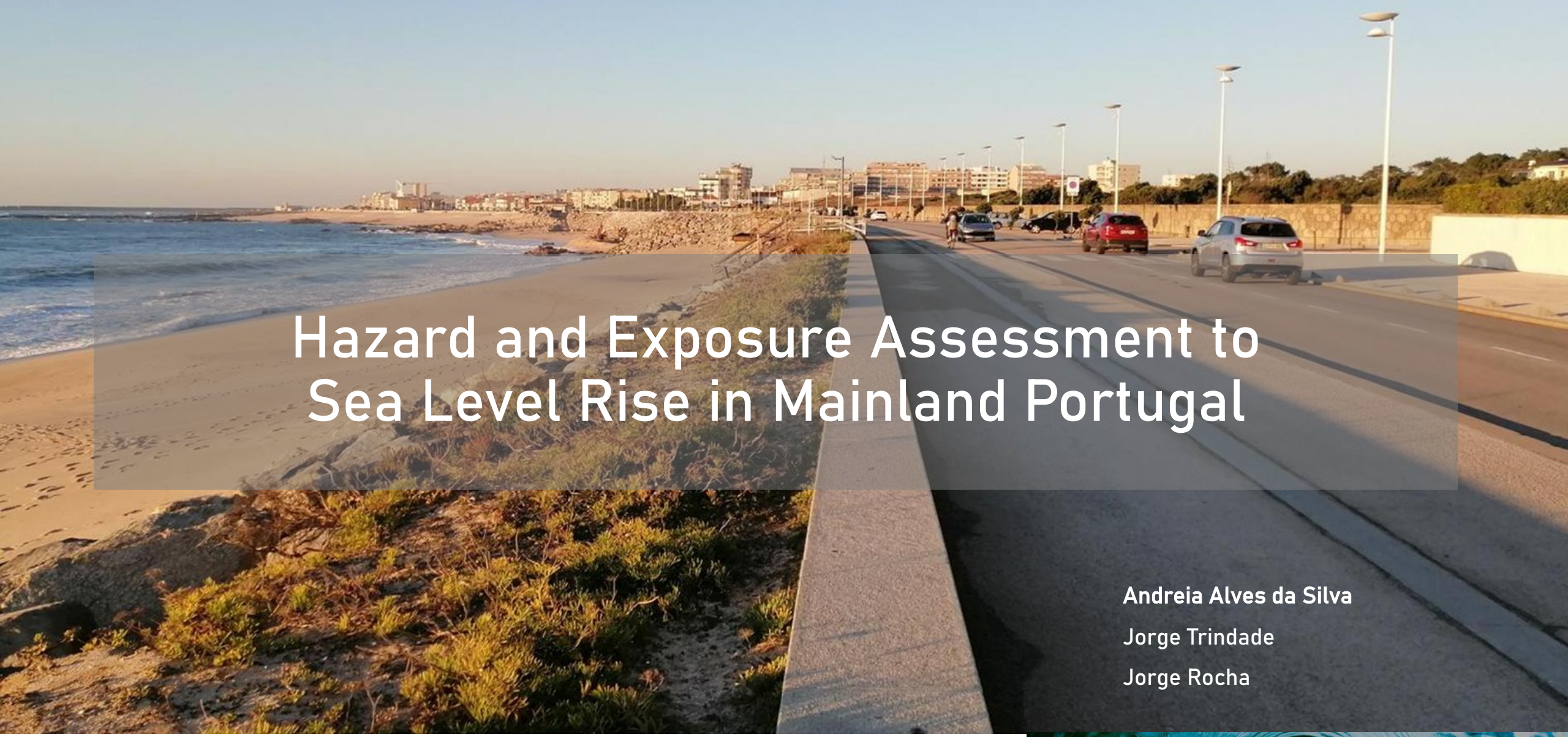


Hazard and Exposure Assessment to Sea Level Rise in Mainland Portugal

Andreia Alves da Silva

Jorge Trindade

Jorge Rocha

U LISBOA | UNIVERSIDADE DE LISBOA

IGOT Instituto de Geografia e Ordenamento do Território UNIVERSIDADE DE LISBOA

CEG 80 ANOS Centro de Estudos Geográficos

CoLAB +ATLANTIC

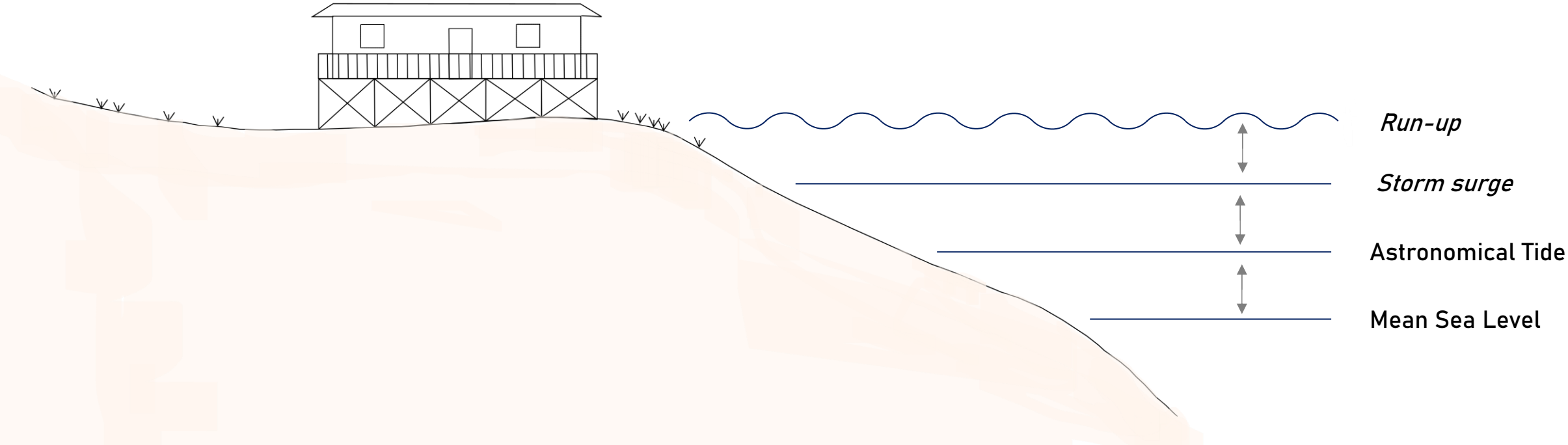
WATER, SUSTAINABILITY AND DEVELOPMENT '25

9th MAY 2025

Outline

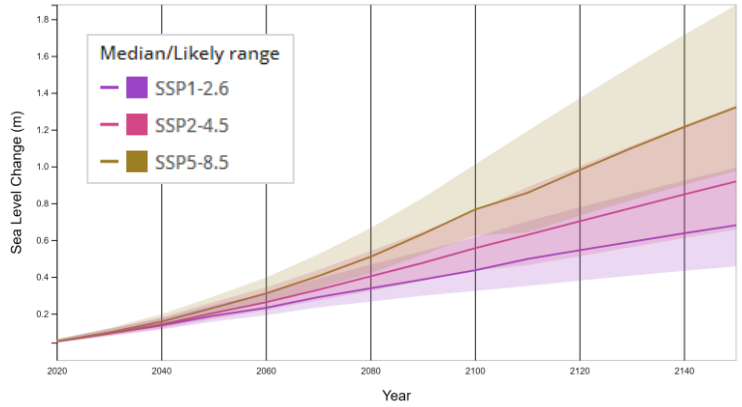
1. Sea Level and Short term changes
2. Characterization of study area: Mainland Portugal
3. Methodological steps for a roadmap for adaptation
4. Action plan for municipality adapation

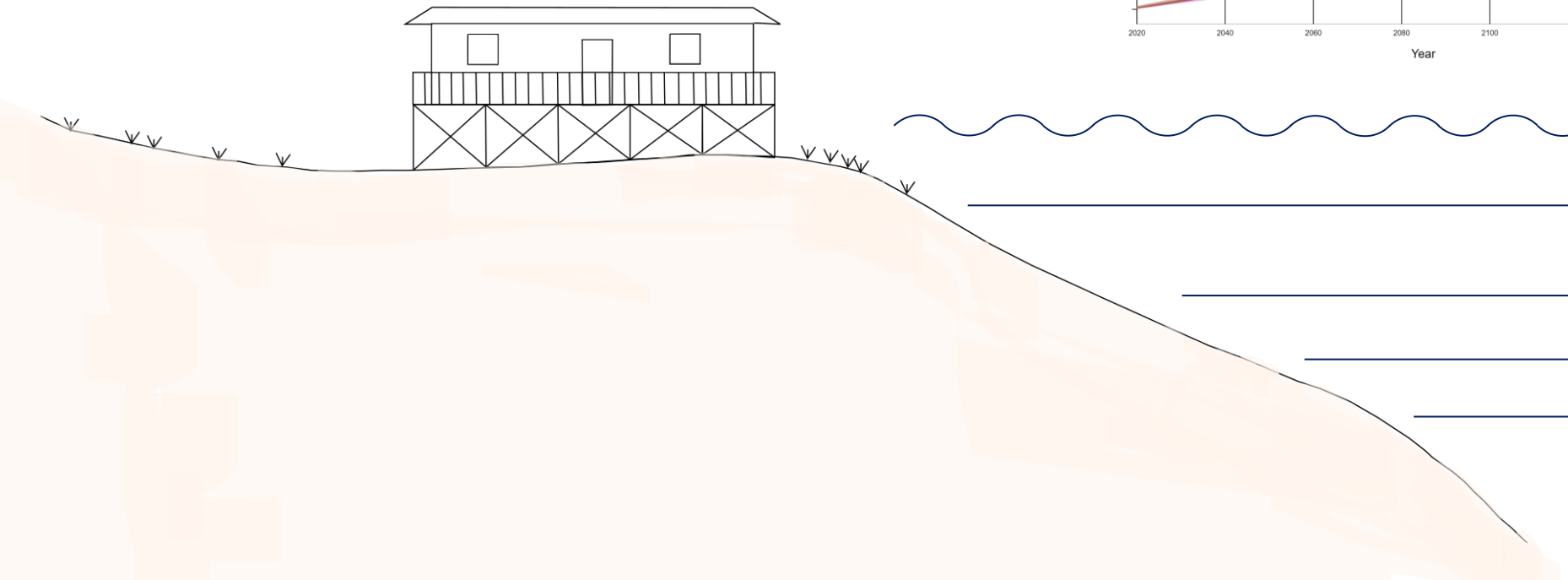
Sea Level and Short term changes



Sea Level and Short term changes

Projeções da subida do nível do mar
(NASA – IPCC)





Run-up

Storm Surge

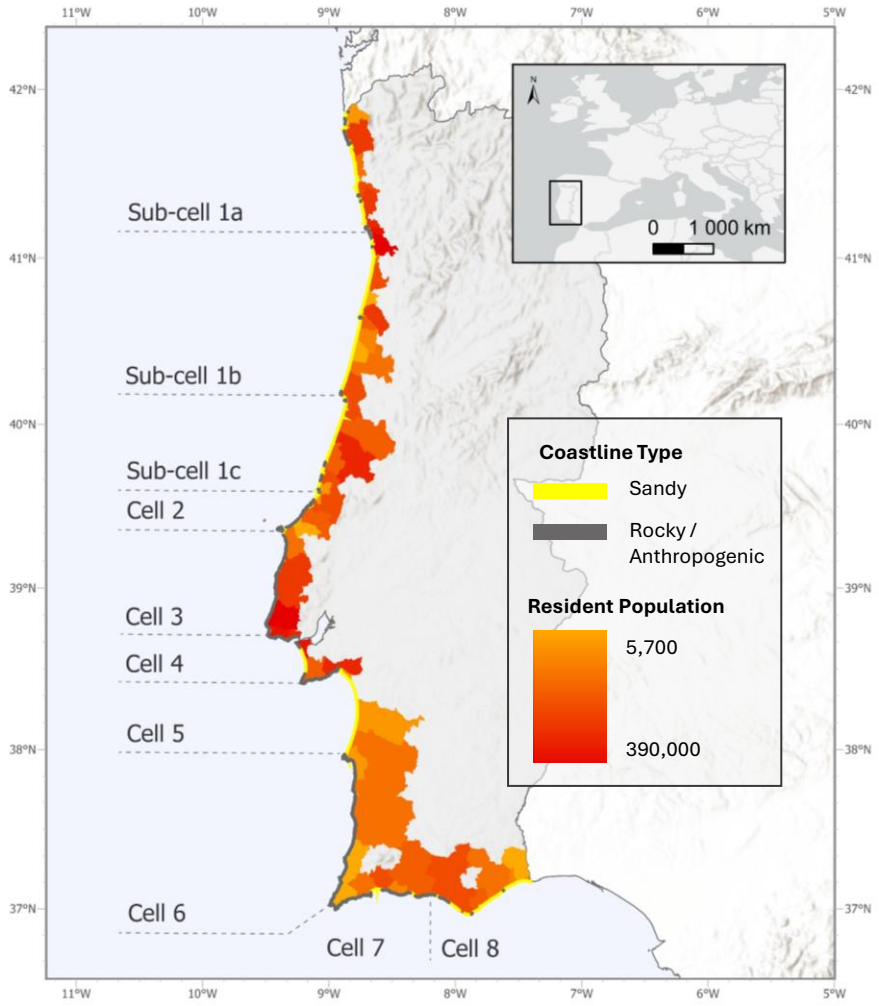
Astronomical Tide

Sea Level Rise

Mean Sea Level

Mainland Portugal

45 % of the Portuguese lowlying áreas are presenting erosion (APA)

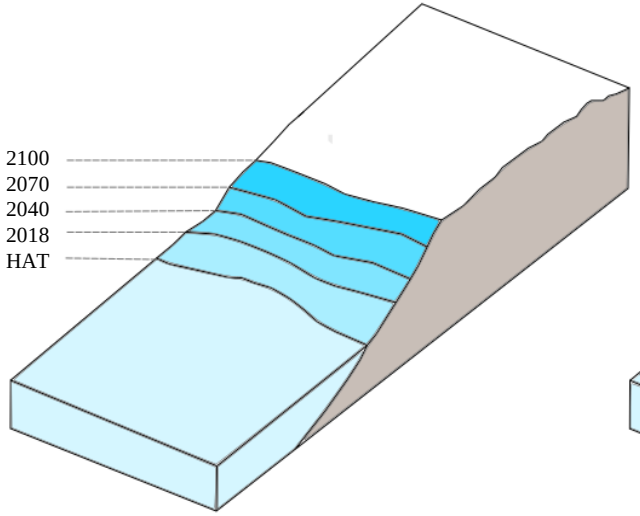


Setores de linha de costa em erosão. Source: APA

Evidence of coastal erosion in Cortegaça. Source: Google Earth

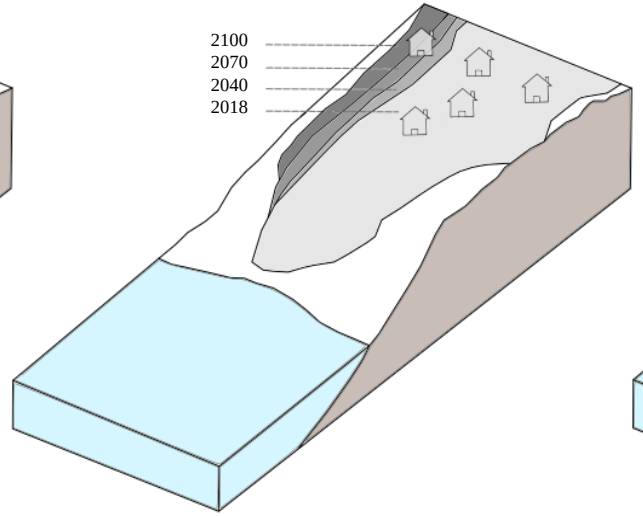
Methodological steps for a roadmap for adaptation

First step



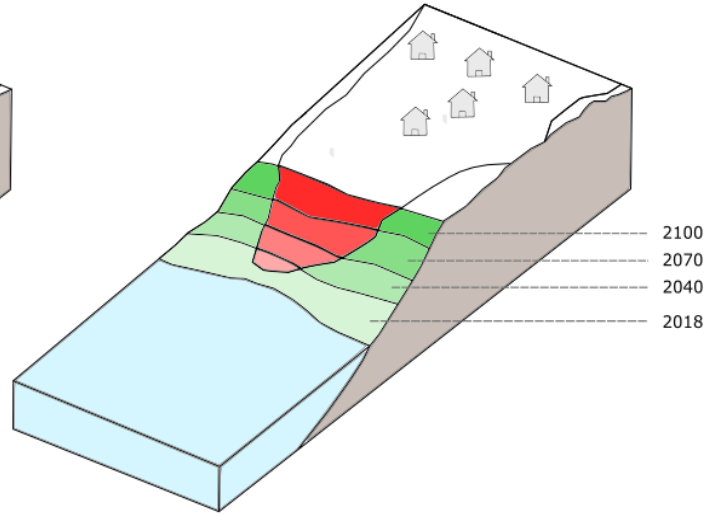
Hazard mapping

Second step



Expansion of urban áreas

Third step

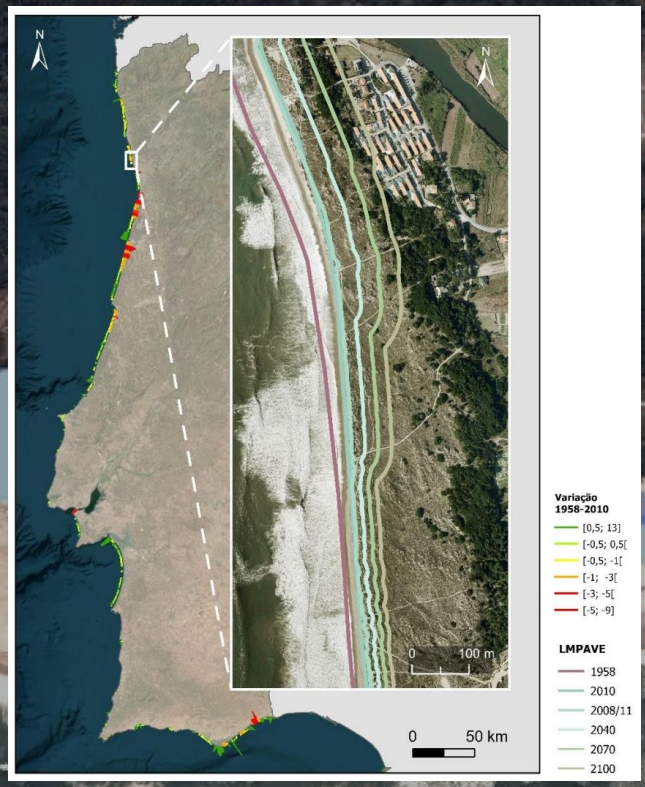


Definition of priority levels for adaptation

First step: **Hazard mapping**

Most retreated line
Provocted by

Shoreline retreat projections



Hazard areas
(RCP4.5)

- 2040
- 2070
- 2100

N

0 100 m

Torreira, Murtosa

First step: **Hazard mapping**

Most retreated line
Provocted by

Shoreline retrat projections

Or

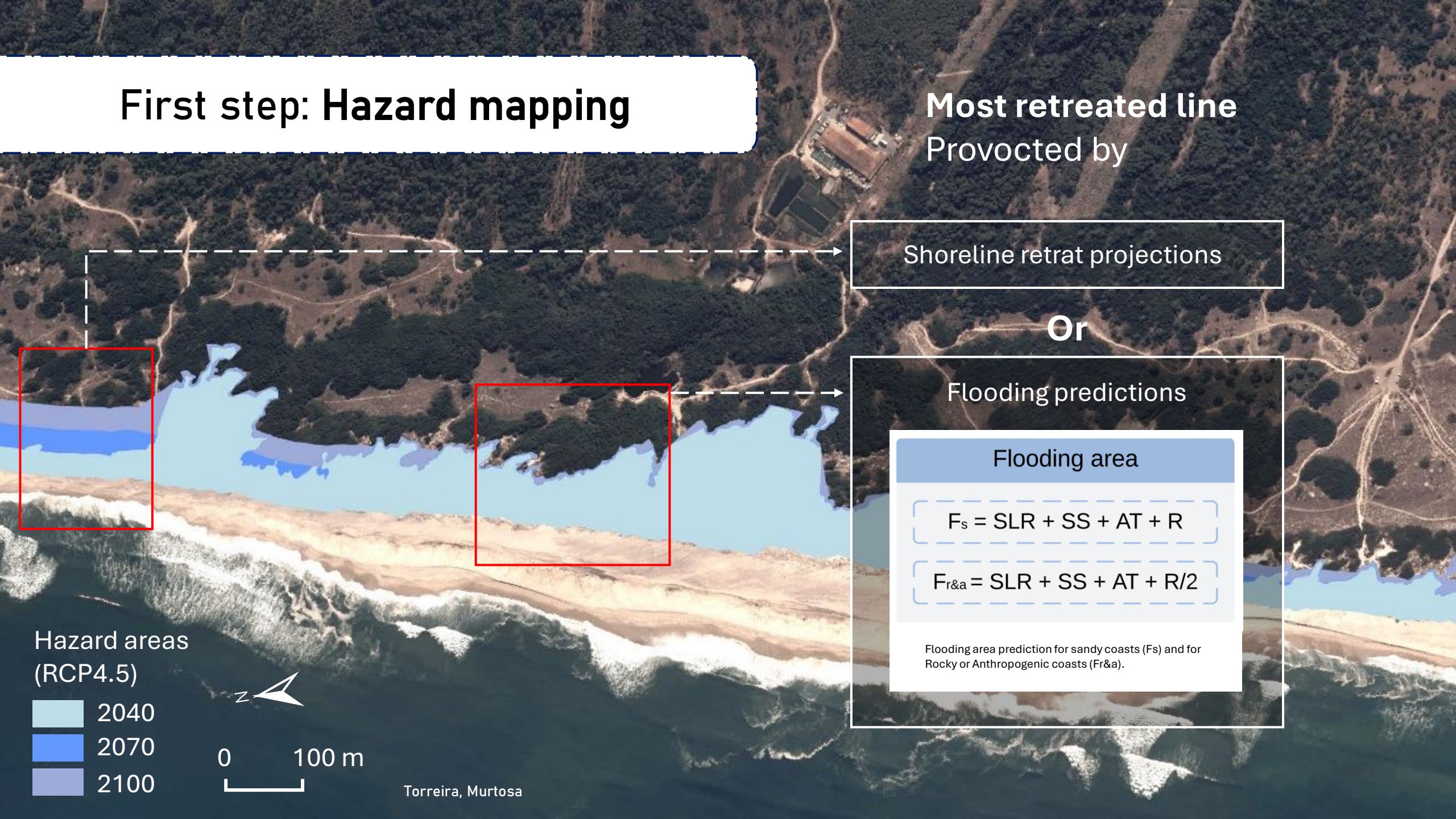
Flooding predictions

Flooding area

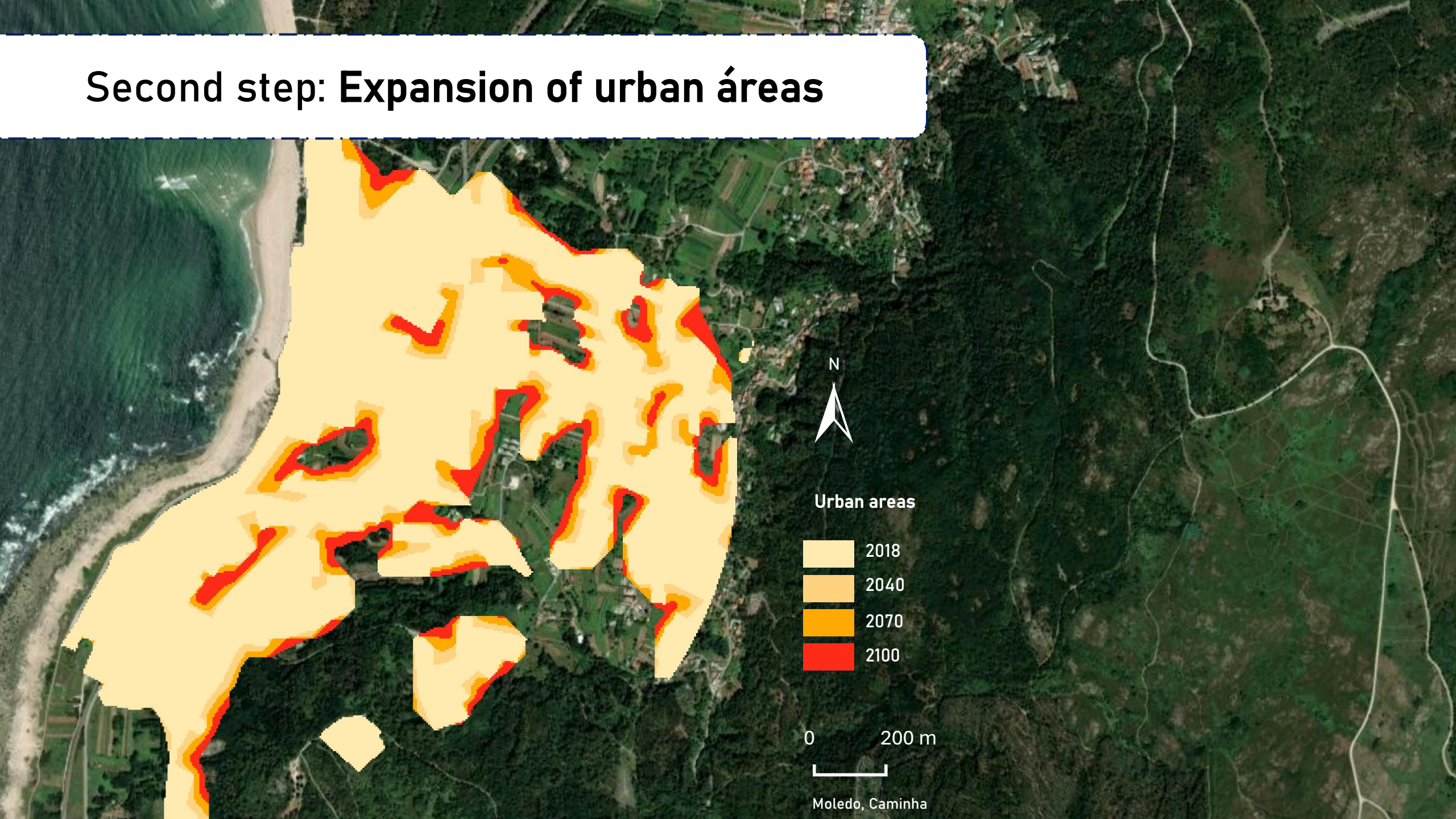
$F_s = SLR + SS + AT + R$

$F_{r\&a} = SLR + SS + AT + R/2$

Flooding area prediction for sandy coasts (Fs) and for Rocky or Anthropogenic coasts (Fr&a).



Second step: **Expansion of urban áreas**



Third step: Definition of priority levels for adaptation

N

Hazard areas (RCP4.5)

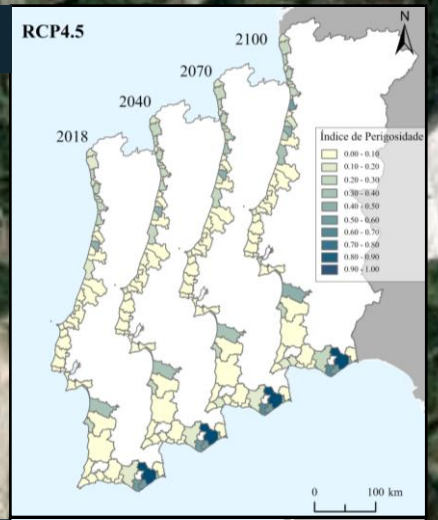
- 2018
- 2040
- 2070
- 2100

Exposed urban areas

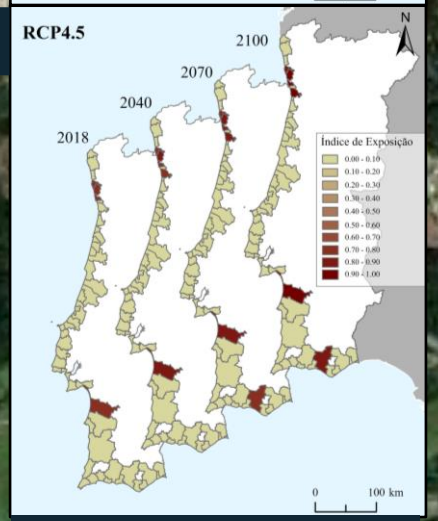
- 2018
- 2040
- 2070
- 2100

Amorosa, Viana do Castelo

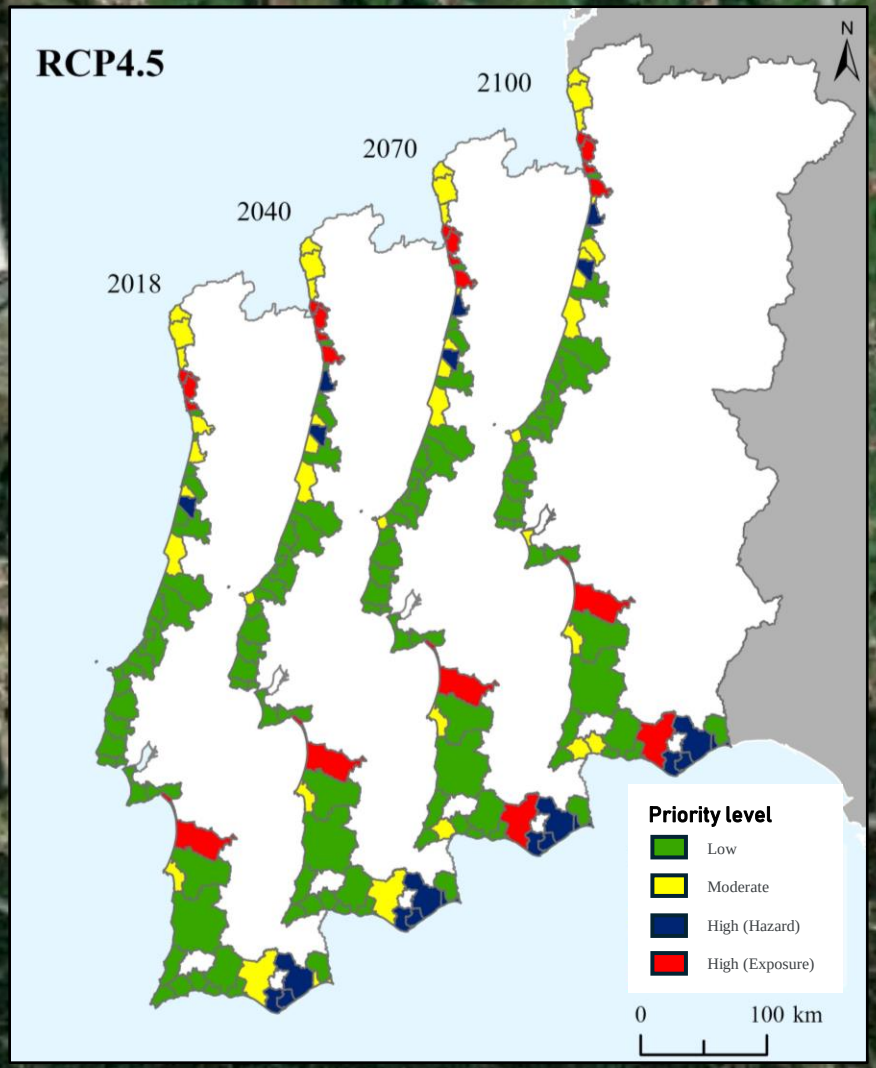
a)



b)



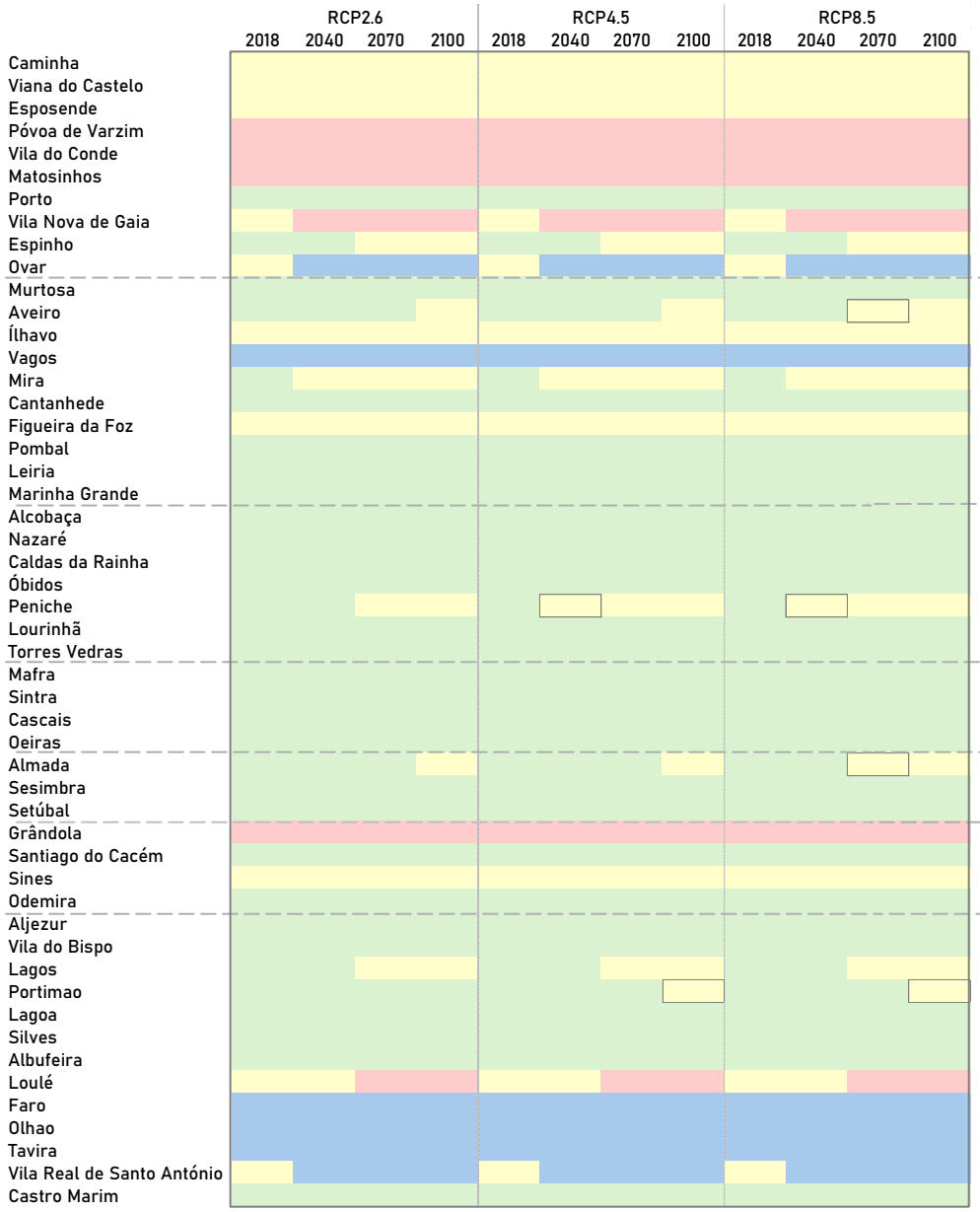
Municipalities profiles for a) hazard, and b) exposure

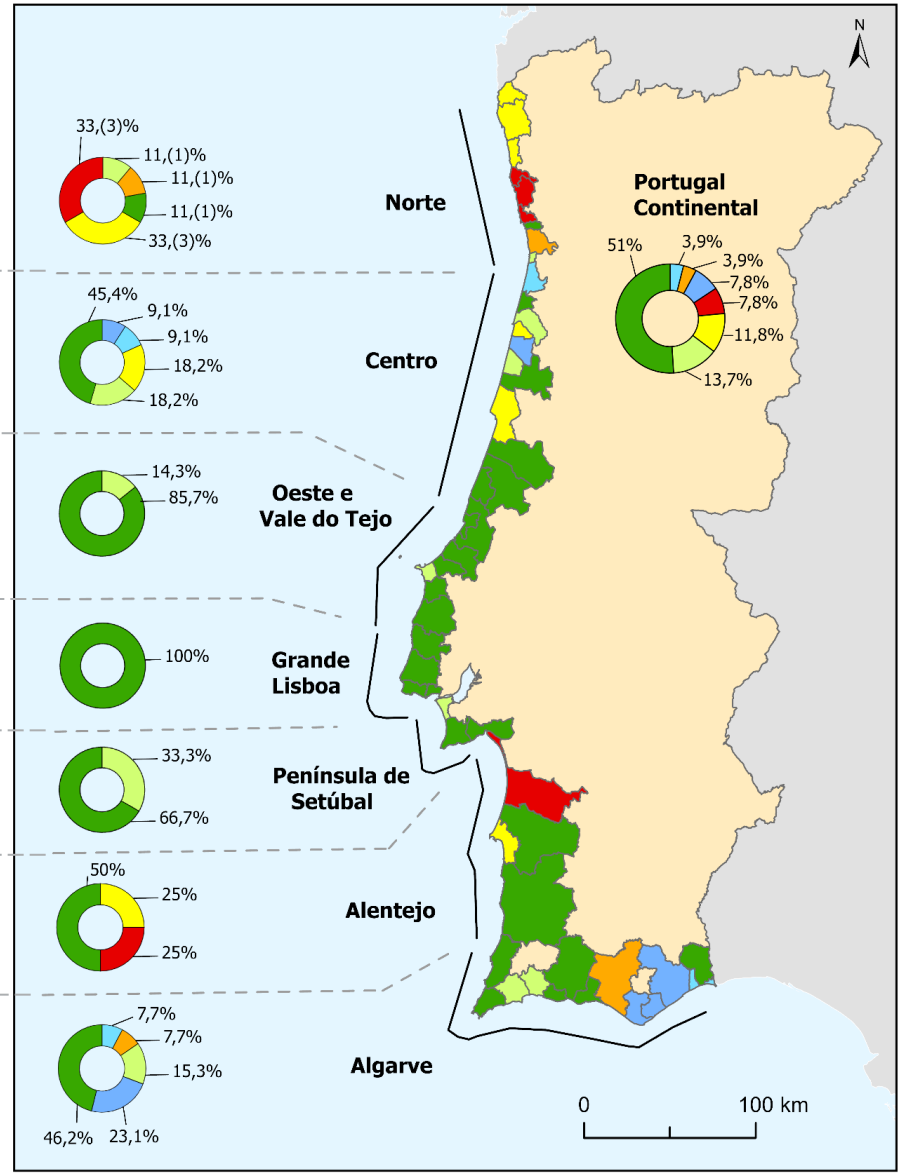


Adaptation levels attribution by relationship between hazard and exposure

Action plan for municipality adapation

Municipal priority levels, in a cartographic summary table, at NUTS II level.

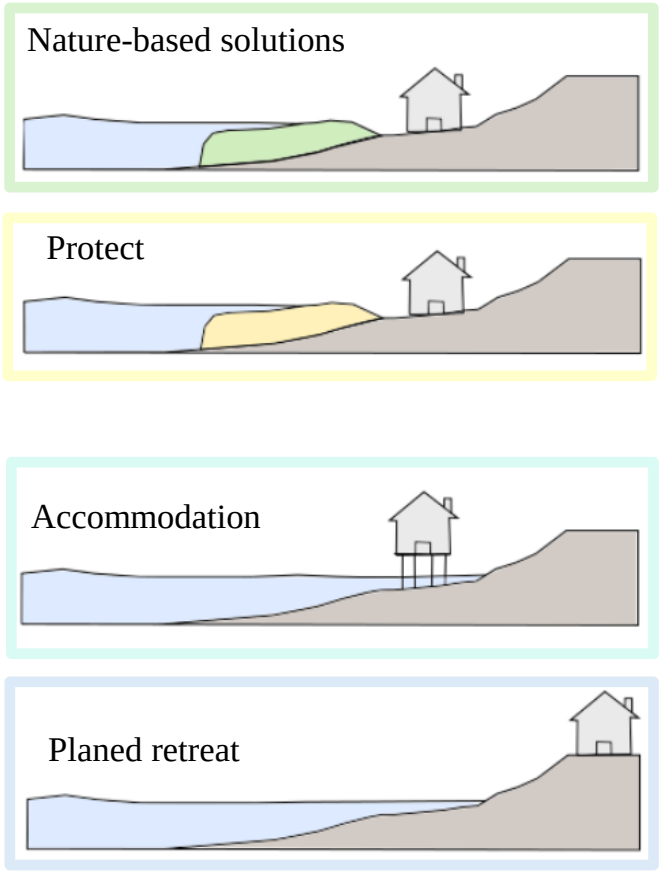


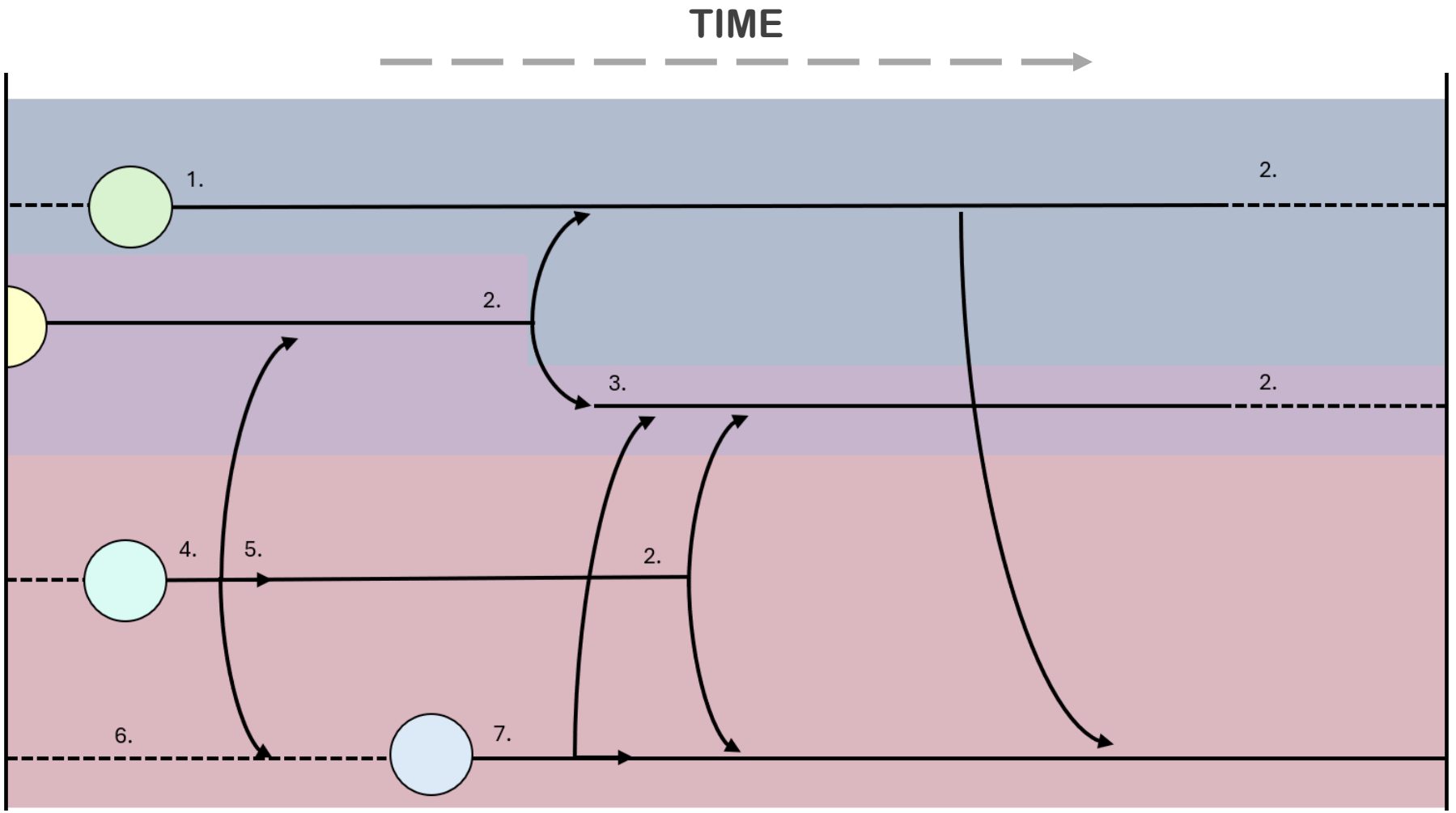


Adaptation plan

Hazard areas
Exposure areas
Hazard and exposure areas

1. Implementation of nature-based solutions (NBS).
2. Threshold of rupture;
3. Hybrid strategy that combines protection and NBS;
4. Preference and implementation of an accommodation strategy;
5. Occurrence of frequent flooding;
6. Retreat planning;
7. Retreat implementation.



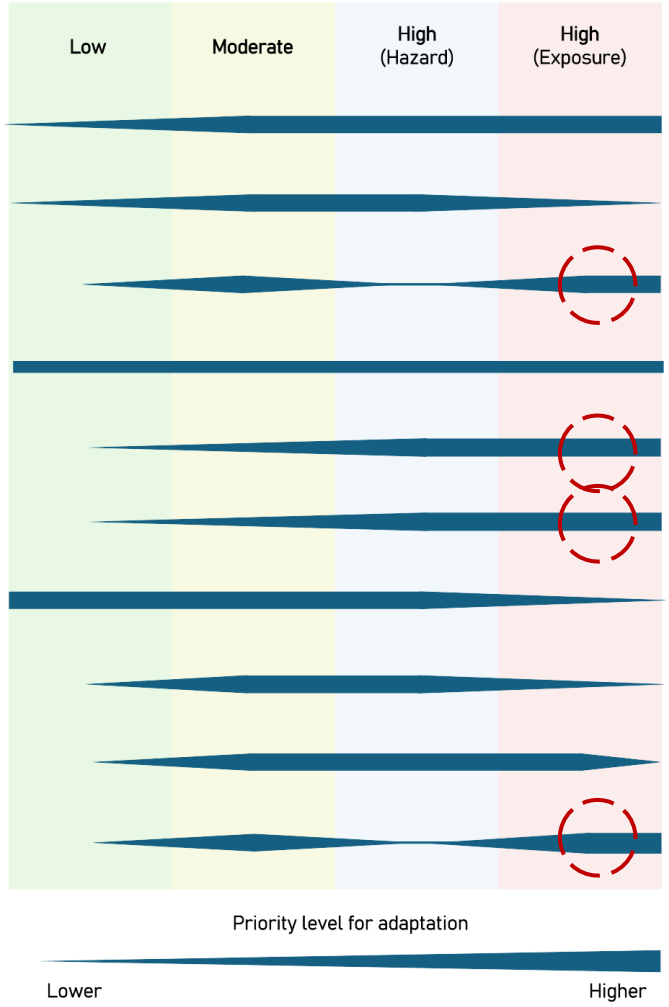


Adaptatition pathways to coastal risks (adapted from Glavovic et al., 2022).

Actions for adaptation to coastal hazards

Adaptation actions to coastal risks

Preventive actions	Studies of socioeconomic impact for identifiation of the viability of the adaptation strategies;
	Studies on the effectiveness of adapting the cultivation of different agricultural crops;
	Planning of coastal urban centers to prevent groundwater contamination;
	Implementation of literacy for coastal hazards during intergenerational workshops for raising awareness among local communities;
	Implementation of Early Warning Systems;
	Investment in research and monitoring;
NBS	Implementation of Nature Based Solutions (NBS);
Protection	Implementation of hybrid strategies of protection and NBS;
Accommodation	Accommodation of fishing communities;
Planned retreat	Planned retreat for exposed urban areas.



Municipalities intervention measures and the priority level for the adaptation levels of priority.

This work was conducted under the **HighWaters project – Assessment of exposure scenarios and social vulnerability to sea level rise for the sustainable use of the territory** (Ref.: EXPL/GES-AMB/1246/2021), funded by the Foundation for Science and Technology.

Discover more information about the highwaters project at:

Read the full document here:

Thank You!

andreia.silva@colabatlantic.com