

## Foreword

# Human Impact on the Coast

## Impacto humano sobre la costa

Man has had an impact on the coastline since earliest times but it has been during the last two centuries (The Anthropocene) when human interference of coastal areas has become, by far, the main factor affecting its geomorphologic evolution. Coastal development for commerce, industry and in recent decades by the widespread migration of people to the coast for settlement and tourism have increased the pressure on this zone. Also, the growing demand for clean energy sources is likely to result in the installation of centres for the development of wind, wave and tidal energy in or near the coast.

Now with the changing climate, sea-level rise, increasing storms and the violence of rainfall, the vulnerability of the coast and its settlements is becoming a matter of growing concern.

It has also been realized that the coastal environment is greatly influenced by changes in the hinterland, particularly in the river basins-deforestation, changing agricultural practices, mining and the development of new cities all have an impact on the coast, even if they are thousands of miles away, by

increasing the flux of sediments, nutrients and pollutants. **Evans** in the first paper of this volume attempts to review some of these changes and influences and the likely future scene.

Rocky coastlines are probably the part of the coast least affected by man. However, **Neves** has shown how the cliffs of Rocha do Gronho, Portugal, have suffered increased erosion due to man-induced changes in the adjacent area and the decrease of beach sand moving alongshore to provide protection of the base of the cliff.

The interference of alongshore transport of sand by the construction of groynes and jetties and the maintenance of dredged channels across the nearshore zone is one which has produced the greatest problems. It has led to the necessity of expensive coastal protection schemes which often have had further repercussions along the adjacent coast. This is clearly demonstrated by **Rodriguez *et al.*** to be a major problem on the Huelva coast, SW Spain. Similarly, **Pedrosa and Freitas** show how recent developments of the Espinho-Paramos coast, Portugal, have resulted in the amplification and propagation of coastal erosion.

Dredging and maintenance of estuarine outlets has become increasingly necessary in order to keep channels free of sediment and to accommodate the ever-increasing size of ships. An interesting subsidiary effect of such activity is described by **Monge-Ganuzas *et al.*** from the Oka estuary, Spain. There, dredging and the dumping of sand on nearby beaches and intertidal areas, to increase the depth of the channel which gives access to a shipyard located on the inner estuary, has modified the ebb-delta at the estuary mouth and also the breaking pattern of the famous "Mundaka left wave". This caused the forced cancellation of the world famous Billabong Pro surf championship with disastrous results to the local economy. Fortunately, the situation has reverted to its former pattern and the famous breaking wave has been restored.

The development of industry in estuaries and coastal inlets has led to a great loss of coastal wetland habitats as well as pollution, all of which produce adverse ecological effects. Interestingly, **Cearreta *et al.*** demonstrate that in spite of the development of the largest oil refinery in Spain in the Muskiz estuary, there is little evidence of chemical pollution, although the loss of coastal habitats is considerable. Similarly, **Irabien *et al.*** show that the Santoña marshes, N Spain, have not suffered the feared chemical pollution due to substantial local development and change in land usage.

In contrast, **Prego *et al.*** show that the human activities associated with the harbours and shipyards of the Galician rias have left a clear geochemical imprint on the bottom sediments. This is severe in the rias of Ferrol and Vigo and, as yet, only moderate in those of Pontevedra and La Coruña. **Freitas *et al.*** show how the changing pattern of mining in the hinterland has led to a decrease of

supply to the Sado estuary, Portugal, which has however unfortunately again increased in parts of the estuary due to the development of an industrial complex.

**Mil-Homens *et al.*** give a clear warning of the widespread influence of human activities beyond the coastline. In spite of the high-energy sandy nature of the continental shelf off Portugal there are local areas of mud accumulation. These are sites of distinct historical enrichment of heavy metals which must come from distant sources and have been spread offshore.

It is hoped that this short collection of papers, covering the various aspects of man's impact on the coastline of Iberia, will help in making more scientists aware of the changes which have already taken place due to human activities. These are likely, unless a great deal of care is taken, to become exacerbated in the future because of increasing coastal development and the predicted climatic changes. The coast is a very fragile environment and both it and the adjacent hinterlands need to be treated carefully unless we will leave a dreadful legacy for future generations.

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