

NEW EXPERT-BASED COASTAL CLASSIFICATION: A GIS TOOL TO COMPARE AND ANALYSE COASTAL REGIONS

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5

A coastline is the area where interaction of the sea and land processes occurs. Coastal areas are very high-dynamic regions, continuously affected and permanently formed by littoral geomorphologic processes (Bird 2008). The configuration of a coast is associated with various factors, such as the geological setting, substrate-lithology, ecosystem characteristics, regional climate, wave and tidal regimes, human development and near shore infrastructure.

To conduct a coastal classification in broad sense is a fairly complex task, depending on the objective of the work. Many different concepts have been applied to coasts in attempts to characterize dominant features in terms of physical or biological properties, modes of evolution, geographic occurrence, among others (Finkl 2004). Also, the need for a better coastal management due to the world-wide human pressures on the coastal zone and the resulting vulnerability when erosion processes and human activity come into conflict, motivated the development of coastal classification criteria that fit different purposes (Finkl 2004, Ihl *et al.* 2006, Appelquist 2013, Appelquist y Balstrøm 2014). Some of the earlier classification approaches were broad in scope but lacked important details while other specialized systems were topically too focused. As a result of more comprehensive studies of coasts and the increasing availability of digital information, such as Geographic Information System (GIS) frameworks, integrated and systematics approaches to coastal classification are now the preferred options (Finkl 2004 y Scheffers *et al.* 2012). Present-day management demands require problem solutions, which overlook and integrate the marine, littoral and terrestrial sphere of the coastal zone.

In this context, the aim of this project is to carry out a comprehensive GIS-based coastal classification scheme in order to provide a basis for a general characterization of the coastal area. This tool is meant to be open for use over coastal regions world-wide and to be further developed through expert knowledge.

The framework uses a simple assessment methodology, considering data and computing requirements, allowing application by any kind of user. Through the software Maptitude, littoral sections are segmented and classified according to six categories: (1) Dominant coastal type, e.g. cliff coast, (2) substrate/geology/lithology at the coastline, (3) man-made coastline modifications, (4) seaward environment, (5) landward environment, (6) type of human development. In the experimenting phase of the project we work on a scale of 1:20.000; however, the scale is flexible and requires adjustment, depending on the overall length of the coastal region under consideration.

At this preliminary stage, coastal areas of Argentina and Germany are classified, with a wide variety of coastal characteristics: the first region has an open coast in the south Atlantic ocean, whereas the German Baltic coastal region shows environmental conditions typical of a nearly closed sea. Based on the differences between these coasts and the lessons learned in this comparative analysis, the proposed coastal classification method has been developed and improved and its general applicability has been tested. As a preliminary result, the Argentine coast is mainly distinguished by two distinct regional sectors, the Buenos Aires and the Patagonian coastlines. In the first region the classification tool records extended modifications due to the development of industrial and recreational infrastructure, geomorphological dominated by sandy beaches and tidal plains, whereas the Patagonian coast, in general, preserves a natural setting without intensive human intervention. The coastal landscape there is characterized by gravel-sand beaches, cliffs and coastal platforms. On the other hand, the classification for the German Baltic coast identified a high degree of human intervention along the coast; thus, in certain segments the original coastal landscape is modified by commercial and military ports, dikes, artificial beaches and marinas, among others.

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The classification method presented here intends to provide a tool for scientists to advance the understanding of coastal systems world-wide and to compare regional coastal settings, e.g. with respect to vulnerability from climate change and sea level rise. The tool may also assist coastal managers in assessing the environmental state of specific coastal areas and in choosing appropriate options for sustainable development there in years to come.

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