

16TH INTERNATIONAL CONFERENCE LITTORAL22
12 – 16 SEPTEMBER 2022 @ COSTA DA CAPARICA, PORTUGAL

BOOK OF ABSTRACTS



16th INTERNATIONAL CONFERENCE
LITTORAL 22
12 - 16 SEPTEMBER | COSTA DA CAPARICA, PORTUGAL
ADAPT OUR COAST FOR A SUSTAINABLE FUTURE



Title

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Abstracts are organized by chronological order of presentation.

December 2022





COASTAL COLLABORATIVE COMMUNITIES OF CHANGE

Coastal areas are very dynamic ecosystems that have been crucial for human activities for centuries. With the increase of population density in coastal areas, several environmental problems arise, namely pollution, overfishing and habitats degradation, among others, causing losses in biodiversity and ecosystem services.

Besides the pressures caused by humans, coastal areas and its communities are also exposed to extreme events, that endanger population and coastal infrastructures, causing economic and environmental losses. Climate Change will aggravate these issues. In fact, according to the Intergovernmental Panel on Climate Change, sea-level will rise in the next century, and storms will become more energetic and violent, with increased frequency. This will increase the risk of overtopping and flooding, as well as the damage and destruction of structures and dune erosion.

Urgency to act combined with the large-scale societal changes call for new solutions in every sphere of our societies. For this reason, the Littoral22 conference was a multidisciplinary event that aimed at addressing these issues in an integrative and comprehensive manner. This conference brought together delegates from 27 countries to collaborate and discuss the most current coastal research studies and projects.

The discussions and knowledge that emerged from the conference represent an invaluable resource for coastal scientists, engineers, and managers and are all compiled into this Book of Abstracts.

Besides the Book of Abstracts, [the Costa da Caparica commitment](#), developed in partnership with Coastal and Marine Union (EUCC), MARE – Marine and Environmental Sciences Centre/ARNET – Aquatic Research Network, and the Municipality of Almada, was one of the main products of the Littoral22 Conference, and should be an example for coastal collaborative communities of change worldwide.

ADAPTING FOR A SUSTAINABLE FUTURE

COSTA DA CAPARICA COMMITMENT

The excellence of the works presented and discussed allowed the organizing commission to collect a set of principles, from which the seven key ones were selected and named "Costa da Caparica Commitment for Local Climate Action - Commitments for a coastal community sustainable, resilient and adapted to climate challenges".

The principles, fully aligned with the United Nations Sustainable Development Goals (SDGs) are:

1. Quality of life
2. Resilience to hazards and security
3. Institutions, social and intergenerational equity
4. Economic Vitality
5. Decarbonised mobility
6. Environmental quality

The Commitment was approved in plenary at the closing session of Littoral22, by the delegates present and by the representatives of the City Council of Almada, FCT NOVA, MARE/ARNET, and EUCC.

Costa da Caparica Commitment

COASTAL COLLABORATIVE COMMUNITIES OF CHANGE

ADAPTING FOR A SUSTAINABLE FUTURE

QUALITY OF LIFE

A community with universal access to essential services, including housing, food, health, jobs, security, education. A community that is socially less vulnerable to the impacts of climate change. A community with climateresilient livelihoods

RISK SECURITY AND RESILIENCE

A community that is less vulnerable and more resilient to the hazards and risks associated with climate change and natural and technological disasters. A community whose safety is underpinned by a community strategy and actionplan for climate change adaptation, response, relief and security. A community with a warning system for extreme events.

INSTITUTIONS, SOCIAL AND INTERGENERATIONAL EQUITY

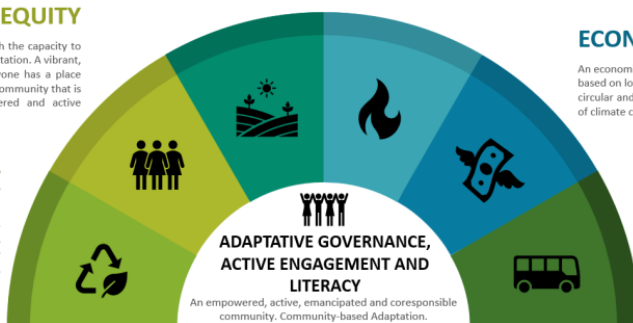
A local civil society and government institutions with the capacity to implement public policies that promote climate adaptation. A vibrant, harmonious and inclusive community, where everyone has a place and a right to personal fulfillment and happiness. A community that is fair in adapting to climate change. An empowered and active community.

ECONOMIC VITALITY

An economically fulfilled community based on a decarbonized economy based on local resources and values. A community that bets on the blue, circular and more adaptive economy and less vulnerable to the impacts of climate change

ENVIRONMENTAL QUALITY

A community with access to a green and blue infrastructure that promotes quality ecosystem services and high biodiversity. A community with access to quality public spaces, housing, water, sanitation and air. A community better prepared to adapt with nature-based solutions to climate change.



DECARBONIZED MOBILITY

A community with access to a public transport network and a soft mobility network promoting efficient and decarbonized connectivity

José Carlos Ferreira
 NOVA University Lisbon / ARNET / MARE
 (Chair of the Organizing Committee)



Susceptibility and exposure to sea level rise in the Sado estuary and in the Arrábida coastal zone

Thursday, 15th September - 10:30: (Costa Azul Room) - Accept for Poster

Prof. José Zêzere¹, Prof. Sérgio Oliveira¹, Prof. Susana Pereira¹, Prof. Raquel Melo², Dr. Pedro Santos¹, Prof. Eusébio Reis¹, Prof. Ricardo Garcia¹, Prof. Jorge Trindade³, Dr. Rita Morais¹, Prof. Jorge Rocha¹

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1. INTRODUCTION

Sea level rising is a major driver of three climate hazards in the Sado estuary and in the Arrábida coastal zone: estuarine flooding, coastal flooding and cliff retreat.

In this work, the susceptibility to estuarine flooding, coastal flooding and cliff retreat is assessed for the present and at the end of the century, for the SSP2-4.5 and SSP5-8.5 emission scenarios. The exposure of people and assets to the considered climate hazards is assessed for both the current climatic conditions and those projected for the end of the 21st century.

2. METHODS

The susceptibility to present-day estuarine flooding was assessed based on the delimitation of the 100-year return period flood in the Sado estuary, produced by the National Laboratory of Civil Engineering (LNEC), whereas the susceptibility to current coastal flooding and cliff retreat was based on data provided by the Portuguese Environment Agency (APA) that supported the Espichel - Odeceixe Coastal Zone Program (POC).

The areas affected by coastal flooding were identified considering the coastline dynamics and evolution over the last decades, the ongoing sea level rise, the storm surge and the wave runup in storm conditions (Silva et al., 2013a, 2013b). Although the overwash, promoted by runup, will not cause a permanent flood, it is considered in this work because it will directly affect exposed people and property, particularly in urban areas. As a rule, a flood elevation of 8 metres above mean sea level was used as a reference, considering the variation in mean sea level, the maximum astronomical high tide, the maximum-recorded storm surge and the wave runup. This value is in line with those obtained for the coastal zone of Sintra and Cascais municipalities' (Marques et al., 2009; Taborda et al., 2010).

The areas susceptible to cliff retreat were identified taking into consideration the inventory of 86 landslides (rockfalls and shallow slides) that were inventoried based on aerial photo interpretation and field surveying, along the coastal cliffs between the Cabo Espichel and Setúbal. In addition, susceptibility to cliff retreat considers the risk zones adjacent to the cliff face, provided by the APA, defined according to the geological and geomorphological characteristics of the cliffs (Penacho et al., 2013a, 2013b; Marques et al., 2013).

The susceptibility evaluation of estuarine flooding, coastal flooding and cliff retreat by the end of the 21st century considers the projections provided by NASA and the IPCC, which indicate sea level rises along the Portuguese coast of 0.59 m and 0.79 m, respectively for the SSP2-4.5 and SSP5-8.5 climate scenarios. The modelling provided by the Coastal Risk Screening Tool of Climate Central [<https://coastal.climatecentral.org/>] (Kulp and Strauss, 2019) was also considered, adding the local effect of moderate flooding with 10 % annual exceedance probability to sea level rise (Muis et al., 2016).

The assessment of exposure to sea level rising was carried out for roads, railway, residential buildings, resident population and strategic, vital and/or sensitive facilities. The road and railway networks were obtained and classified from the Open Street Map Geofabrik. Residential buildings were obtained from the Portuguese

Building Georeferencing Base (BGE). The resident population *per* building was estimated by dasymetric crossing between the BGE and the respective 2011 Census tracts (Garcia *et al.*, 2016). The location of strategic, vital and/or sensitive facilities was provided by the City Halls of Setúbal, Sesimbra and Palmela.

3. RESULTS

The area affected by current estuarine flooding covers 1378 hectares of predominant marshland together with low elevation areas that follow the mouths of the tributary streams on the right bank of the Sado river. This is the case of the Livramento stream, which has a subterranean course in the lower part of the city of Setúbal. The projected estuarine flooding for the end of the 21st century increases by about 80 % with respect to the current one and will not differ significantly depending on the climate scenario (3566 ha in SSP2-4.5 and 3626 ha in SSP5-8.5). This increase will affect densely urban areas on the riverfront of the city of Setúbal.

The coastal flooding currently affects the narrow constrained sandy beaches along 44.3 hectares in the Arrábida coastal zone. The area susceptible to coastal flooding projected for 2100 increases by more than 100 % in relation to the present and will not vary substantially depending on the climate scenario (88.64 ha in SSP2-4.5 and 89.55 ha in SSP5-8.5). The projected scenarios will affect the central low part of the urban area of Sesimbra village.

Coastal cliffs are the dominant coastal system in the Arrábida chain. Currently, coastal erosion and cliff retreat affect 714.23 hectares along the Arrábida coastal zone. The area projected as susceptible to coastal erosion and cliff retreat in 2100 will increase about 40 % with no measurable differences between climate scenarios. In 2100, the total dangerous area will cover 992.45 hectares, which includes the area currently subject to coastal erosion and cliff retreat.

Currently, there are 94 residential buildings and 110 inhabitants exposed to the considered hazardous processes in the Sado estuary and along the Arrábida coastal zone. There is only one strategic, vital and/or sensitive facility exposed. In addition, exposed roads and railways account for 12.9 km and 0.2 km, respectively. These features will increase to 764 residential buildings and 1902 inhabitants by the end of the century for the SSP2-4.5 scenario, considering present occupation. In this climate scenario, the number of strategic, vital and/or sensitive facilities exposed will increase to 22, and the exposed roads and railways will increase to 31.9 km and 7.8 km, respectively. In SSP5-8.5 scenario, the exposure will be higher by the end of the century, with 894 exposed residential buildings and 2204 exposed inhabitants. In line with these features, there will be 34 exposed strategic, vital and/or sensitive facilities, and the exposed roads and railways will increase to 33.7 km and 8.3 km, respectively.

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