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TITLE: A global exploration of tidal wetland creation for nature-based flood risk mitigation in coastal cities

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ABSTRACT:

Coastal cities around the world are increasingly exposed to flood risks due to climate change, resulting sea level rise and more intense storm surges as well as due to growing coastal population densities and land subsidence. Nature-based risk mitigation, consisting of conservation or creation of coastal ecosystems that have the natural capacity to adapt to sea level rise and to mitigate storm surges, is increasingly proposed, but real-live implementation is yet limited to specific local cases. Our study presents a global scale analysis of the surface areas available for potential creation or restoration of tidal wetlands (salt marshes and mangrove forests) in front of 135 highly populated, flood-exposed coastal cities, as part of nature-based or hybrid strategies to buffer against coastal flood risks. Our results reveal that 34% (4 600 km²) of the total land area within the influence zone of storm surge propagation between the sea and the cities is potentially available for tidal wetlands creation. Those areas mainly correspond to rural areas with a low population density such as croplands, paddy fields or vegetated areas and to water bodies. The key factors influencing the area potentially available for tidal wetlands creation are the geomorphology and the population density, as 60% (8 300 km²) of the land area below mean high tide in front of the studied cities is urbanized or densely populated. Cities located along deltas or estuaries and in bays and lagoons (e.g. Hamburg, Guayaquil, Tianjin, Portland or San Jose) have generally larger low-lying coastal zones and consequently larger potentially available areas for salt marshes and mangrove forests restoration or creation for coastal flood risks mitigation. Our results contribute to increasing evidence and awareness of the possibilities of nature-based mitigation of coastal flood risks by restoring and creating tidal wetlands in front of flood-exposed coastal cities around the world.

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