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Understanding the Effects of Sea-Level Rise on Coastal Wetlands: The Human Dimension

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In the 21st century coastal systems are subject to the pressures of centuries of population growth and resource exploitation. In 2003, in the US approximately 153 million people (53 percent of the population) lived in coastal counties, an increase of 33 million people since 1980 and this is expected to increase by approximately 7 million by the year 2008. Eight of the world's top ten largest cities are located at the coast, 44 % of the world's population (more people than inhabited the entire globe in 1950) live within 150 km of the coast and in 2001 over half the world's population lived within 200 km of a coastline. . Increased population density at the coasts often brings pollution and habitat degradation – decreasing the value of many of the resources that initially attract the coastal development – and it also means the effect of sea-level rise on coastal geomorphic systems must be seen in the context of additional human pressures.

For global sea-level debate centers on the magnitude and rate of the rise around most of the world; the exception being those areas still experiencing falling sea-levels due to isostatic rebound. Many coastal island states are clearly vulnerable. While the 'lurid and misleading maps' of the 1980's used by many to indicate areas to be flooded by rising seas in the future, have been replaced by more considered discussion of the response of coastal dynamics to rising seas there is still considerable debate about the amount of sea-level rise shorelines will experience in the 21st century.

For coastal wetlands four main sets of physical factors - fine sediment regime; tidal conditions; coastal configuration; and relative sea-level change – define the geomorphic context for coastal marsh development and survival during the 21st century. Each of these factors is influenced by changes in climate and human alterations to coastal and inshore environments. In turn changes in sediment dynamics are mediated by both physical forcing and biotic factors, and plant growth is an additional factor influencing the survival of more organic marshes. Salt marsh surfaces are frequently considered to be in an equilibrium relationship with local mean sea level but the projection of salt marsh sustainability under future climate scenarios is a complex issue and depends on: the relative importance of organic matter to marsh vertical development; the complexities governing organic matter accumulation during rising sea level; the importance of subsurface processes in determining surface elevation change; and the role of storm events and hydrologic changes in controlling sediment deposition, soil conditions and plant growth.

The effects of global change, both climate and human induced, on coastal wetlands will be manifest differently among various geomorphic settings but their vulnerability to global change in the 21st century should be taken seriously by coastal managers and policy-makers alike.