Meet the mastermind behind Louisiana's plan to rebuild land

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Jul 20, 2017 – LAKE CHARLES - On a cement platform below the I-10 bridge, Ehab Meselhe pulled a jug of muddy water out of an unassuming metal box. The box held water samples suctioned from the Calcasieu River by an automatic gauge. Each jug represented a sample taken 48 hours apart.

Looking at the tawny colored water in the jug, Meselhe said if the water was taken from the Mississippi River, it would be muddier. That, Meselhe said, is a sign of the Mississippi's potential. It's evidence that the river that once shifted paths on its route to the Gulf of Mexico -- depositing sand, silt and clay along its way -- is still capable of building land.

As vice president of science and engineering at The Water Institute of the Gulf, Meselhe has been tasked with studying several of the state's most ambitious projects to rebuild and stabilize land along the coast. His work has informed the planning for two river diversions in Plaquemines Parish, which would create openings in the levees that keep the Mississippi River contained. The openings would allow river sediment to flow into adjacent marshes, replenishing land that's sinking and eroding in large part from being leveed off from the river.

Much like the sediment carried hundreds of miles from agriculture fields in the Midwest to Southern Louisiana, Meselhe's own life has been carved by water. He was born in Egypt, in a town at the apex of the Nile delta, and spent the first part of his career studying the Nile basin.

"It's very long but it is much smaller in size than the Mississippi," he said of the Nile's water volume in comparison to the Mississippi's. "In fact, the two mid-diversions put together is the same size as the Nile. So, I keep saying that we are sticking a Nile out of the Mississippi."

Meselhe left Egypt to study civil and environmental engineering at the University of Iowa. He earned his master's degree in 1991 and his Ph.D. in 1994. He continued his hydraulic research in Iowa for three more years before moving to Louisiana to take a teaching position at the University of Louisiana at Lafayette. Meselhe left a tenured position at the college to join The Water Institute in 2012, before the institute even had an office in which he could work.

Though he's lived in the U.S. for nearly 30 years, Meselhe still has a slight Egyptian accent. His speech is measured, with the patience of a former college professor. "Does that make sense?" he asks, after trying out a way of explaining things.

The larger of the two diversions Meselhe has helped conceive, the

mid-Barataria diversion, would send 100 to 200 million tons of sediment from the river into Barataria Basin over a 50-year period. The opening would be located on the West Bank, just north of the town of Ironton. State officials, backed by Meselhe's modeling, claim the diversion would create or maintain 30,000 acres of marsh.

The mid-Breton sediment diversion would be located on the east bank near Wills Point, about 13 miles downriver from Caernarvon. State officials claim it would build or maintain 15,000 acres.

Meselhe's work has helped the state pinpoint suitable placements for the diversions. Gauges like the one in the Calcasieu River have helped his team determine how much sediment the Mississippi River is carrying at a given time. The river carries sediment in different directions as it weaves through its meandering path to the Gulf. The sediment is more spread out in the deeper portions of the river and is condensed in the shallower portions. That's part of the reason why the best placement for a diversion is on a sandbar on the inside of a river bend, where water is the shallowest. There, a diversion could capture more sediment and less water.

To determine where in the marsh the river water should be directed, Meselhe's team looked at the subsidence rates, or the rates at which the land is sinking. "When the subsidence rates are high you continue to deposit material but it keeps sinking," he said. "So you are not gaining ground and you are not breaking surface."

Still, using a river to build is much different than using brick and mortar. Meselhe can't control how much water and sediment will come down the river in the future. He also can't control when the next hurricane will hit.

"You do have a lot of uncertainties because you try to put these projects on the landscape and then you try to examine how they would perform under a broad array of conditions, whether it's fair weather conditions, sometimes droughts, flood events, storms of different magnitudes, but sometimes it's not possible to expect every possible permutation or combination of different events together," he said. "especially if you are planning decades ahead of time."

Yet, Meselhe's belief in the river's ability to build land is as firm as an architect's faith in bricks. The uncertainties, he said, can be controlled for by adapting to the conditions of the river. The diversions will be controlled by gates that the state will be able to open and close at will.

Meselhe was drawn to The Water Institute by the prospect of putting science to work. "I really enjoy what I do here because I enjoy that the science now has a seat at the table," he said. "There are other pieces to it. You have to consider logistics. You have to consider the cost. So, there are other non-technical components. But bringing science to the table and integrating that with the decision process is something that I enjoy. So, if a project gets implemented and gets built and it actually works and it helps that's the reward that I get."

Meselhe sees himself as a scientist first, which means he doesn't advocate for

projects. His role is studying whether an idea will work, he said. Still, he has plugged sea level rise and subsidence data into a modeling system and watched 1,207 square miles of the state turn red. If nothing is done to stop the rate of land loss, that's the amount of land the state stands to lose over the next 50 years, under the best case scenario, he said.

"As these open water areas get deeper and deeper it is hard to come up with a strategy that would reverse that. So, while it's not too late, for sure it's not too late, there is a sense of urgency," he said. He added more studies can be done along the way, and the management adjusted as needed. "So, we should not wait. We cannot wait because, yes, the longer you wait, the harder it becomes. And, then, ultimately, you will be faced with the only option of retreat."

While most of the sediment in the Mississippi River comes from the Missouri River, most of the water comes from the Ohio River. In May, the Mississippi was high, draining spring rains from 41 percent of the continental United States. From his office in Baton Route, Meselhe looked out at the river. When the river is high is also when it's carrying the largest amount of sediment. The Mississippi River carries more than 100 million tons of sediment through Baton Rouge annually.

"Here's one more opportunity missed," he said, knowing that the sediment of this year's spring rains would once again be carried out into the Gulf, instead of being used to rebuild land in the marsh. Read the full story here.

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