

# Climate Change and Coastal Cities, The Imperative Need for Action

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## ABSTRACT

Issues of water security are rapidly becoming of utmost importance for many countries in the 21st century. Many factors are contributing to the water security crisis, including sporadic and intense rainfall events, destructive storm surges, increasing populations, and a scarcity of accessible, potable water. These contributing factors are all evolving to heighten the severity of water security issues and their associated repercussions. However, despite the recognition of these issues at the global level, the issues of water security are most critical in coastal regions.

While the projections of the increases in sea level noted above appear initially as relatively modest (<1.0 m increase in oceans by 2100), one of the most obvious dangers to coastal cities are storm surges. However, while the serious magnitude of impacts of enormous storm surges is widely evident, intensification of the issues related to exposure and vulnerability also require consideration of the implications associated with increasingly large populations in the coastal zones in need of enormous quantities of water supply. The impact of subsidence arising from the extraction of groundwater to meet the water demands for coastal cities is, in many locations, ominous. The 'pave, pipe and pump' philosophy that has dominated areas such as Houston for over a century has resulted in parts of Houston dropping between 3 and 4 m since the 1920s. The relative magnitudes of land subsidence in coastal cities compared to global sea level rise include Tokyo has subsided by 4.2 m, Manila by 1.5 m, and Bangkok by 1.2m.

With increasingly large percentages of the world's population expected to live on, or near, coastlines, there is clear evidence of an evolving water security crisis for coastal cities including, but certainly not limited to, Beijing, Tianjin, Manilla, Jakarta, Dhaka, Guangzhou, Bangkok, Kolkata, Miami, New Orleans, Karachi, Ho Chi Minh City, Lagos, Sao Paulo, and Shanghai. As apparent from the preceding list, the problems of subsidence are not limited to one region of the world but the largest concerns relate to population increases in the Low Elevation Coastal Zone (LECZ) are clearly the largest concerns that need to be addressed.

Issues of the damage potential in coastal zone cities are already of major concern and rapidly intensifying. This presentation will review the relative magnitudes of various types of impacts evident and predicted over the next century, as well as listing a series of possible options in response. A series of lines of evidence are described in the presentation, demonstrating that global warming is both apparent and ominous, resulting in demonstration that water security implications to coastal cities are multi-faceted, including sea level rise and storm surges, land subsidence, and burgeoning 'populations at risk'. No single action will solve the issue and the need exists to act quickly. Hard engineering approaches alone are insufficient. The evidence is widespread that humans are impacting the climate and the environment. Sea level rise is occurring and is recognized as one of the indicators that the global climate is warming. However, no single action will solve the issue, and we need to act quickly.