

Building urban and regional resilience for coastal cities: A nature inspired approach

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Abstract

The Shanghai-Yangtze River Delta Urban Agglomeration (SHYRDUA) region, including Shanghai City, Jiangsu Province and Zhejiang Province, is the largest metropolitan region in China and the sixth largest in the world. Located at the junction of the Yangtze River and the East China Sea, the region faces severe challenges of sea-level rise, coastal erosion, storm surge, saltwater intrusion, and urban flooding, and is therefore in desperate need of building urban and regional resilience to protect its 150 million people from the impacts of these potentially devastating disasters.

The need for resilience building is not unique to the SHYRDUA region. Among the world's 16 cities with more than 10 million people, 12 are coast, and, like the SHYRDUA region, at high risk to climate change impacts and extremely vulnerable to sea-level rise. The world's 136 largest coastal cities could risk combined annual losses of \$1 trillion from floods by 2050, and about 150 million people in those cities will be exposed to a 1 in 100 year coastal flood event due to the combined effects of climate change by the 2070s.

In addition to traditional approaches that rely primarily upon humanly constructed defenses, such as storm surge barriers, levees, and seawalls, various nature inspired strategies have been proposed and, in some cases, implemented, for resilience building in coastal cities. Underlying these various strategies for, and approaches to, urban resilience building is the ecological wisdom of following nature's lead. In fact, these strategies are in conformity with traditional well-known Chinese idea of yishubuyidu (宜疏不宜堵, It is better to divert than block) established by Great Yu (大禹, 2297 BC - 2198 BC).

In the same spirit, in this paper, I propose a nature inspired approach to strategic planning for urban and regional resilience building in the SHYRDUA region. Under this approach, certain inland areas are demarcated as flood buffers to protect densely populated urban areas from impacts of storm surges and tidal intrusions. In conjunction with traditional engineering apparatus (dikes, levees) and other natural instruments (wetlands, oyster reefs), these buffer areas divert, attenuate, and absorb the momentum of Mother Nature with minimum intervention to socio-ecological systems. The practicality of this regional approach and its implications to resilience building in other coastal cities will be discussed.