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Full Flood Safety in New Orleans Could Take Billions and Decades

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NEW ORLEANS, Nov. 22 - Amid all the arguments over how to rebuild this pummeled city, there is one universally held article of faith here: New Orleans must have a flood protection system strong enough to withstand Category 5 storms, the worst that nature can spawn.

It is a rallying cry heard on radio broadcasts and in a front-page editorial in The Times-Picayune, in ruined neighborhoods and in corporate boardrooms.

Strong protection is the linchpin that everything else depends on, said Joe Veninata, the owner of a shopping center and rental homes in the Gentilly neighborhood, "for people to come to the city and invest, for the people to feel secure."

"Without that," Mr. Veninata said, "we can't build New Orleans anymore."

Building Category 5 protection, however, is proving to be an astronomically expensive and technically complex proposition. It would involve far more than just higher levees: there would have to be extensive changes to the city's system of drainage canals and pumps, environmental restoration on a vast scale to replenish buffering wetlands and barrier islands, and even sea gates far out of town near the Gulf of Mexico.

The cost estimates are still fuzzy, but the work would easily cost more than $32 billion, state officials say, and could take decades to complete.

The current levee system around the city was designed to withstand the equivalent of a Category 3 storm, and the Army Corps of Engineers is spending $1 billion to bring the damaged sections to their original design strength. They plan to complete that effort before next year's hurricane season, which begins on June 1.

But a sense of how much more extensive Category 5 protection would be can be found 23 miles east of downtown New Orleans at a strait called the Rigolets, which connects the gulf and Lake Pontchartrain. For nearly 200 years, the brick bastion of Fort Pike has looked down on the two-thirds-mile gap, which the fort was built to protect against military threats from land or sea.

These days, however, the threat is from the sea itself. A surge from storms like Hurricane Katrina can push water through the gap and send floods deep into the city. So engineers and other experts say that the Corps of Engineers should build a gate across the Rigolets (pronounced RIG-uh-lees) that could be shut in the face of a storm.

From a viewpoint by the remains of Fort Pike looking across the sparkling water, the project seems enormously daunting, on a scale of the flood systems that protect cities like London and Amsterdam. And it is only one step toward the goal of fortifying New Orleans to the highest level. Congress only recently agreed to give $8 million to the corps for a study about providing increased protection for South Louisiana, with a preliminary report due in six months. The final plan is two years away.

While every expert has a list of things that would upgrade the city's flood controls, Category 5 protection is not easy to define, experts say. Dan Hitchings, director of Task Force Hope, the corps's Hurricane Katrina relief effort, noted that Category 3 hurricanes were specifically defined while Category 5 includes any hurricanes with winds greater than 155 miles an hour and a storm surge greater than 18 feet.

"What's the top end for a Cat 5 hurricane?" Mr. Hitchings said. "There isn't one."

Herbert Saffir, a co-creator of the Saffir-Simpson hurricane scale, said he would not recommend designing a Category 5 protection system because such a storm would be unlikely to hit any particular spot more than once in 500 years. Only three Category 5 storms in recorded history have made landfall in the United States, Mr. Saffir said; Hurricane Katrina had been a Category 5 in the gulf but was at Category 4 at most when it landed east of New Orleans near Buras, La.

Others disagree. Maarten van der Vlist, an engineer with Rijkswaterstaat, the Dutch equivalent of the Corps of Engineers, said that after a disastrous flood in 1953, the Netherlands chose to protect against flooding that occurs once every 10,000 years.

Most Category 5 proposals for New Orleans include devices to close seaward passageways like the Rigolets and gates at the mouths of today's drainage and navigation canals. Jurjen Battjes, a professor of civil engineering at the Delft University of Technology in the Netherlands and an expert on levee systems, said that approach had worked well in his country. "You don't want to let your enemy invade deeply into your territory," Professor Battjes said. "Close your fence at the outside."

Current levees can be made higher and stronger, and any new system might also include internal levees that would prevent a breach in one spot from swamping large stretches of the city, said Thomas F. Wolff, an associate professor in the department of civil and environmental engineering at Michigan State University. Levees, Professor Wolff said, are known as "series systems," which he compared to "Christmas tree lights from the 1950's - when one goes out, they all go out."

That levee work must be coupled with the restoration of coastal marshes and barrier islands that can blunt the progress of a storm, said Ivor van Heerden, a professor in the department of civil and environmental engineering at Louisiana State University and deputy director of the university's hurricane center.

"Where you had wetland, the levees were not eroded," Professor van Heerden said of Hurricane Katrina's damage, "and where you did not have wetlands, the levees were annihilated."

But local efforts are only part of the challenge. Many experts say it is no less important to reorganize the nation's method of designing and building flood systems.

The current patchwork of local, state and federal agencies responsible for flood protection must be unified and streamlined, said Robert G. Bea, a professor of engineering at the University of California, Berkeley. The Corps of Engineers should manage the project, as it has done historically, Professor Bea said, but it has to avoid the piecemeal approach that has made the system more vulnerable over time. (The Louisiana Legislature recently voted down a proposal, however, that would have merged the levee boards that maintain the region's flood systems.)

Experts say that New Orleans also needs restrictions on where people can build, and a new, independent organization that has the power to set standards for levee strength around the nation and to inspect them. Greater emphasis on evacuation and safety plans, too, would be necessary.

But corps officials say that it is impossible to predict the next storm. Lt. Gen. Carl A. Strock, the chief of engineers for the corps, said in an interview in Washington that focusing too tightly on what went wrong about Hurricane Katrina could lead to less effective plans for the future.

"We don't need to be fighting the last war all the time," General Strock said. The next storm could come up through the center of the city, or along the west side, swamping the western river basins and overflowing the levees along the Mississippi River that held during Hurricane Katrina.

Even if many of the current proposals can be accomplished, Mr. van der Vlist said, it remains hard to know whether they would really be able to withstand a Category 5 storm. "In the Netherlands, we don't have hurricanes like you have," he said. The low-lying nation is protected against the forces of water, but does not experience the crushing power of hurricane winds.

New Orleans may be able to get by with a protection level less than that required to resist a Category 5 storm, if it is robustly designed and built, said Robert A. Dalrymple, a professor of civil engineering at Johns Hopkins University and a member of the American Society of Civil Engineers team that investigated the levee breaches.

"If you have a Category 3 protection system and a Category 4 storm hits it, there will be overtopping of the walls," Professor Dalrymple said. But if the walls can be built so that they can resist the scouring action of the overflowing water, and "if the walls stay there, there will only be flooding for several hours," he added. The street drains and pumping stations could then remove the water.

The cost of any significant upgrade, however, will be enormous - more than the $21 billion spent on New York City after 9/11, but less than the $57 billion to be spent on highway construction and maintenance in the recent federal transportation bill. Washington and state governments spend about $160 billion a year on infrastructure, including roads, transit and utilities, according to the American Society of Civil Engineers.

Given a large federal deficit and other demands for money, however, there is still no indication that Washington will pay the $32 billion or more for full protection.

Scott A. Angelle, the secretary of the Department of Natural Resources for Louisiana, said that fortifying New Orleans to the highest level could be accomplished by giving Louisiana half of revenues from federal leasing for offshore oil and gas drilling beyond the three-mile territorial limit in the gulf. The plan, which has been proposed in legislation by Louisiana's United States senators, Mary L. Landrieu and David Vitter, would produce as much as $2.5 billion a year. The state currently receives no money for drilling beyond the limit.

The work ahead, Mr. Angelle said, is daunting but certainly possible. "We can fix anything that we focus on," he said. "We, as a people, and we, as Americans."