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Coastal Environmental Change
During Sea-Level Highstands:
A Global Synthesis with implications
for management of future coastal change

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Quaternary coastal morphology and sea level changes



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The morpho-sedimentological types of Italian coasts and their susceptibility to sea-level rise: a first approximation

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Abstract

The length of the Italian marine coastline measured on 1:100.000 scale topographic sheets totals 7.912 km. The national territory is composed of the north-south trending peninsula, three major islands (Sicily, Sardinia and Elba) and several small-island archipelagos. Local administration is under the responsibility of 15 coastal *Regioni* and 56 *Province*.

Artificial coasts (EUR 13289, 1998) represent a relevant portion (7.5 %) of the Italian territory, totalling 592 km. Anthropogenic modifications mainly consist of seawalls and ports. Liguria is the *Regione* more extensively affected by artificial coasts (33%) with a cumulative length of 115 km.

Climate, elevation and drainage vary significantly. The Italian coastline is almost entirely within the Temperate zone. One extreme, indicating Subtropical conditions, is located in southern Sardinia, Sicily and southern Calabria, the other, indicating Subcontinental conditions, is located in the northern Adriatic coast. With respect to rainfall only Puglia, southwestern Sicily, and southern Sardinia, suffer Semiarid conditions. The tidal range is mostly within 0,5 m. Only the northern Adriatic sea suffers tidal elevations of the order of 1,0 m.

In the past 50 years the mouths of Italian rivers have been subjected to erosion which is largely the result of the reduction of sediment supply. In the same period long coastal tracts underwent continued erosion (CNR-MURST, 1997) on both linear (e.g., Latina, Metaponto) and narrow (e.g., northwestern Calabria) coastal plains. As a consequence the corresponding beaches are more and more susceptible to surge storm activity.

With reference to the problem of global (accelerated) SLR (Nicholls and Nimura, 1998) Italian research is incipient. Zerbini et al. (1996) discuss 100 yr long time series of T-gauge registrations in the Mediterranean. According to such data SLR shows a linear trend and the rate of the non-tectonic (eustatic) component of SLR applicable to Italy is 1.1 mm/yr.

In areas of land subsidence the relative sea-level rise is particularly relevant (Carbognin et al., 1995). In Venice a local subsidence of 0.4 mm/yr is the most probable future scenario CoRiLa (1999). Coastal plain areas suffer strong human impacts and consequent increased subsidence, especially in the northern Adriatic, northern Tuscany, southern Latium, and Sele and Volturno plains.

It is very difficult to separate tectonically-driven from other types of subsidence. The former is of particular importance in a tectonically active country like Italy where Quaternary coastal areas are subjected to tectonic uplift/subsidence rates of the order of 1 mm/yr. The tectonic behaviour of Italian coastal areas can be summarized as follows (Ambrosetti et al., 1987).

- Stability or moderate uplift: coastal territories of Puglia, north and central Latium, Sardinia and southern Sicily;

- Uplift: mostly confined in Campania (Cilento), large portions of Calabria and northwestern Sicily;

- Differential terrestrial uplift and shelf subsidence: scattered all around the peninsula and Sicily;

- Subsidence: widespread, particularly in the northern Adriatic coasts. From cartographic comparisons in the first 60 years of the 20th century the coastal plain subsided from -3 mm/yr (Romagna) to -8 mm/yr (delta top).

The definition of Sensitivity given here is confined to physical changes and ignores socioeconomic and ecological aspects (Shaw et al., 1994). Thus, Sensitivity means the likelihood that physical change will occur, a definition which is almost equivalent to the concept of Vulnerability. Sensitivity is preferred here because of the simplifications introduced in the incorporated variables and their adaptation to the Italian-Mediterranean peculiarities (e.g., microtidal regime).

The Coastal Sensitivity Index (CSI) is calculated for the 1:100.000 scale topographic sheets covering the Italian marine coasts.

A GIS technique is used to measure coastal properties. The scored variables are from two lines of analysis, related with morpho-sedimentological aspects and wave climate plus shoreline tendency. The former incorporate relief, rock type, coastal and shelf landforms, sediment transport pattern.

Rocky coasts are widespread and total 59 % of the Italian coastline. The low-lying sandy coasts essentially coincide with the geographic distribution of alluvial plains and total 36 %. Deltaic coasts total 5%. The rocky coasts are subdivided into 73 % hard cliffs and 27 % soft cliffs. The latter are 24 % siliciclastic, 2 % calciclastic and 1 % pyroclastic.

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