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# Regionalization and Evaluation of Impacts of Climate Change on Mexican Coasts

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Mexican coasts exhibit a high variety of geoforms and processes, and consequently, are exposed to a variability of types and impact levels of geological hazards. Tropical cyclones are the most devastating hazards for the Mexican coast, although, impact levels are higher on the southern coast of both Atlantic and Pacific oceans. The second dangerous geo-hazards are earthquakes and tsunamis, which affect all Pacific coast, causing more damage the earthquakes generated in the Cocos Trench. For seismic hazards, there is a regionalization of the Mexican territory, however, even though the high levels of damages caused by other natural hazards, there is a lack of initiatives for performing atlas of natural hazards or coastal management plans. Exceptions are the local scale atlas of natural hazards by the Mexican Geological Survey or some other local scale atlas made with several errors by non experience private consultant companies. Our work shows results of analyses of coastal geological hazards associated to global warming such as the sea level rise, and the increase in strength of some coastal processes.

Initially, due to the high diversity in coastal environments for the Mexican coast, it was considered that, a regional characterization of the coastal zone, and the gathering of environmental data for determining levels of impact of the various coastal hazards, as an evaluation of coastal vulnerability. Thus, the basic criteria for defining Coastal Regions, in order of importance, were the following: geomorphology, climate, geology, tectonics, and oceanography. Also, some anthropogenic factors were taken in account for the coastal regionalization, such as civil construction along the coastline, land used and modification of the fluvial system. The analysis of such criteria, allows us to classify the Mexican coasts in 10 Coastal Regions. On the Pacific coast regions are: (I) Pacific Coast of Baja California, (II) Gulf Coast of Baja California, (III) Coastal Plain of the Gulf de California, (IV) Pacific Southwest Coast, and (V) Chiapaneca Coastal Plain. On the Atlantic coast, regions are: (VI) Tamulipeca Coastal Plain, (VII) Veracruzana Volcanic Coast, (VIII) Tabasqueña Coastal Plain, (IX) Yucatan Platform, and (X) Caribean Coast.

Secondly, the coastal hazards associated to a rising sea level and increasing strength of coastal processes due to climate change, were analyzed, and allowed us to determine, in order of importance, the following hazards: (a) marine flooding, by sea level rise per se and effect of storm surges; (b) beach erosion by waves, causing lose of beach width or the retreat of the whole beach system, and overwash of sand barriers; (c) fluvial flooding of coastal plains and deltaic areas; (d) salinization of estuaries and aquifers by saltwater intrusion.

Finally, after overlying the characteristics of each Coastal Region and its exposition to the identified coastal hazards, we concluded that, Coastal Regions highly vulnerable to sea level rise are number V and VIII, since they show wide lowlands (up to 7 m above MSL), and have high populated areas affected by heavy rain, tropical cyclones and storm surges; regions with moderate vulnerability are number VI, IX and X, which contain lowlands (up to 7 m above MSL), populated areas, exhibit watershed with low sediment production, and are located on the tropical cyclone tracks; regions with moderately low vulnerability are number III and VII, which contain relatively narrow lowlands, important lagoon and deltaic systems, several rivers are affected by anthropogenic activities, and are moderately affected by storms and tropical cyclones; regions with low vulnerability and short coastlines exposed to sea level rise hazards are regions number I and IV, which contain narrow lagoon and deltaic systems; and finally, region II is of a very low vulnerability, with narrow and scarce areas exposed to sea level rise hazards.

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