



## **Basin modifications and coastal dynamics: the Ionic coast of the Basilicata region, flood effectiveness**

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The sea level and the coastline are particularly mobile elements because they are affected by all the geotectonic, climatic and anthropogenic phenomena in processes at the local scale, at the scale of the physiographic unit and up to the scale of the whole planet. The general climatic conditions prevailing over the last two thousand years have guaranteed general conditions of aggradation of the river mouths and of the silt-ing coastal areas, as documented by the position of ancient settlements, with respect to the recent coastlines. These trends are still maintained today in areas which are not densely populated, like the south-western and southern coasts of Turkey, for which for instance no tampering in the internal basins has been recorded. Elsewhere, as well studied on the Ionic coast of Basilicata and on other low coast around the mouth of the Ofanto and Fortore river in Apulia, until a short time ago, tampering by man on the basin and on the coastline itself now show at present significant conditions of changing equilibrium. In some cases they are modifications of the distribution of sediments, with sections of coastline eroded and sections of coastline extending. In other cases, and in that of the Basilicata Ionic coast, it is an huge environmental change, characterised by net erosion (difference between coast area lost by erosion and area of the coast advancing) in exponential progress and in generalized extension of the erosion phenomena to the whole coast. Analysis of the activity of man inside the basins document in detail all of the modifications made to the basins themselves. The evolution dynamics of coastlines has been reconstructed by means of a multitemporal comparisons between coastlines over several years by using aerial photographs. In the first study period (1955-1987), a substantial balance is verified in terms of linear extension of the eroded and advanced coast line, but not in terms of corresponding areas:

this means about 25 hectares of sandy beaches removed from the whole coastline examined in 32 years. In the subsequent decade, starting from 1987, there has been a worrying speeding up of the process of marine ingression to the detriment of the forest beach, where about twice the quantity eroded in the previous period (about 45 ha) disappears in a third of the time. This trend increases in the subsequent period (1997-2003) where about 7 hectares disappear per year. The erosion trend is exponential; it is thought that this is due to numerous factors: in particular reaching steady conditions in the negative balance of mass at the river mouths is no longer balanced by the progressive exhaustion of the sand storage offered by the beaches and the dunes. Among natural and man made causes responsible of coastal dynamics changes, the main have been recognized in the variation in the sedimentary mass balance operated by barrages: as regards the basins on the Ionic Sea, the water catchment system is based on 11 dams and 7 check dams on 4 of the 5 existing rivers. It should be remembered that the deficit of mass at the river mouths in the studied area has been estimated to be of about 3 million m<sup>3</sup>/y . It is important point out that even the alluvial material coming from the lateral watercourses, by entering the main watercourse downstream of the dams, thus theoretically available to the beach fill, does not reach it because the function of flood control, carried out by the dams, significantly reduces the overall flows downstream and thus the transport capacity.. In the above outlined scenario, intense precipitations leading to the complete filling of the reservoirs and to subsequent floodings downstream of the dams may be useful for the removal of the stored sediments along the main river courses and to a insperate quasi-natural coastal plain nourishment. This statement has been verified as true in almost three similar situation that interested in the last time the Sinni river with the large Monte Cotugno dam and reservoir, the Bradano river, with the large San Giuliano dam on the Ionic sea side, and the Fortore river with the large Occhito dam on the Adriatic coast. In the three cases, the reservoirs were completely filled and it was necessary to activate the dam sluices. This condition, together with very intense precipitations, create huge floods, but was also very useful for the transport of sediment to the sea. In the case of the Fortore flood, were completely destroyed near the coastal area the railroad, the motorway and the highway. The necessary interventions of defending the coast, in relation to the performed analysis must be directed at contrasting the deficit of mass with sand nourishments, assisted to reduce the longitudinal and transversal movement and thus increasing the time of persistence of the sediment on the beach. Obviously we think also that artificial controlled floods can help the process of maintenance of the effectiveness of river, without enjoining of the benefits on the beaches coming from natural disastrous floodings.