



Coastal urban flood resilience vs climate change

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Processes of founding and expanding cities in coastal areas have undergone great changes over time driven by environmental conditions. Coastal settlements looked for places above flood levels and away from swamps and other wetlands whenever possible. With time, as populations grew, cities were extending trying to avoid low and wet lands. No city has been able to limit its growth and the systems for protecting against floods have not kept up with the pace of expansion of coastal cities. The risk of flooding can never be eliminated, but only reduced to the extent possible.

Flooding of coastal areas is today dramatically attributed to eustatic sea level rise caused by global climate change. This can be however inaccurate, even being caused by sea waters. Current climate change is generating an average sea level upward trend, but other regional and local factors result in this trend being accentuated in some places or attenuated, and even reversed, in others. Consequently, the intensity and frequency of coastal flooding around the planet originated from the ocean is increasing, although not so much as a unique result of this general eustatic elevation, but rather of the superposition of marine and crustal dynamic elements, the former also climate-related, which give rise to a temporary raising in average sea level in the short term.

Since the Little Ice Age the planet has been suffering a global warming change leading to sea level rise. The idea of being too obeying to anthropogenic factors, as that of being experiencing a significant sea level rise due to it, may be attributed to Arrhenius (1896), though it is of much later highlight after the sixties (Bruun, 1962) of the last century. Never before, in fact, the human factor had been able of such an influence on climate through fossil fuels consumption and land use transforming. As the history of the planet was finely tuned, however, other types of changes in sea levels became apparent, resulting from vertical movements of the crust, modifications of sea basins due to continents fracturing, drifting and coming together, or to different types of climate patterns (Fairbridge, 1983). Therefore coastal zones are doubly susceptible to floods.

Precipitation immediately triggers pluvial flooding (flash flooding when the intensity is extreme). If it continues upland or when snow and glaciers melt eventually fluvial flooding can occur. The presence of urban development and landscape represent important, modifying factors. Additional interference is caused by river and waste water drainage systems. The climate also influences sea levels in coastal areas, where tides as well as the structure and dynamic of the geoid and its crust come into play. From the sea, waters can flood and break or push back berms and other coastline borders (Mörner, 1976). The sea level, controlling the mouth of the main channel of the basin's drainage system, is ultimately what governs flood levels. A temporary rise in sea level acts as a dam at the mouth.