TEXAS A&M UNIVERSITY CORPUS CHRISTI
SOUTH TEXAS ECONOMIC DEVELOPMENT CENTER

Economic Pulse

Impacts of Rising Seas

by Jim Lee

Global sea levels are expected to rise up to two feet by the end of this century, according to the Conrad Blucher Institute at Texas A&M University-Corpus Christi. In a recent panel presentation, Dr. Philippe Tissot, associate director of the Institute, emphasized how rising water levels will affect ports and coastal communities particularly in the Gulf of Mexico.

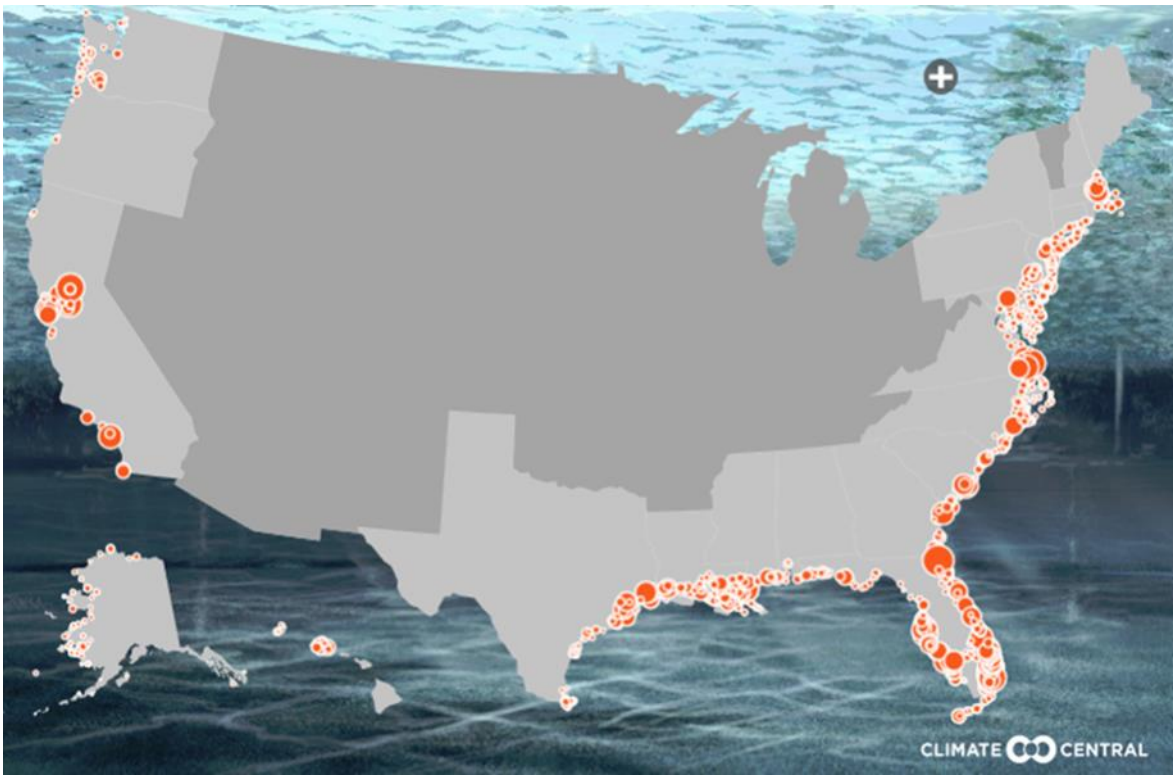
How High?

During the last century, sea water levels worldwide rose by two-thirds of a foot. Partly due to the global warming trend (see *Economic Pulse*, 2013, Issue 5), which has contributed to the melting of glaciers and ice sheets and thermal expansion of the oceans, rising sea levels have appeared to accelerate in recent decades.

While Tissot described the change as a "manageable" condition, there is currently no consensus among scientists as to the projected water level surges or the underlying reasons for the change.

A recent article in *Nature*, a popular science journal, warns that six feet or more of global

Cities Locked In By 2100



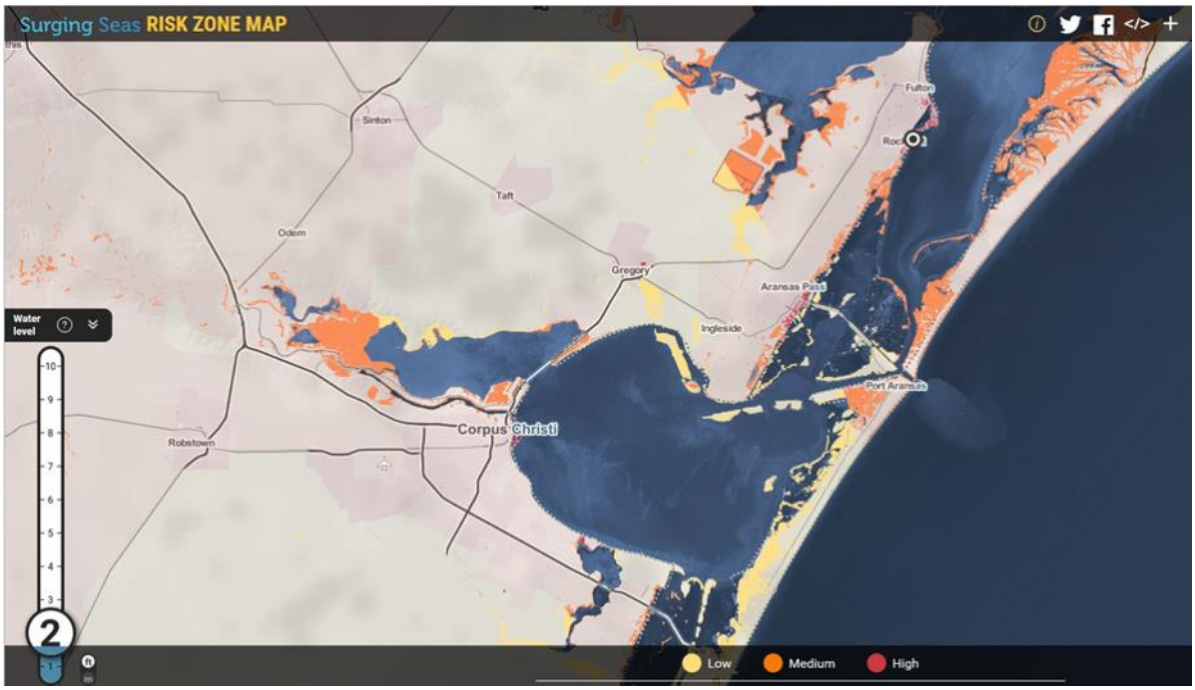
SOURCE: climatecentral.org.

HIGHLIGHTS:

Corpus Christi is one of the Gulf cities most vulnerable to the risk of rising sea levels. This article presents estimated impacts under the alternative scenarios of higher water levels by two feet and six feet. Given the consensus about future sea-level changes, the impacts seem manageable, but the increase in economic losses and spillover effects would accelerate for each additional foot of higher water level.

Read this article and additional data online at stedc.atavist.com. This article benefits from comments of Philippe Tissot.

Population Affected By 2-ft. Water-Level Rise



SOURCE: ss2.climatecentral.org.

water rise will be possible within this century if current pollution levels remain unchecked (DeConto and Pollard, 2016). Tissot added that the problems of rising sea levels are exacerbated by the fact that waterfront land levels can also be sinking due to the shifting of land shelves, compression of sediments combined with the pressure from ocean water or fluid extraction.

Climate and sea-level changes are global issues, but the impacts are felt locally. Here we look at some direct impacts on Corpus Christi, which is widely regarded as one of the coastal cities most susceptible to rising sea levels. Other Texas cities at greatest risk of being swamped by the Gulf of Mexico include Galveston and Port Arthur. According to a recent study at the University of Arizona, Corpus Christi is the third most vulnerable Texas city, with about 15 percent of its area below one meter, or about 3.3 feet.

What Rising Seas Would Cause

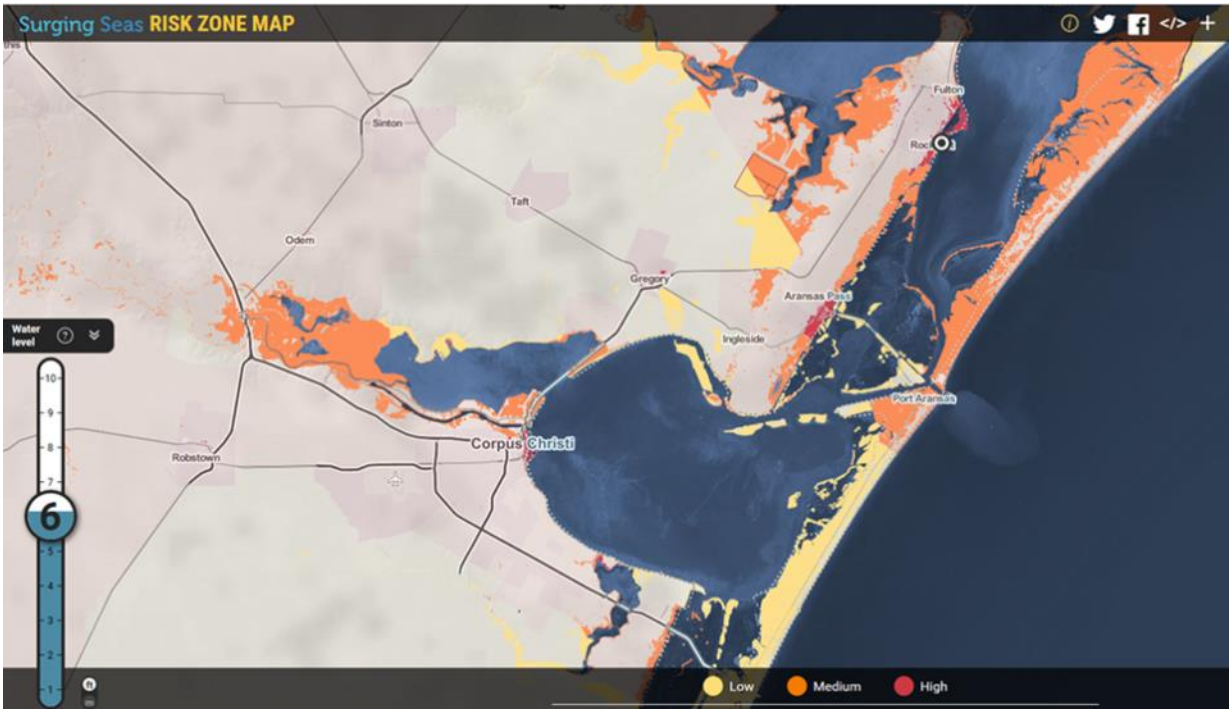
Tissot's assumption of up to two feet in sea water level is rather conservative in comparison with many dramatic scenarios, such as the recent claim of a possible six-foot surge. The Climate Central team measures a water level using elevation above the local high tide line, instead of the standard elevation value found on traditional maps.

The table on the next page compares the projected impacts on the individual counties of the Corpus Christi metro area under two alternative hypothetical scenarios: a 2-foot water-level rise and a 6-foot water-level rise.

We draw most data and projections from Climate Central (climatecentral.org), which compares elevation data of geographical locations from NOAA's Office for Coastal Management against demographic and economic data of local residents from the Census.

In the case of two feet, more than 1,000 people in the area would be affected. Most of those residents would lose their homes, with losses of property values in today's dollars totaling about $430 million. A total land area of nearly 9 square miles along with 16 miles of roads would also be swamped by sea water.

Population Affected By 6-ft. Water-Level Rise



SOURCE: ss2.climatecentral.org.

While those impacts amount to no more than half of one percent of respective measures of the metro area as a whole, a breakdown of impacts by county highlights the vulnerability of certain areas. According to Climate Central, the risk of relative sea-level rise, tidal patterns, or storm surge varies from place to place, so the same water level will become a risk factor at different times in different places. The maps on the previous page illustrate the specific areas at greatest risk.

The coastal communities of Aransas County, such as Rockport-Fulton and Aransas Pass, are most affected by the rising sea water levels. With only 5 percent of the area population, this county accounts for nearly one in five people and one-third of public infrastructure likely affected within the metro area.

In Nueces County, about 1,000 people would live on exposed land below 2 feet. The impacts concentrate on North Padre Island and areas surrounding Oso Bay in Flour Bluff and Ward Island, the main campus of Texas A&M University-Corpus Christi, as well as the downtown seawall and marina districts. Out of the projected 680 homes in that county swamped by water, 530 are located within the Zip code 78418.

Because the marina has already replaced traditional wooden docks with floating docks to allow for storm surges and high tides, no severe property damages would be expected there under this scenario.

An increase of sea level by two feet would also not likely affect most industries even in the low-lying areas within the Corpus Christi Port District. However, this is not the case if the sea level rises by six feet. Under this scenario, the city's six oil refineries are expected to submerge under water, so are six local schools, the local university, and 10 wastewater sites.

The key takeaway from the table is not the exact amounts of economic losses. Instead those estimates highlight that the projected impact increases exponentially for each additional foot of higher water level, especially for waterfront communities susceptible to the rising seas.

While the estimates of economic losses seem less striking than we might have conceived, the true impact would most likely be far beyond the direct damage to private and public properties. Damage to public infrastructure, such as roads and water treatment facilities, adversely affect local residents and economic activity in addition to the replacement costs. For instance, the National Parks Service estimated in 2015 that sea-level rise by about three feet would put coastal parks and beaches worth $40 billion at high risk.

The current replacement value for Padre Island National Seashore totals about $41 million, which include the costs of roads, parking areas, a concession building and other facilities. Still that estimated economic loss does not factor in the loss in leisure and economic activities due to beach erosion and the missing park infrastructure.

Likewise, given the reliance of the Corpus Christi economy on the oil and gas industry, damage to the local oil refineries would generate tremendous spillover effects on other parts of the business community. Also, the risk of storm surge flooding increases with higher sea levels.

On the other hand, rising seas would probably not adversely affect the shipping activity in Corpus Christi, according to Port Authority officials. Ironically, in a nut shell, a higher sea level alone might benefit navigation of larger ships without dredging the seabed.

This exemplifies the policy dilemma of managing global climate change.

References

DeConto, R., and Pollard, D. "Contribution of Antarctica to Past and Future Sea-Level Rise," *Nature*, 2016, 531(7596), 591-597.

Lee, J. "Local Climate Change," *Economic Pulse,* 2013 Issue 5.

Impacts of Rising Sea Levels

	Nueces	San Patricio	Aransas	Metro Total
2 Ft. Rise:				
Population	1,003	110	260	1,373
Land	4.6 sq. miles	2.1 sq. miles	2.2 sq. miles	8.9 sq. miles
Roads	8 miles	3 miles	5 miles	16 miles
Homes	680	106	424	1,210
Property value (2016)	$323M	$18M	$8M	$429M
6 Ft. Rise:				
Population	8,964	1382	3757	14,103
Land	27 sq. miles	22 sq. miles	43 sq. miles	92 sq. miles
Roads	167 miles	35 miles	136 miles	338 miles
Homes	6,779	950	3,886	11,615
Property value (2016)	$2.5 Billion	$196 Million	$628 Million	$3.4 Billion

SOURCE: riskfinder.climatecentral.org; author's calculations.

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