

PhD Open Days



ADAPTATION TO CLIMATE CHANGE IN ESTUARINE ENVIRONMENT

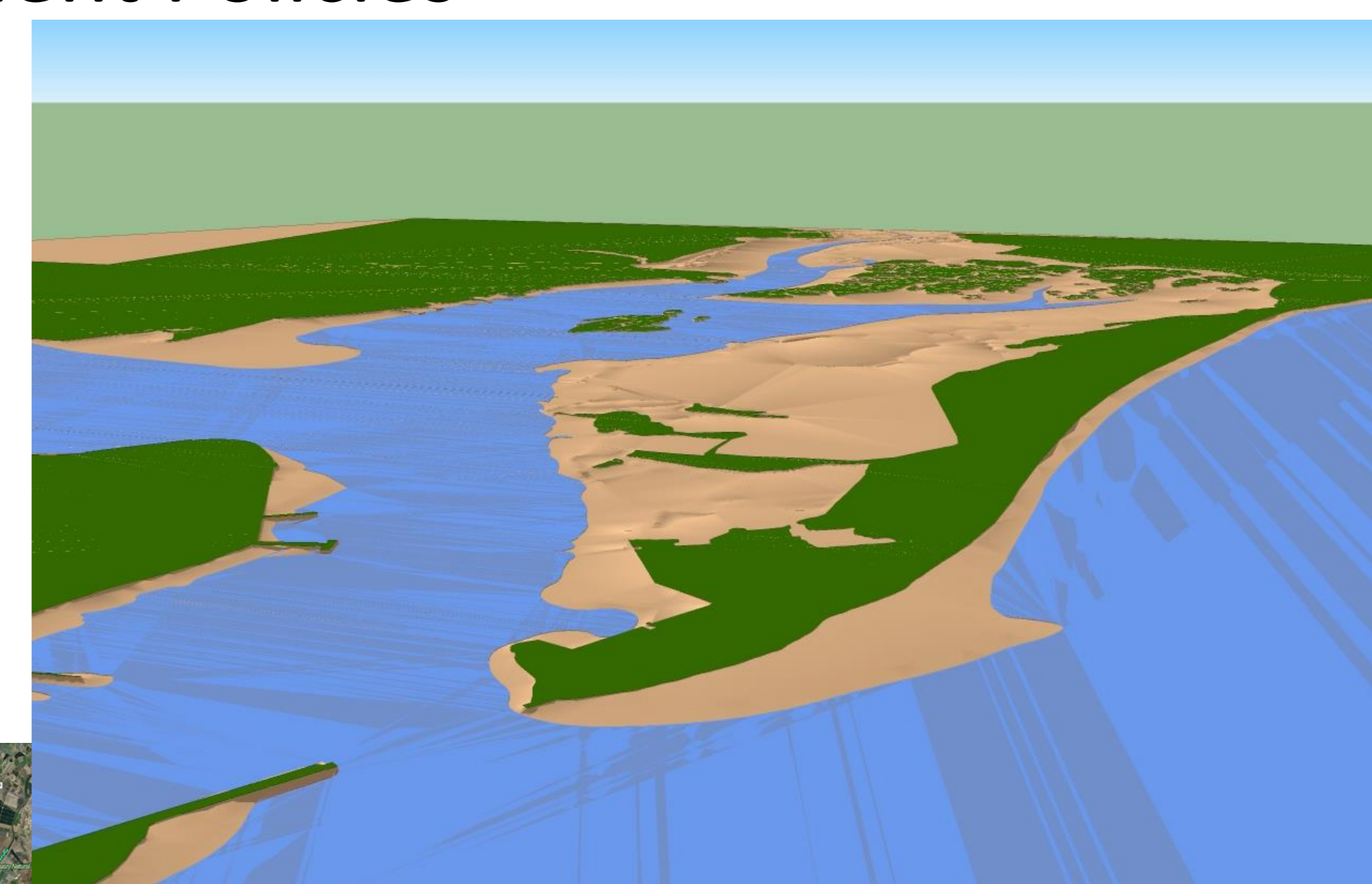
PhD Program in Climate Change and Sustainable Development Policies

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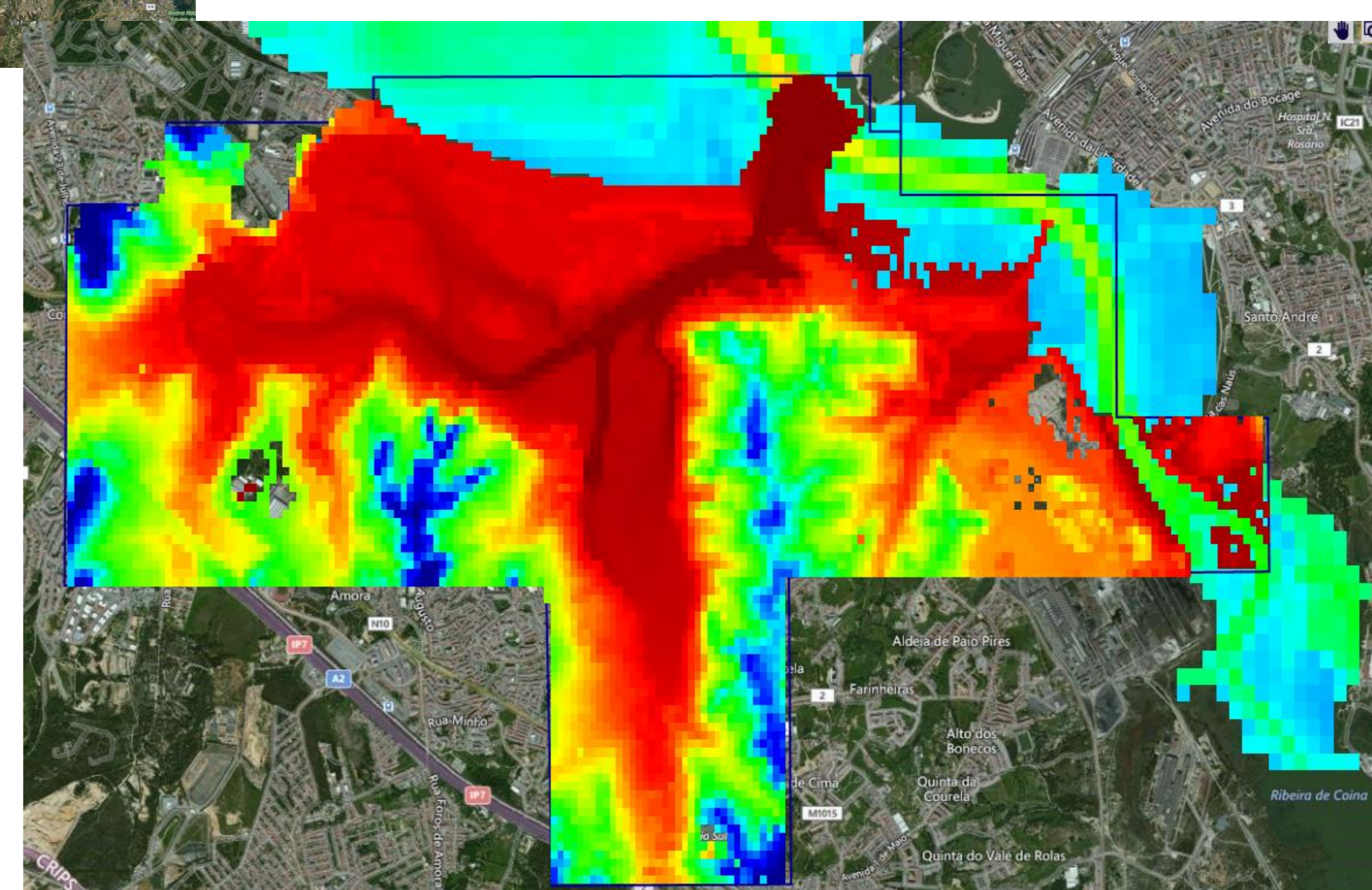
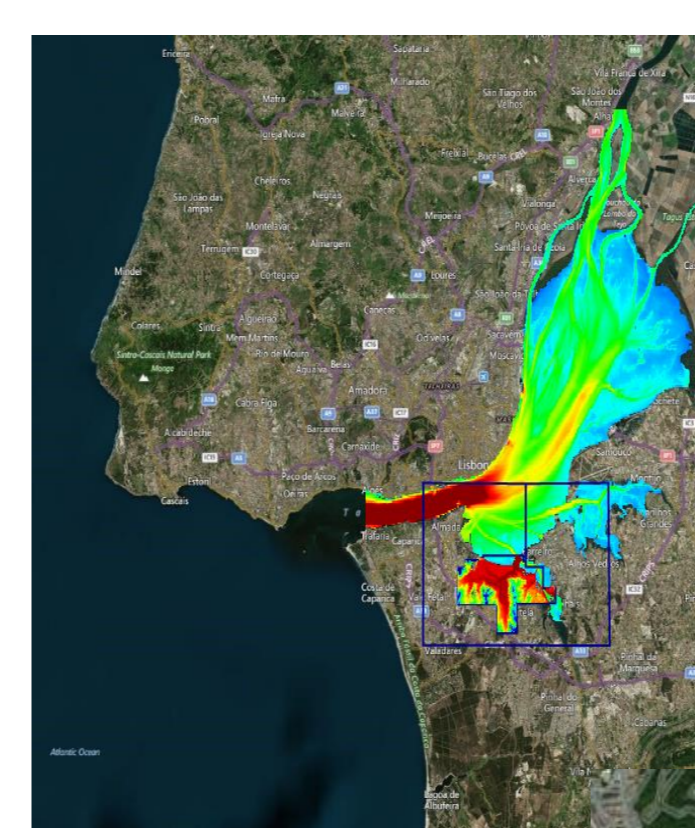
In a Climate Change scenario, the mean sea level rise (MSLR) and increase in the frequency and intensity of extreme events, coastal erosion and the loss of coastal natural defenses is a concern, as the effects are already being felt and going to be worse. It is necessary to act and find adaptation measures.

This gap in the systematization of coastal adaptation options, particularly in estuarine environments, is developed in this work, as well as its application to a specific case study, the Bay of Seixal, in the South side of the Tagus River. A flat estuarine bay with both: urban and natural areas in risk of flood in the next fifty years.

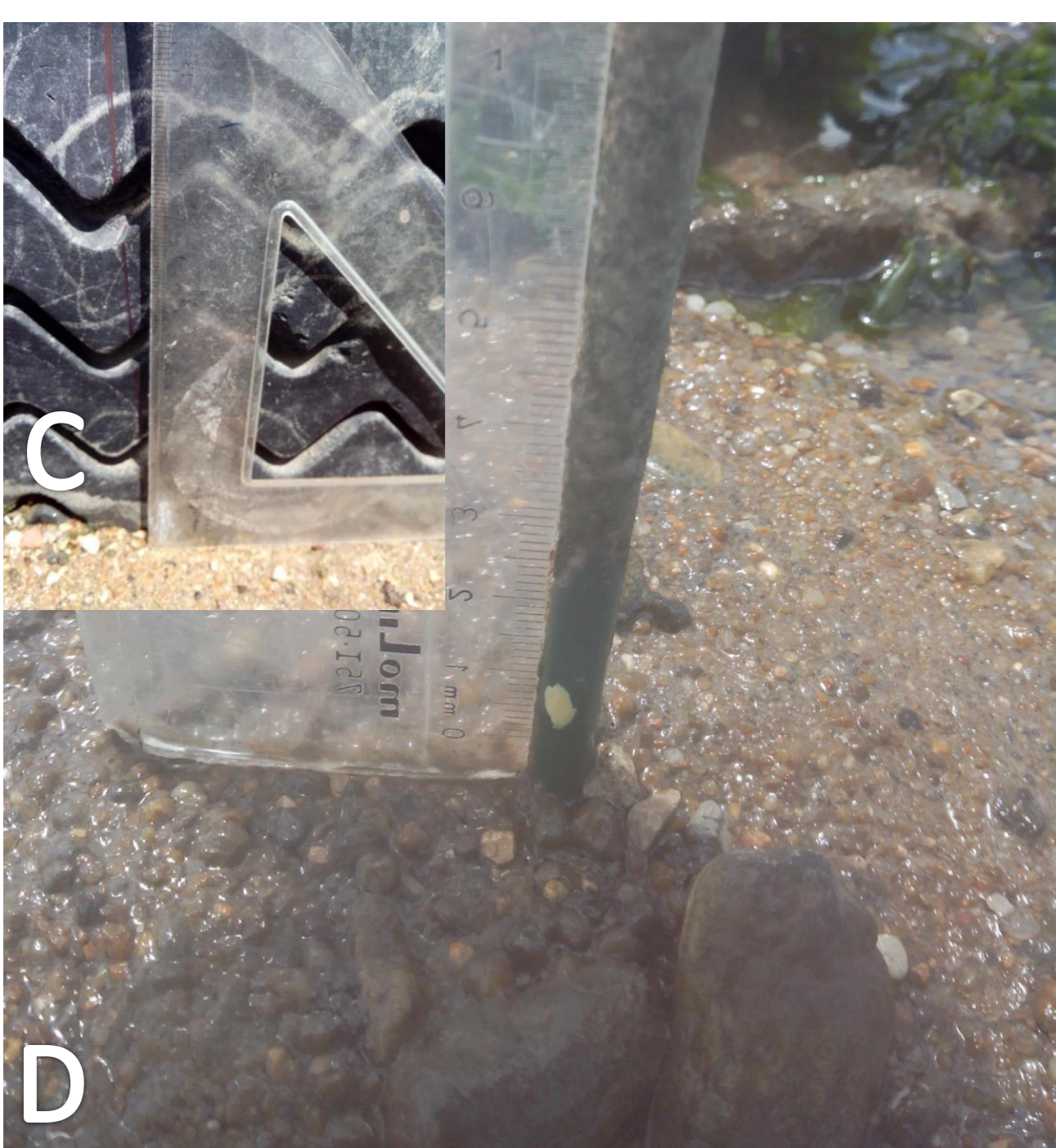
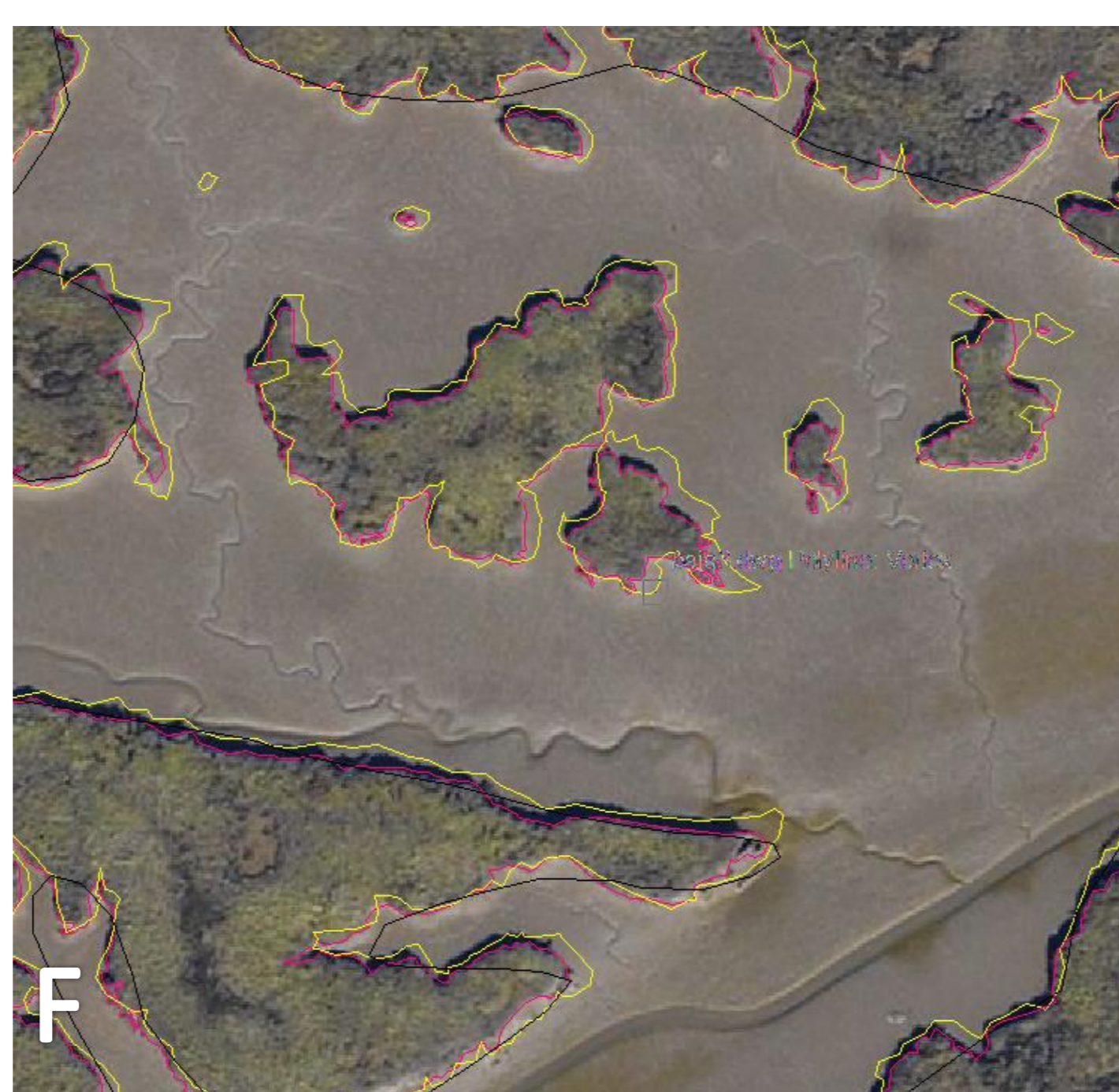
With the MSLR, the natural lower areas are the first at risk of disappearing, like a very important saltmarsh zone. Actually, the observations made for this thesis, saltmarsh is already in regression and destruction in all the bay, as well as the erosion and the retreat of sediments. That's why my research also includes measures to work around this situation and make the natural defenses more resilient.



Modeling: Mohid Water Program, Hydrodynamic 3D model: study of waves, currents, flood and sedimentation in Seixal's Bay (5x5m)



In situ analysis:
A/B Retreat of marsh in 1 year (2015/2016)
E Dune erosion (Winter 2015)
C/D Loss of sediment layer
-1cm to -2cms, in 1 year (2015-2016)
F Orthophotomaps' analysis: 1998/2013
G/H 2017 *in situ* with GPS
Generalized retreat of marsh, can be > 3m



The purpose of this thesis is to study the different ways of adapting to sea level rise, and to study, analyze and systematize different technical solutions for coastal protection in the estuarine environment, ranging from the most heavy and costly ones (such as walls, dams, sluices, etc.) to the softer ones (using natural defenses of coastal ecosystems, such as sediments and salt marsh vegetation) and both (mixed solutions). The use and empowerment of these natural resources is a low-cost solution that has been increasingly supported, with good experiences and with good results around the World. In this way, the thesis will focus in particular on the salt marsh ecosystem and dynamics, a living, flexible and adaptable system that can follow the MSLR as long as it has the conditions to do it (sediment support), thus maintaining its coastal protection function and all other functions and ecosystem services, such as biodiversity support; its role in Mitigation as long term cycle CO2 sequestrant, among others.

Using and combining natural living, or not, defenses like salt marshes and sediment with constructed coastal defenses, a coastal solution can be more resilient in time, cheaper and win win solution for Adaptation and Mitigation comparing to a unique defense. So, the stud, evaluation and project of coastal defense adapting solutions, and applying them to a case study, evaluating the local capabilities and receptiveness to execute them, is the aim of this theses, so that other professionals can count with some reflections, experience and conclusions about the different estuarine coastal defense solutions, that are not exhaustible and need constant monitoring, reassessment and imagination.

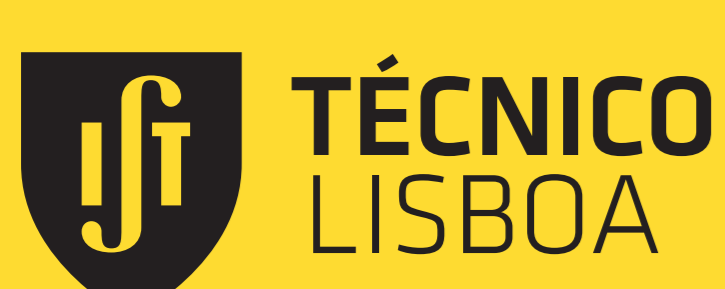
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Example of mixed solution in Seixal's Bay



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