World's large river deltas continue to degrade from human activity

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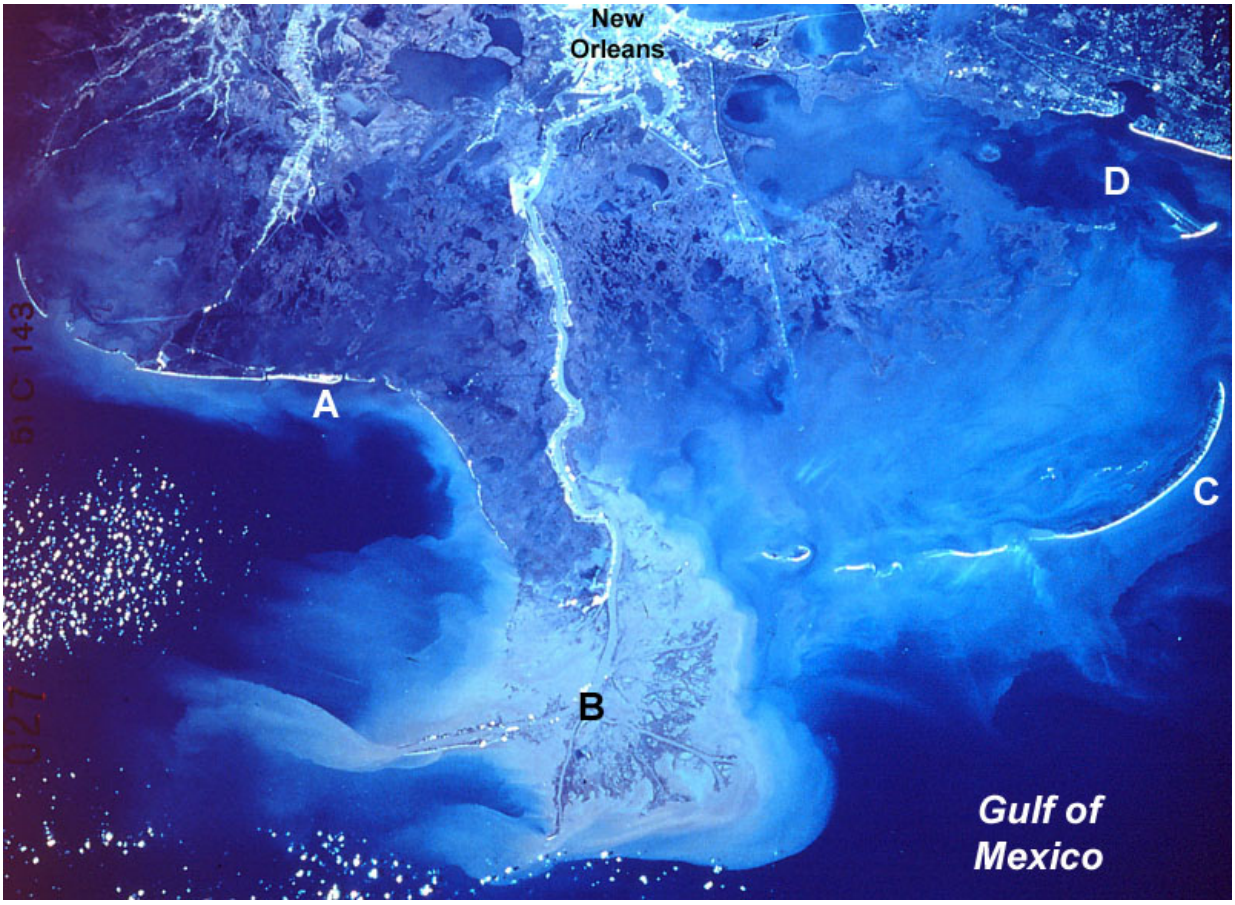

The Mississippi River Delta from the Space Shuttle Discovery in 1985. Credit: NASA

From the Yellow River in China to the Mississippi River in Louisiana,

researchers are racing to better understand and mitigate the degradation of some of the world's most important river deltas, according to a University of Colorado Boulder faculty member.

CU-Boulder Professor James Syvitski said more than two-thirds of the the world's 33 major deltas are sinking and the vast majority of those have experienced flooding in recent years, primarily a result of human activity. Some 500 million people live on river deltas around the world, a number that continues to climb as the population increases.

"These deltas are starved of the sediments they need for stability because of upstream dams that trap the material," said Syvitski, a professor in geological sciences who also is executive director of the international Community Surface Dynamics Modeling System (CSDMS) which is based in Boulder. "We are seeing coastal erosion increasing in many places across the planet."

Human effects on river deltas range from engineering tributaries and river channels, extracting groundwater and fossil fuels, trapping sediments behind dams, reducing peak flows of rivers and varied agricultural practices, he said.

Syvitski presented new research findings on changing deltas around the world at the 2016 Ocean Sciences meeting held in New Orleans Feb. 21-26, 2016.

River deltas are land areas created by sediment that collects at the mouths of rivers as they enter slow-moving or standing water like oceans and estuaries. "Deltas are sinking at a much greater rate than sea levels are rising," Syvitski said.

One positive action was taken on the 3,395-mile-long Yellow River recently when some major dams were flushed of their sediments and

sent rushing downstream, said Syvitski. "This might be the first time that dam operators on the Yellow River have worked with people in the coastal zone to solve a problem."

But looming threats to the Yellow River Delta include the sinking, or subsidence of land caused in large part by a move from rice farming to aquaculture—raising fish and shrimp, he said. The land in some areas there is sinking by 10 inches per year as groundwater is pumped to the surface.

"The rate of subsidence there is amazingly high—the ground can sink 3 feet in 4 years and affect infrastructure like buildings and roads," Syvitski said. "But more importantly, lowering the land surface makes it much more exposed to the ocean environment, including storm surges from hurricanes and tsunamis."

The two major river deltas in the United States are the Mississippi River Delta in Louisiana and the Sacramento-San Joaquin River Delta in California. While the Sacramento-Joaquin Delta has significant issues with agricultural, industrial and urban pollution and subsidence, things are more dire in the Mississippi River Delta, where a football field-sized chunk of wetlands disappears every hour, said Syvitski. There are more than 40,000 dams 20 feet or higher on the Mississippi River system.

The Community Surface Dynamics Model System is a global, interdisciplinary program involving hundreds of researchers and students now in 500 institutes in 68 countries. Cross-disciplinary research groups develop integrated software modules that predict the movement of water, sediment and nutrients across landscapes and into the oceans. Major funding for CSDMS comes from the National Science Foundation.

"We are interested in how landscapes and seascapes change over time,

and how materials like water, sediments and nutrients are transported from one place to another," he said. "The CSDMS effort gives us a better understanding of Earth and allows us to make better predictions about areas at risk to phenomena like flooding, deforestation, forest fires, land-use changes and the impacts of climate change."

Provided by University of Colorado at Boulder