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Overview: This paper presents an assessment of global sea level rise and the need to incorporate projections of rise into management plans for coastal adaptation. It also discusses the performance of a shoreline revetment; M. Ali Seawall, placed to protect the land against flooding and overtopping at coastal site, within Abu Qir Bay, East of Alexandria, Egypt along the Nile Delta coast. The assessment is conducted to examine the adequacy of the seawall under the current and progressive effects of climate change demonstrated by the anticipated sea level rise during this century. The Intergovernmental Panel on Climate Change (IPCC, 2007) predicts that the Mediterranean will rise 30 cm to 1 meter this century. Coastal zone management of the bay coastline is of utmost significance to the protection of the low agricultural land and the industrial complex located in the rear side of the seawall. Moreover this joint research work highlights the similarity of the nature of current and anticipated coastal zone problems, at several locations around the world, and required adaptation and protection measures. For example many barrier islands in the world such as that in the Atlantic and Gulf of Mexico coasts of the U.S., lowland and deltas such as in Italy and the Nile Delta, and many islands are also experiencing significant levels of erosion and flooding that are exacerbated by sea level rise.

Global Climatic Changes: At a global scale, an example of the effects of accelerated climate changes was demonstrated. In recent years, the impacts of natural disasters are more and more severe on coastal lowland areas. With the threats of climate change, sea level rise storm surge, progressive storm and hurricane activities and potential subsidence, the reduction of natural disasters in coastal lowland areas receives increased attention. Yet many of their inhabitants are becoming increasingly vulnerable to flooding, and conversions of land to open ocean. These global changes were recently demonstrated in autumn 2010 when the storm Becky reached the Santander Bay, Spain. As reported by THESEUS, the FP-7 EU project (2009-2013), the peak of nearshore significant wave height was about 8 m, the storm surge reached 0.6 m, with tidal level of 90% of the tidal range. The latest storm in December 2010, which hit the Nile Delta and which was the severest in the last decades showed that generated surges, up to 1.0 m as well as a maximum of 7.5 m wave height in the offshore of Alexandria presented a major natural hazard in coastal zones in terms of wave run up and overtopping.
Along the US Atlantic Coast, where Hurricane Sandy this autumn and Hurricane Irene in 2011 left chaos in their wakes, a perfect storm of rising sea levels and dense coastal development at high risk . Super storm Sandy sent a storm surge of 4-5 m onto New Jersey's and New York's fragile barrier island and urban shorelines, causing an estimated $70 billion (USD) in damages and widespread misery for coastal inhabitants.

Sea Level Rise and Impact on Upgrade of Coastal Structures: Williams (2013) highlights in his recent paper that adaptation planning on national scales in the USA for projected sea-level rise of 0.5–2 m by A.D. 2100 is advisable. Further he points out that sea-level rise, as a major driving force of change for coastal regions,

is becoming increasingly important as a hazard to humans and urban areas in the coastal zone worldwide as global climate change takes effect. During the 20th century, sea level began rising at a global average rate of 1.7 mm/yr (). The current average rise rate is 3.1 mm/yr, a 50% increase over the past two decades. Many regions are experiencing even greater rise rates due to local geophysical (e.g., Louisiana, Chesapeake Bay) and oceanographic (mid-Atlantic coast) forces. Further the Mississippi River Delta plain region of Louisiana has much higher than average rates of LRSL rise due to geologic factors such as subsidence and man-made alterations to the delta plain, wetlands, and coast. As a result the entire coast is highly erosional and highly vulnerable to sea-level rise and storms. Detailed mapping studies over the past two decades show that subject to sea-level rise, subsidence, frequent major storms, and reduced sediment budget. Sea-level rise, with high regional variability, is exhibiting acceleration and is expected to continue for centuries unless mitigation is enacted to reduce atmospheric carbon. Low lying coastal plain regions, deltas, and most islands are highly vulnerable.
The assessment of Abu-Qir seawall included the review of the current-2011design and past upgrades since 1830. Hydrodynamic analyses were conducted to estimate wave height distributions, wave run up and overtopping over the seawall. Use has been made of the Modified ImSedTran-2D model (Ismail et.al, 2012) as well as universal design standards (EurOtop, 2008). Comparison of the predicted overtopping with the observed wave overtopping volumes during the 8hrs-2010 storm, allowed the verification of the used universal design tools. Based on the results for worst wave design scenarios and anticipated sea level rise after 50 years (50 cm), recommendations are given to increase the height of the seawall cap, to strengthen the beach top and back slope with a facility to drain storm water to increase coastal resilience.

Recommendations: Protection of coastal fringes requires that new design alternatives to protect eroding lowland shorelines of deltas and barrier islands should be explored. These soft engineering alternatives are such as beach nourishment, sand dunes stabilization, and storm barriers. Use of integrated barrier island and coastal lagoons & wetlands would act as a buffer zone to defend main land. The sustainability of the integrated natural systems would require (1) barrier island and shoreline restoration (2) hydrologic and vegetation restoration of coastal lagoons, and (3) relocation of development in highly vulnerable areas. Such adaptation planning and restoration projects will require a major undertaking by national governments and international institutions. Joint research projects between international organizations such as: USA research centers (USGS, NOAA, Corps of Engineers), EU sponsored project groups, EU coastal marine centers as well as other world wide coastal research institutes (CoRI, Alexandria) are encouraged to advance the state of the art on managing coasts to adapt to sea level rise employing cost-effective coastal protection technologies.

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