

Filling gaps in scientific knowledge of the Gulf Coast's interconnected natural and human system

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Improved understanding of the coupled natural-human coastal system will help promote resilience of coastal communities and ecosystems under rapidly changing environmental conditions and support informed decision-making, says a new report from the National Academies of Sciences, Engineering, and Medicine.

The physical and ecological systems, people, and economy in the Gulf Coast are inextricably linked. The natural system includes processes such as sea-level rise, subsidence, storm surges and flooding, sediment management, marsh and wetland loss, and conservation and restoration activities. The human system encompasses land use and coastal development, adaptation, and migration or relocation. The interactions and feedbacks between the natural and human systems are what make up the coupled system.

The committee that carried out the study and wrote the [report](#) identified three critical areas of research that could address gaps in high-priority scientific knowledge, helping to inform decision-making and research planning related to the strategic initiatives of the National Academies' Gulf Research Program (GRP):

- How will coastal landforms and coastal ecosystems along the Gulf Coast respond to rapidly changing conditions (both natural and human-induced), especially given the expectation for

continued relative [sea-level rise](#) acceleration?

- How will human settlement and economic activity along the Gulf Coast respond to evolving coastal landforms and ecosystems under rapidly changing conditions?
- How can improved understanding of both near- and long-term evolution of the Gulf Coast's coupled natural-human system be applied to inform stakeholder decisions made at local, state, and regional levels? How will the coupled system evolve when decision-making is updated as scientific understanding advances?

The report recommends that GRP create an integrated research program that focuses on understanding of the evolution of the coupled coastal system. This research program should support collaborative, multidisciplinary research teams; encourage comprehensive, Gulf-wide integrated observational and modeling efforts; offer research opportunities that are longitudinal and multidecadal; and deliver easily accessible observational data and model results. Such an effort has the potential to positively transform living along the Gulf Coast and in coastal zones around the world by informing decisions from local to federal levels, says the report.

Turning research products into actionable policies for a re-envisioned future Gulf entails communication and collaboration between scientists and stakeholders such as city planners or emergency managers, but current barriers prevent effective communication. The report identifies opportunities to overcome these barriers, such as targeted funding that would allow stakeholders to better interpret and use scientific information, creating an incentive structure that fosters information sharing between the energy industry and other stakeholders, and encouraging scientists to engage substantially with stakeholders from product development to delivery stage.

Such a research program will enable significant advancement toward

understanding the feedbacks and interactions among the physical, ecological, and human components and the resulting evolution of the coupled system along the Gulf Coast, in the context of both human and climate drivers.

The report recommends focusing planning efforts on a near-decadal scale (10-50 years) and a decadal-century scale (50-200 years). These periods encompass the time scales of the physical and ecological drivers of anticipated changes and the motivating factors for human response and decision-making.

More information: Long-term Coastal Zone Dynamics: Interactions and Feedbacks between Natural and Human Processes and their Implications for the U.S. Coastline. [dels.nas.edu/Study-In-Progress ... ions/DELS-BESR-16-04](https://dels.nas.edu/Study-In-Progress...ions/DELS-BESR-16-04)

Provided by National Academies of Sciences

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