

# THE BLACK SEA COASTAL ZONE: PRESENT-DAY STATE AND THREATS ARISING FROM GLOBAL CHANGE AND FROM REGIONAL VARIABILITY

Nicolae Panin

National Institute of Marine Geology and Geo-ecology - GeoEcoMar Bucharest RO-024053, Romania - panin@geocomar.ro

## Abstract

The total length of the Black Sea coastline is over 4 400 km and it belongs to 6 states: Bulgaria, Turkey, Georgia, Russian Federation, Ukraine and Romania. The proposed zoning of the Black Sea coastal zone evidences 17 main zones characterised by different geology and morphology, as well as specific littoral water circulation, sediment drift systems and sedimentary budget. These zones belong to three main morphodynamic categories: (1) low, accumulative coasts mostly related to the rivers mouth zones (mainly sandy complex barrier beaches with strong longshore sediment drift systems); (2) Erosive coasts within lowstanding plateaux and plains, with active cliffs with very narrow beaches in front of the cliffs; (3) Mountainous coasts, with cliffs, marine terraces, land slides, sometimes with sandy or gravely beaches. An overview of the coastal erosion in the Black Sea and of factors controlling these erosional processes is given. The threats to the coastal zone generated by global changes and anthropogenic pressure are analysed. The most vulnerable sections of the Black Sea coastal zone exposed to environmental risks are presented and analysed.

*Keywords : Coastal Processes, Erosion, Black Sea, Global Change.*

## The Black Sea coastline

The total length of the Black Sea coastline is over 4 400 km and it belongs to 6 states: Bulgaria, Turkey, Georgia, Russian Federation, Ukraine and Romania. The Black Sea coastal zone can be divided in 17 main zones characterised by different geology and morphology, as well as specific littoral water circulation, sediment drift systems and sedimentary budget [1].

In a more general approach, the Black Sea coast zone could be subdivided into three main morphodynamic categories, with very specific characteristics and behaviour:

1. Low, accumulative coasts mostly related to the main rivers mouth zones. This type of littoral zone consists of sandy complex barrier beaches with strong longshore sediment drift systems; these zones are generally characterised by isostatic adjustments of overloading by rapid accumulation of sediments (subsidence). To this type belongs the Danube Delta front with a very exposed to erosion littoral of about 240 Km; two sections of the River Dnieper liman - Karkinit Bay unit: the Kinburn spit - Dolgyi Island section (~ 20 Km) and the Tendra spit - Dzharylgatch Island section (~ 137 Km); the Taman - Anapa unit (about 200 Km long); the Kolkhida (Rioni) Lowland where the rivers Chobi, Rioni, Inguri and Supsa have built up their deltas; on the Turkish coast there are the deltas of Kizilirmak, Yesilirmak and Sakaraya rivers, and finally, in Bulgaria, sandy accumulative beaches related mainly to the rivers Diavolska, Kamchya, Provadyiska and Batova, summing about 100 Km.

2. Erosive coasts in front of lowstanding plateaux and plains, with active cliffs in loess and loess-like deposits, sometimes underlyed by older deposits as Pontian limestones, Meotian clays and Sarmatian lumachelles, with very narrow beaches in front of the cliffs. To this type of coasts could be distributed the north-western unit of the Ukrainian coastal zone (from the northern limit of the Danube Delta to the town of Ochakov or the western limit of the Dnieper liman, summing 232 Km), the southern unit of the Romanian coastal zone (Cape Midia - Vama Veche at the Bulgarian border - about 75 Km long), and the northern part of the Bulgarian coast, from the Romanian border to Caliacra Cape (about 50 Km long) [2].

3. Mountainous coasts, with cliffs, marine terraces, land slides, sometimes with sandy or gravely beaches. This type of coasts is generally subject of isostatic and orogenic uplift. To this type are belonging the coasts of Crimea, Caucasus, Pontides, Strandza and Staro Planina Mountains, as well as of Frangensko and Avrensko plateaux [1,2].

## Coastal erosion in the Black Sea: factors controlling the erosional process

The coastal erosion in the Black Sea represents one of the main environmental concerns of the riparian countries. The erosion is controlled by:

a) Global and natural factors. The Black Sea coastlines erosion is strengthened as everywhere in the World Ocean by the global changes and the general sea level rise. The coast erosion will depend on synergetic effect of factors controlling the littoral processes (meteorological regime, wave energy regime, water circulation, sediment supply and drift etc.), global changes and the consequent modification of the energetic level of the coastal sea, general sea level rise and regional characteristics as shoreline morphology, elevation and geologic constitution, subsidence or/and neotectonic regime.

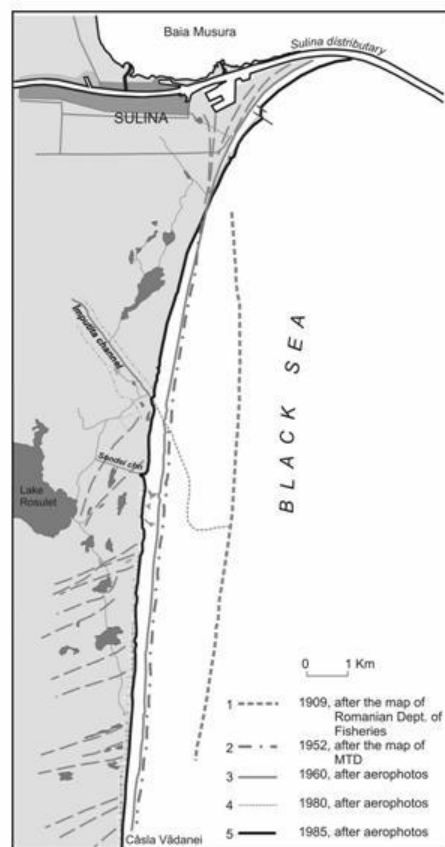


Fig. 1. Erosion of the Danube delta.

b) Anthropogenic factors. The coast zone erosion and the state of the coastal sea ecosystems are strongly affected by anthropic activities, the effect of which is added to the impact of natural factors. The anthropogenic changes of large rivers hydrologic characteristics (water and, especially sediment supply, regularisation of floods etc.), men-made littoral structures as breakwaters, dykes, groins, harbours etc., which are modifying the littoral circulation cells, the uncontrolled use of beach sand, dredging of sand too close to the beaches or within the river mouth bars and many other activities are causing an enhancement of coastal erosion and endangering of the coastal ecosystems.

The low, accumulative coasts (first category of coasts described above) are the most influenced by global change, specifically by the sea level changes and by the changes in the river sediment inputs [1, 3-5]. The decreasing sediment supply and changes in littoral sediment drift due to anthropic activities (river damming, hydrotechnical regularisation, littoral structures