Factsheet: Coastal Erosion

What is Coastal Erosion?

Coastal erosion is the landward displacement of the shoreline caused by net loss of sediments transported away by waves and currents. In coastal cliffs, erosion can be the result of subaerial processes that cause landslides and rockfalls. Coastal erosion is a natural short-to-long-term process, but climate change and human activities can alter these natural processes and accelerate and intensify erosion. Erosion can produce negative impacts, such as the loss of beaches, land and property and damage to structures[1]. Coastal erosion is a global problem with environmental and socioeconomic impacts affecting almost every country around the world having a coastline[2].

Two coasts, two landscape-changing forces. Left: a lava flow reshapes the shores of La Palma. Right: the Múlafossur Waterfall carves the cliffs of the Faroe Islands.

Why is it important?

In recent decades, a growing trend has emerged: populations are increasingly concentrated in coastal regions and tourism has aggravated this trend. In 2011, 41% of Europe's population (206 million people) lived in the coastal regions of 23 out of 28 EU Member States[3,4]. This phenomenon has resulted in significant alterations to the coastal environment. The demands placed upon coastal resources have intensified, and exposure to coastal hazards, including erosion, coastal retreat, subsidence and flooding, has risen concomitantly. These combined factors constitute some of the most pressing challenges facing coastal communities[3].

Growing coastal populations carve their own imprint on European shores.

Key European projects

- **GSEU – Geological Service for Europe**: a major EU-funded initiative bringing together 49 partners aimed at developing a sustainable Geological Service for Europe, where coastal erosion is a significant focus. The project is delivering harmonised geological datasets, tools, and services, including those related to coastal vulnerability and offshore wind farm siting.
- **Coastal Erosion Projects (ESA EO4Society)**: projects under the European Space Agency's EO4Society initiative to develop innovative Earth Observation products and methods for monitoring coastal erosion, utilizing data from Sentinel-1 and Sentinel-2 missions[5].
- **EUROSION Project**: commissioned by the European Commission's Environment Directorate-General, this project developed a European Coastal Erosion Layer (CEL) database, characterizing the official coastline of the EUROSION project[6].

Coastal Erosion and Society

How is Coastal Erosion relevant to policy?

Europe's coastlines are incredibly varied, with unique physical features, political systems, economies, and cultures. This has led to a situation where each country has its own way of protecting its coastline. In the past, this approach may have worked well enough. However, it's becoming more difficult to manage coastlines effectively as human activity increases and these areas become more valuable for tourism, defence, fishing, transport, energy transition (windfarms) or protecting natural habitats.

Coastal regions play a key role in the European economy. The EU's blue economy generated a turnover of EUR 624 billion in 2021, based on sectors that directly or indirectly depend on the health and productivity of our seas, ocean and coasts[4,7]. The Marine Strategy Framework Directive serves as the EU's primary instrument for their protection, conservation, and sustainable use[7]. Effective planning for coastal erosion management and mitigation demands the awareness, collaboration, and engagement of scientists, policymakers, and society[8].

Portrane coastal system, North Dublin – an area that has undergone significant shoreline retreat over the past two decades.

Policymakers now face a significant challenge: they need to find a balance between respecting each country's traditions, limitations, and economic needs, while also developing common solutions that can be used by all. This is especially important because managing coastlines effectively now requires not just engineering solutions, including nature-based ones, but also a consideration of the social and economic impacts[8]. Furthermore, the transboundary nature of the marine environment necessitates enhanced cooperation and coordination among member states in formulating coastal erosion management policies.

The role of EuroGeoSurveys

EuroGeoSurveys, through its Marine Geology (MGEG) and Earth Observation and Geohazards (EOEG) Expert Groups, offers crucial advice, support, and geoscience knowledge transfer to tackle coastal erosion challenges across Europe. The objective is to empower governments, industry, and researchers to make informed decisions for the sustainable development, management, and protection of coastal environments.

The MGEG laid the groundwork for the EMODnet-Geology consortium, which, since 2009, has been instrumental in developing the European Marine Observation and Data Network programme established by the European Commission[9]. This project delivers free marine thematic products on European seas and shorelines. Geological, marine resource (aggregates), and coastal behaviour maps and information (erosion and sedimentation, coastal type, vulnerability to erosion and flooding, resilience) with full European coverage are accessible through the European Geological Data Infrastructure (EGDI). These products serve as a valuable tool for assessing and addressing the adverse effects of coastal erosion[9,10].

Towards long-term impact

Improved knowledge of coastal behaviour in response to marine processes and the risk of coastal change is essential for sustainable coastal management amid climate and human pressures. The strategic vision of a permanent **Geological Service for Europe** is key to provide the coordination, scientific capacity, and long-term stability needed to keep this knowledge up to date.

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