

# Risks and vulnerabilities of the Romanian Black Sea coast



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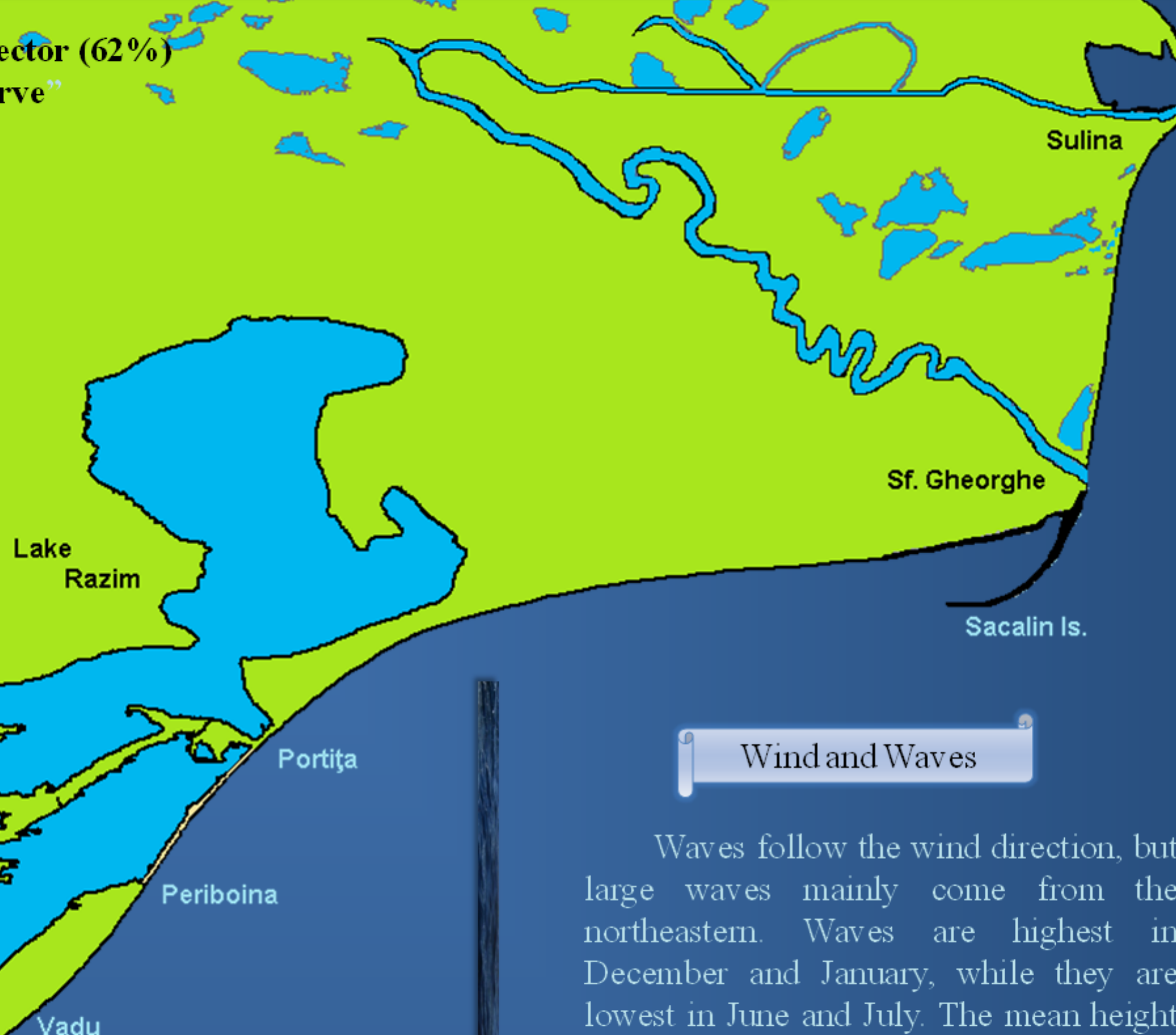
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## The Romanian Northern coastal sector (62%) - is "Danube Delta Biosphere Reserve"

The Danube Delta has been formed during the late Quaternary period, especially in the Holocene. Large supply of the sediment by the Danube has expanded the deltaic area and helped the growth of several sand spits toward the south.

Lake Razim and Lake Sinoie were originally embayments of the Black Sea, but they became lakes by closure of their entrance with growth of barrier beaches.



## The Romanian Shoreline Changes between 1962/1981-2011



## Wind and Waves

Waves follow the wind direction, but large waves mainly come from the northeastern. Waves are highest in December and January, while they are lowest in June and July. The mean height of the significant waves during winter is 1.2 m, while in summer is 0.8 m.

The shoreline shape varies with lapse of time as calculation progress and the alongshore sediment transport rate continues to change because of the change in the shoreline orientation with respect to the wave direction at breaking.

The rate of the shoreline position change has been analyzed from the shoreline survey data and various topographic maps in the past. Examples of the shoreline change rate (average of respective area); a negative value indicates erosion.

Mamaia North	-0.4 m/year
<b>Mamaia South</b>	<b>-2.0 m/year</b>
Tomis	-0.2 m/year
Eforie Middle	-0.7 m/year
Eforie Sud	-0.6 m/year
Tuzla	-0.7 m/year
Costinești	±0.0 m/year
Olimp - Venus	-0.5 m/year
Saturn - Mangalia	-0.8 m/year
2 Mai	-0.6 m/year
Vama Veche	-0.7 m/year

## Introduction

Romania has a territorial coastline extending over 240 km along the northwestern side of the Black Sea. In the past several decades, however, the Romanian Black Sea shore has been suffering from serious beach erosion.

## Water Level

The annual mean water level in Constanța has steadily rising since the start of the water level observation in 1933 with the mean rate of 2.2 mm/year, which is much larger than those at the stations along the oceans. This rate of the mean water level rise is equivalent to the shoreline retreat rate of -0.18 m/year at Mamaia and -0.08 m/year at Costinești.

## Beach Erosion

Along the long beach of Mamaia, the alongshore sediment transport by waves is estimated as 160,000 m<sup>3</sup>/year northward and 140,000 m<sup>3</sup>/year southward, which results in the net northward transport rate of about 20,000 m<sup>3</sup>/year. This net transport of sediment without new supply is the reason of intensive beach erosion at the south of Mamaia. Sediment transported northward is eventually carried away by the cross-shore currents offshore and lost from the shore area.

The coastal erosion not only threatens the tourism industry in summer season through the loss of beach area but also endangers the safety of housing and public welfare



The danger of cliff collapse is great in certain areas within the Study area; the northeastern shore of Constanța City, the cliff coast of Eforie Nord, and the coast of Eforie Sud are such places.

In the last few years, significant efforts have been devoted to continually improving the cliff side.



Sloping seawall with steps

The Central and Southern sector (38%) is under the pressure of increasing population density, urbanization, coastal industry and offshore production, marine transport, tourism, dumping, coastal erosion, all with negative effects



Cliffside at the 2Mai resort

