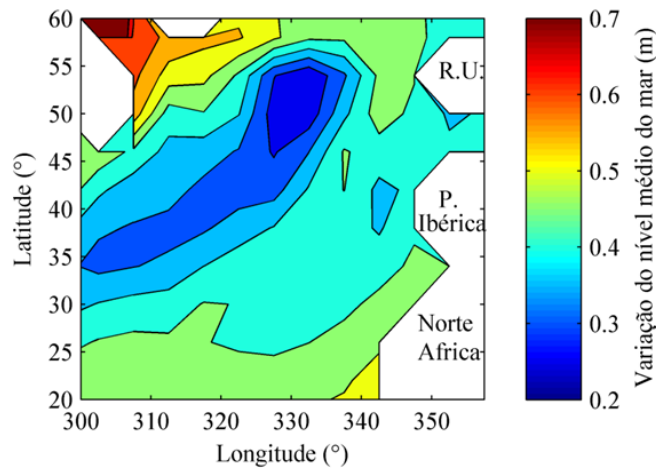
Climate Change Forecasts for 2100

✓ Storm surge



Return Period (years)	2	10	100
Height (m)	0.58	0.84	1.17

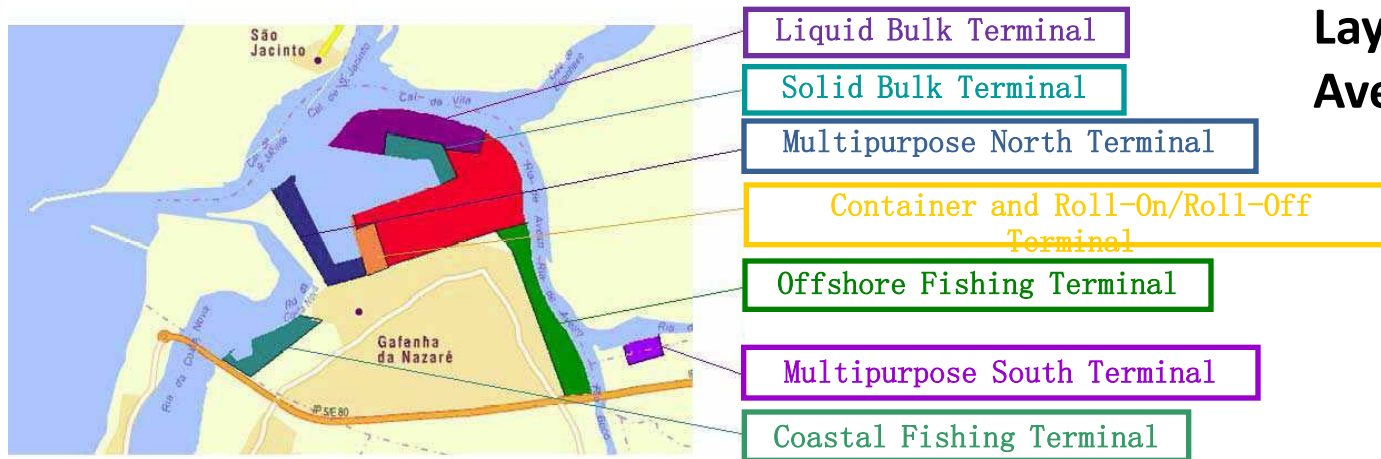
- In future climate the number of storm surge events, their duration and intensity tend to increase slightly



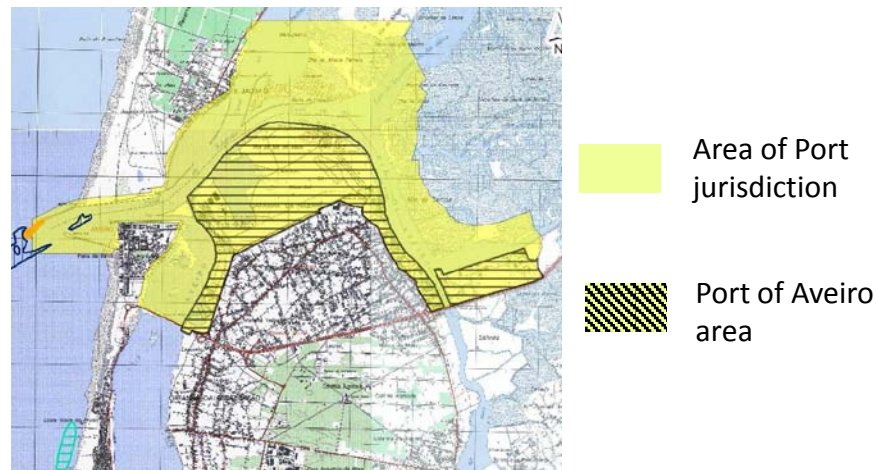
✓ Mean sea level

- Sea level rise between 0.42 cm and 0.64 cm
- The most pessimistic forecasts indicate a sea level rise higher than 1 meter

Port Facilities



Layout of Port of Aveiro facilities



Vision

- ✓ The port of Aveiro will be one of the most dynamic and competitive ports in the Atlantic coast of the Iberian Peninsula in short sea shipping transport and will hold an ample logistic and industrial development node

Port Facilities

Multipurpose North Terminal

- ✓ This terminal has excellent physical facilities:
 - 1150 meters of quays
 - 10 Mooring posts
 - Depths of -12 m
 - 8 covered warehouses
 - 325 000 m² of flattened land

- ✓ It is geared towards the transport of dry cargo and containers, which main transported goods are: steel products, cement, cereals, paper paste, agglomerates and clays



Port Facilities

Multipurpose South Terminal

✓ This terminal has high rates of traffic growth and the following physical facilities:

- 400 meters of quay
- Water depths of -7 meters
- 5 hectares of embankments



✓ This terminal is dedicated to cement, fish, agri-products, salt, kaolin, argyles, wood products, pulp and steel products



Port Facilities

Container and Roll-On/Roll-Off Terminal

- ✓ This terminal has excellent facilities for the potential market segments of containers and ro-ro ships:
 - 700 metres of quays
 - Depths of -12 m
 - 145 902 m² of flattened land duly equipped for the installation of value added services

- ✓ Terminal with potential for 500 metres of expansion of quays, in a front-line area of flattened land of more than 100 000 m²



Port Facilities

Solid Bulk Terminal

- ✓ This terminal has 750 metres of quays with two dedicated areas:
 - 1) 300 metres dedicated to the agricultural food segment
 - 2) 450 metres dedicated to other solid bulk cargo
- ✓ This terminal has 151 000 m² of flattened land duly equipped with infrastructures for added value services
- ✓ It has an adjacent area available for investment measuring around 67 000 m²



Port Facilities

Liquid Bulk Terminal

- ✓ This terminal has 6 Mooring posts:
 - 3 new mooring posts each 150 metres long, with depths of -12.00m
 - 3 older posts, at depths of -7 m

- ✓ The facilities are run by different private companies who are specialised in the transport of chemical products, winemaking products, petrol products and biodiesel



Port Facilities

Coastal Fishing Terminal

- ✓ This sector possesses a set of infrastructures dedicated to unloading, storage and commercialisation of the fish catch for local traders
- ✓ The fish stalls and ice factory are located next to the Coastal Fishing port and with capacity for 136 boats
- ✓ It also has 1 support building and 72 warehouses for local fish traders



Port Facilities

Offshore Fishing Terminal

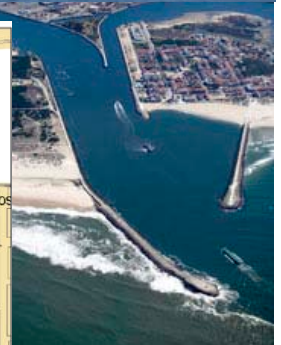
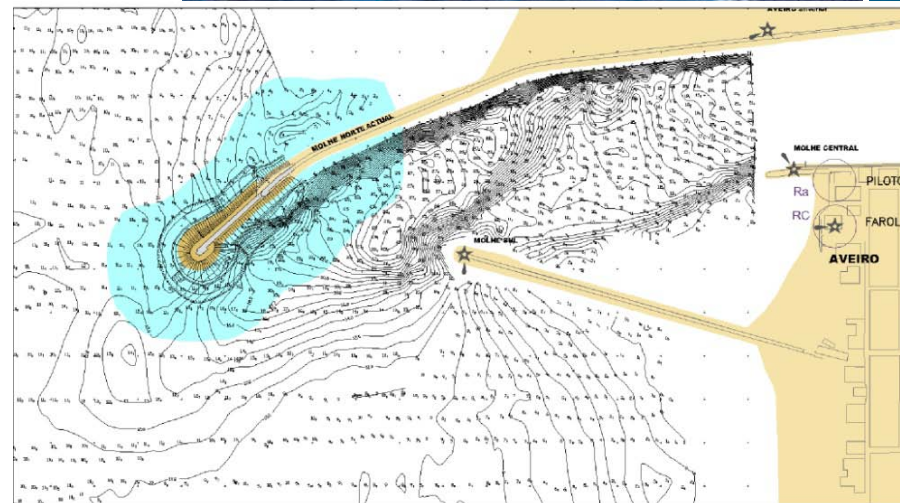
- ✓ Equipped with a weighing bridge with capacity of up to 60 tonnes, this terminal serves high-sea fishing boats and fish processing industries and has:
 - 17 quay-bridges at depths of -7 metres
- ✓ This sector includes a Specialised Fish Unloading Terminal that is 160 m long and completely equipped with the infrastructures needed for a facility of this nature



Inlet Channel / Human Action

- ✓ Unstable inlet
 - ✓ North and south jetties with several extensions along the last decades
 - ✓ Triangle dick for tidal prism regulation for the lagoon main channels
 - ✓ Dredging operations of the inlet and main lagoon channels

- ✓ 2014: Concluded the last extension of the North jetty (200 m) accomplished by the dredging of a new external channel to access the lagoon



Port Infrastructures in Risk

- ✓ Sea level rise
 - ✓ Storm surges
- } ✓ **Marginal floods**

- Offshore Fishing Terminal



- The marginal flattened lands and piers for most of the port facilities

Port Infrastructures in Risk

- ✓ Wave regime
- Inlet jetties breakdown
- Navigation safety and operability



Strategy to Protect Aveiro Port

- ✓ Inventory and assessment of port infrastructures
- ✓ Assessment of infrastructures resistance
- ✓ Inventory of damages caused by extreme weather events within the port
- ✓ Accurate climate change forecasts
- ✓ Predictions of changes on marginal flooding and inlet conditions (jetties resistance and port operability)
- ✓ Risk analysis on the goods and persons on the port in order to provide the information needed to prioritise interventions
- ✓ Inventory of previous studies and projects
- ✓ Proposal of possible solutions
- ✓ Comparative analysis of different solutions
- ✓ Decision on best solutions

Thanks!!!

