

Selected Findings from
**Confronting
 Climate Change
 in the Gulf
 Coast Region**

Prospects for Sustaining
 Our Ecological Heritage

Global Warming & Sea-Level Rise in the Gulf Coast Region

Climate Change and Sea Level

As temperatures rise, warming ocean waters expand while mountain glaciers and inland ice melt; in addition, polar ice caps are projected to shrink—all these sources adding more water to the world’s oceans. The result is a rising sea level over centuries to come. Global sea level has been rising since the last Ice Age, and it is expected to rise even faster over the 21st and coming centuries as global warming accelerates.

Climate change-induced sea-level rise will have a disproportionate effect along the Gulf Coast shoreline for a number of reasons:

- The Gulf Coast region has a flat topography, which will move the coastline quite far inland even with only a few inches of sea-level rise.
- In many areas the land is sinking (subsidence), with rates ranging from as little as 2 inches in some parts of the Gulf to alarming rates of up to 31 inches per century in others.
- Along much of the shoreline, extensive development places many people, crucial infrastructure, and private homes and establishments at risk.

- The Gulf coast regularly experiences major storms such as hurricanes.

Climate models project an average sea-level rise along the Gulf Coast ranging from over 8 to almost 20 inches in the next century. Taking regional subsidence into account, the relative sea-level rise over the next 100 years could range from 15–17 inches along most of the Gulf Coast to as much as 44 inches in parts of southeast Louisiana where Mississippi River sediments are rapidly sinking.

The Potential Impacts from Accelerated Sea-Level Rise

Coastal ecosystems, such as marshes, estuaries, and seagrass beds, are shaped by naturally occurring sea-level change and coastal

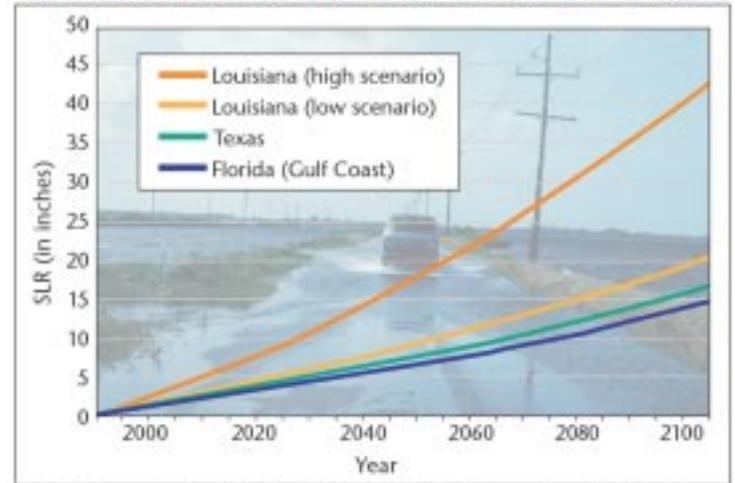
storms. When coupled with high rates of land subsidence and greater human impacts on the coastal environment, however, these forces can damage human communities and further degrade coastal ecosystems, leaving them less able to adapt to the changing environment over time.

Coastal Wetlands

Coastal wetlands help retain and purify water, stabilize sediments, and protect coastal areas from storm surges. These natural services are valued at millions of dollars and would be lost as wetlands vanish or deteriorate in quality.

- Continuing land sinking and human interference with coastal processes, such as dam and levee building and river diversions, combined with sea-level rise and other climate changes, are likely to lead to wetland degradation and losses, and could undermine wetland restoration efforts.
 - Wildlife species such as waterfowl, alligators, and fur-bearing animals depend on wetlands. Recreational opportunities, such as hunting and fishing would be seriously affected by a continuing and eventually accelerating loss of wetlands.
 - As temperatures increase, tropical ecosystems like black mangroves are likely to expand northward and establish them-

Relative Sea-Level Rise Scenarios for the Gulf of Mexico



Note: Model runs produced by Tom Doyle (US Geological Survey) are based on midrange SLR scenarios and average regional subsidence figures as described in the text.

Photo: Denise Reed. Chart: DG Communications

Sea-Level Rise (SLR)	Western Gulf	Southeast Louisiana	Eastern Gulf
(1) Average subsidence Over last 100 years	4"	8–31"	2"
(2) Hadley model projection for sea level by 2100	8.4"	8.4"	8.4"
(3) Canadian model projection for sea level by 2100	15.6–19.2"	15.6–19.2"	15.6–19.2"
(4) Mid-range scenario selected in report	13"	13"	13"
Relative SLR by 2100 (sum of lines 1 and 4)	17"	21–44"	15"

selves more firmly in the more temperate regions of the central Gulf Coast, unless prevented from doing so by human development.

Fisheries

The rich waters of the Gulf Coast states yielded 1.95 billion pounds of fish and shellfish in 1999. Worth more than \$758 million dockside, this yield represents 21 percent of the weight and 22 percent of the value of the national commercial fishery harvest. Aquaculture is also an important industry in the region due to mild temperatures and the availability of fresh water. With climate change, significant changes must be expected.

- The region's aquaculture industry is highly sensitive to changes in the availability of fresh water and to saltwater intrusion into crawfish ponds. Models project accelerating rates of sea-level rise as well as reduced rainfall for the immediate Gulf shoreline areas, which will increase the risk of permanent or occasional saltwater intrusion into ponds, thereby drastically affecting production.

- If wetlands can survive as sea level continues to rise, the yield of estuarine-dependent fisheries like shrimp, oysters, and crabs will increase or decrease depending on the size and quality of the new habitat over time.

Coastal Development, Beaches, and Tourism

Over recent decades, most of the Gulf shoreline has been rapidly developed for residences, recreation, and tourism. The Gulf of Mexico is also home to 10 of the 50 largest ports (by cargo volume) worldwide, making the region a nationally and globally important industrial location and transportation hub. As development and economic activity in coastal areas has increased, so has societal vulnerability to coastal hazards. Global climate change will likely increase that vulnerability.

- Accelerating sea-level rise due to global warming will increase the rate of

erosion—an already significant threat to homes, roads, and other infrastructure along the shorefront of many barrier islands, such as Grand Isle, Dauphin Island, Galveston Island and Sanibel Island, and along mainland coasts. As erosion proceeds, shorefront development becomes more vulnerable to the impacts of severe storms.

- Accelerating sea-level rise will also increase storm surge height, even if hurricanes and tropical storms do not become more intense. Thus, greater economic losses from storms, as well as higher repair and maintenance costs (e.g., for port and industrial facilities or beach replenishment) must be expected in the future.

- During major storms, storm surge could reach further inland, especially if barrier islands and wetlands are lost as buffers. Existing storm protection and emergency management measures could be rendered inadequate.

Fresh Water from Coastal Aquifers

The region's freshwater resources will be increasingly tapped for urban residential and industrial uses, for agricultural irrigation, for prevention of saltwater intrusion into coastal aquifers and aquaculture and rice ponds, and for the maintenance of healthy aquatic ecosystems. These competing demands on limited resources are already presenting freshwater management challenges, and potential changes in climate could aggravate these problems.

- In coastal areas, the threat to groundwater resources will come from the combined effect of saltwater intrusion due to sea-level rise and the projected decrease in rainfall.

- Coastal areas in Louisiana, Florida and Texas are already experiencing higher salinity levels in wells; saltwater intrusion



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will magnify that problem.

- Saltwater intrusion also threatens freshwater withdrawals for drinking water from surface waters such as the Mississippi River or other coastal systems such as Bayou Lafourche.

Policymakers and Coastal Managers Can Address the Challenges of Sea-Level Rise

Sea-level rise is already occurring and is virtually certain to accelerate in a warmer world. Reducing greenhouse gases and curbing global warming will help to slow the rise of the global sea level. In addition, there are basic management approaches to address the challenges arising from sea-level rise. These approaches include structural (engineering) measures, both “soft” and “hard”—such as beach replenishment or erecting seawalls and bulkheads to hold back the sea. They also include non-structural measures such as planning, zoning, land purchases, and conservation easements. Other measures can identify shoreline uses more compatible with rising seas and a moving shoreline. Finally, restoring water and sediment supplies from upstream areas can also reduce stress on existing coastal wetlands (e.g., in the Everglades and Mississippi Delta), thus giving them a fighting chance to adapt to sea-level rise.



This fact sheet is based on the findings of *Confronting Climate Change in the Gulf Coast Region*, a report published in October 2001 by the Union of Concerned Scientists and the Ecological Society of America. The report was written by 10 regional experts under the leadership of Robert Twilley (University of Louisiana-Lafayette).

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The full report is available from UCS at www.ucsusa.org or call (617) 547-5552.