ORIGINAL RESEARCH article

Front. Mar. Sci.

Sec. Coastal Ocean Processes

Volume 11 - 2024 | doi: 10.3389/fmars.2024.1492435

Unintended consequences of modifying coastal river systems

Provisionally accepted

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soon.

Coastal infrastructure projects, particularly the modification of coastal river channels, are becoming increasingly significant to economic activities worldwide as a response to climate-driven changes and urbanization. The benefits of channel modification projects can be realized quickly, but the altered movement of sediments in the river channel can lead to unintended geomorphic changes years or decades later. An example of this is the closure of the San Bernard River mouth, located on the central coast of Texas, which was clogged with sediments by the 1990s as a result of two major projects in the area: the diversion of the Brazos River channel (1929) and the construction of the Gulf Intracoastal Waterway (GIWW) (1940s). The objective of this study was to a) document the delayed geomorphic response to the projects using a GIS analysis of historical maps and aerial imagery, and b) provide a snapshot of altered flow pathways in the area using measurements collected in situ.

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River 2 km inland of its river mouth, reducing discharge in the terminal limb of the river. Due to reduced flow, the river mouth became clogged with wave-transported sediment supplied by the stilladjusting Brazos River which had been diverted to within 6 km of the San Bernard River. With a limited connection to the sea, altered sediment and flow pathways have led to numerous hazards and costly corrective dredging projects surpassing $12 million to date. Optimizing the cost-effectiveness of channel modification projects requires considering their long-term impact as managers continue to adapt to ever-changing coastal zones.

Keywords: coastal infrastructure, coupled human-natural systems, Coastal morphodynamics, Hydrodynamics, river deltas, sediment transport

Received: 06 Sep 2024; **Accepted:** 30 Oct 2024.

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