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Once it's certain a major storm is about to hit, evacuation offers the best chance for survival. But for those who wait, getting out will become nearly impossible as the few routes out of town grow hopelessly clogged. And 100,000 people without transportation will be especially threatened.

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BODY:
Hurricane evacuations rarely go as planned. Storm tracks are hard to predict, and roads are not designed to handle the traffic flow, so huge traffic jams are a common result. In 1998 it took six hours for people leaving the New Orleans area in advance of Hurricane Georges to reach Baton Rouge, 80 miles away. The following year, Hurricane Floyd's constantly changing course spurred evacuations and bumper-to-bumper traffic on highways from Florida to North Carolina.

Moving entire populations out of harm's way is a time-consuming and unpredictable operation complicated by geography, demographics, human psychology, the limits of weather forecasting, and transportation problems that tie many cities in knots even in perfect weather.

Like every coastal area vulnerable to hurricanes, south Louisiana faces these challenges. But the Louisiana delta also has it worse than other coastal areas.

Because the entire region is susceptible to storm-surge flooding, hurricanes pose more danger to those left behind than in places where the coastal profile is higher.

"Evacuation is what's necessary: evacuation, evacuation, evacuation," Jefferson Parish Emergency Preparedness Director Walter Maestri said. "We anticipate that (even) with refuges of last resort in place, some 5 (percent) to 10 percent of the individuals who remain in the face of catastrophic storms are going to lose their lives."

The region's sinking coast and rising flood risk also make the task of getting people out harder than it is elsewhere. South Louisiana presents some of the most daunting evacuation problems in the United States because:

-- The region's large population, including more than 1 million people in the New Orleans area, requires a 72- to 84-hour window for evacuation, well ahead of the time that forecasters can accurately predict a storm's track and strength.

-- Few north-south escape routes exist to move residents away from the coast, and many of those

include low-lying sections that can flood days before a hurricane makes landfall.

-- Evacuees must travel more than 80 miles to reach high ground, meaning more cars on the highways for a longer time as the storm approaches.

-- A large population of low-income residents do not own cars and would have to depend on an untested emergency public transportation system to evacuate them.

-- Much of the area is below sea level and vulnerable to catastrophic flooding. Based on the danger to refugees and workers, the Red Cross has decided not to operate shelters south of the Interstate 10-Interstate 12 corridor, leaving refuges of last resort that offer only minimal protection and no food or bedding.

Emergency officials say they have made improvements since Hurricane Georges, but the changes have yet to be tested under real-world conditions, and many obstacles remain.

Efficient evacuation key to survival

The predicament of the New Orleans area is part of a growing problem along the Gulf and Atlantic coasts. Hurricane evacuation planning and storm forecasting are better than they've ever been, but population growth, expanding development and coastal erosion are outpacing the gains, putting more people in danger and making it harder to move them out of the way.

Coastal areas across the United States have population densities five times the nation's average, according to the National Oceanic and Atmospheric Administration. About 50 percent of the nation lives within 50 miles of a coast, and that population is expected to continue growing.

The population and geographic pressures have forced emergency officials to take a harder look at the prospects for disaster. Two decades ago, few cities had evacuation plans. Now most coastal counties in the southeastern United States have comprehensive playbooks that choreograph the movements of vehicles and track the approach of high winds and storm surges down to the minute.

"Coastal populations have grown up dramatically, while road infrastructure relative to evacuation routes hasn't kept pace," said Louisiana State University assistant engineering professor Brian Wolshon, who studies the issue. "It wasn't that they didn't have plans in the past; it was that they weren't necessary. We needed plans adequate to deal with populations on the scale that we see now."

More lives depend on efficient and complete hurricane evacuations in the New Orleans area than anywhere else in the United States.

Unlike other vulnerable cities such as Miami, where high ground lies close to shore, south Louisiana lies at or below sea level and is at risk from storm surges that can suddenly catch people in fast-rising water that cuts off escape routes. Within New Orleans and parts of Jefferson Parish, the danger is even greater if a storm surge tops hurricane levees, a scenario that could kill tens of thousands of people.

For an evacuation of the New Orleans area to work, more than a million people have to travel at least 80 miles over an aging, low-capacity road system to reach high ground and shelter.

"In terms of what we call the safe zone, the I-10-I-12 corridor is roughly at a 25-foot contour line,

which is the maximum storm-surge line," said state Department of Transportation and Development architect George Gele. "If you can get to the Interstate 10-12 corridor, you will be safe."

Of course, if everyone stopped there, those behind them would be stuck, and motels and housing are limited. Therefore, evacuation routes extend hundreds of miles north into Mississippi, up to Meridian and Jackson. During Hurricane Georges, thousands of Louisianians went as far north as Memphis, Tenn., and as far west as Dallas.

Time is of the essence

Forecasters cannot come close to predicting a storm's landfall accurately beyond 24 hours. Three days before a hurricane hits, the official forecast can be off by as much as 250 miles in either direction -- the distance from New Orleans to a point between Pensacola and Panama City, Fla., to the east and Beaumont, Texas, to the west. That's a dramatic improvement from the 520-mile error rate of 30 years ago, but that advantage is partly negated by the larger populations that have to be evacuated.

Even 24 hours in advance, the average forecast error is about 85 miles, according to National Hurricane Center Director Max Mayfield, meaning 170 miles of coastline or more may be issued hurricane warnings at any one time.

"The decision-making and accounting for uncertainty in the forecast is the weakest link today on responding to hurricane threats," said Jay Baker, an associate professor of geology at Florida State University. "The earlier you start, the more uncertainty there is about where the storm is going to go, how severe it's going to be."

This creates a difficult situation for emergency managers. Delaying puts huge numbers of people at risk. Calling for an evacuation too early shuts down businesses needlessly, costing between $1 million and $50 million for every mile of coast evacuated, and possibly discourages people from leaving the next time.

"The effects on early evacuations due to false scares (are) so terribly important," said University of New Orleans sociologist Shirley Laska. "The lower parishes have grown to accept that," because evacuations occur so often, she said. But in the New Orleans area, people tend to be more skeptical, and false alarms compound that.

Evacuation times are squeezed even further because roads must be closed when the wind reaches gale force, from 39 to 54 mph, and it becomes unsafe to drive. At that point most hurricanes are just hours from landfall. Coastal erosion and sinking have created another problem. Some roads that didn't flood in the past now do, and those that flooded later now are underwater earlier.

"The last study done on the southeast area of the state used data from the late 1980s and was written in the early '90s," said Mike Brown, the state's deputy director of emergency preparedness. "I would not be surprised if the times (for evacuating safely) were to diminish on us as a result of the loss of wetlands."

Louisiana 1, for example, is the single escape route out of the lower reaches of Lafourche Parish and for thousands of workers on Gulf rigs based out of Port Fourchon. "Louisiana 1 is only a half foot above the normal summer high tide at the Leeville Bridge," said Windell Curole, general manager of the South Lafourche Levee District. "So, early in the ball game, Grand Isle, Port Fourchon and much of the rest of Lafourche Parish have to keep close track of storms."

With the threat of flooding and the potential for traffic jams, Curole and other officials fear the wrong set of circumstances could strand thousands of people in their cars in a powerful, fast-moving storm.

In New Orleans, another potential choke point looms. I-10 dips to 12 feet below sea level under a railroad trestle near the Jefferson Parish line and floods in heavy rains. "If it floods, it severs the I-10 evacuation," Gele said. "That is a very fragile point. That is a very critical situation."

The state transportation department is installing a pumping system to address the problem.

Once people are on the road, the challenge is avoiding bottlenecks. I-10 is the only highway that runs all the way through the area, so plans call for evacuees to move east or west along it before they move away from the coast. Moving east, evacuees go up I-59 toward Hattiesburg, Miss. Those going west travel up I-55 toward the north shore and into Mississippi or continue along I-10 to western Louisiana and Texas. Evacuees also can leave by the Lake Pontchartrain Causeway, but it is usually the first major road to be shut down because of high winds.

Officials in Louisiana are negotiating with their Mississippi counterparts about how to run evacuations across the border. Mississippi officials fear that an evacuation of the New Orleans area, starting earlier than one on the more sparsely populated Mississippi coast, could clog the highways before their evacuation even begins, trapping people on the coast.

The lack of alternative escape routes extends the evacuation time, giving emergency planners less margin for error than their counterparts in areas with more routes or fewer people.

All lanes lead outward

The biggest innovation in New Orleans since Georges is a plan to use "reverse laning," turning parts of I-10 into one-way thoroughfares to cut traffic jams and evacuation times and to maximize the number of people leaving. The state transportation department has built crossover lanes to move traffic out of the city one-way going west out of Kenner and one-way east beginning in eastern New Orleans. Mississippi officials have established similar crossovers on I-59 just north of the Louisiana state line and just south of Laurel.

The Louisiana transportation department also has upgraded its flood-monitoring system, called Hydrowatch, which takes information from 154 stations across the area and uploads it to a satellite. From there, the department can access the data and integrate it into a Web site so officials and residents can monitor flooding in real time and see which roads become impassable as the water rises. The site also shows evacuation routes and road closures.

Workers also are installing monitors along highways that use the same system to monitor both weather conditions and traffic. With the satellite monitoring, emergency managers will be able to keep track of traffic flow as it waxes and wanes during an evacuation and respond immediately if problems crop up.

The risk of dying is so high that trying to ride out a storm is foolish, emergency managers say. Yet for various reasons, many people do not leave. In New Orleans, many residents don't own cars. Some are unaware of the danger. Some think they can judge it for themselves. About 44 percent of Orleans residents and 52 percent of Jefferson residents evacuated during Georges, according to a University of New Orleans survey. A separate Jefferson Parish study estimated that 60 percent of residents left the parish.

"I don't have a question about the fact that a lot of people are not going to leave, not just the 100,000

who don't have private transportation," said Terry Tullier, acting director of New Orleans' Office of Emergency Preparedness. "We think we're going to do our people a terrible disservice if we don't tell them the truth. And the truth is that when it happens, a lot of people are going to die."

Those who remain should not expect to find safe shelter, officials say. Few buildings in the area can withstand the forces of a Category 4 or 5 hurricane. "We don't have structures that can handle wind and water at those velocities and at that water height," Maestri said.

Emergency officials once counted on "vertical evacuations" to tall buildings as a way to escape flooding. But Florida's experience with Hurricane Andrew in 1992 has scuttled that policy. Andrew's winds blew windows out of many skyscrapers and heavily damaged the upper floors of many tall buildings. In 1996, sophisticated instrument packages dropped into hurricanes confirmed that wind speeds can be 50 mph stronger several hundred feet above ground level.

"Before 1993 we thought we could evacuate vertically into high-rise buildings. But we can't do that because of what Hurricane Andrew did to Miami-Dade. Our building codes, our buildings, are not as strong as theirs," Maestri said.

Don't bank on shelters

The American Red Cross, which runs federally designated emergency shelters, changed its policy in the mid-1990s after a shelter in South Carolina flooded and people inside nearly drowned. Now the agency bars shelters in areas that can be inundated by a storm surge from a Category 4 hurricane -- which is all of south Louisiana.

Local parishes plan to shelter only those with "special needs," people who cannot be moved. In New Orleans, the Superdome will be used for this purpose.

In lieu of traditional shelters, which offer food and bedding, some parishes plan to open "refuges of last resort" -- buildings that are not safe but are safer than homes. They can house at most a few hundred people per parish, officials say. Most others will be on their own, meaning that in a catastrophic storm more than a 200,000 people could be left at the mercy of the elements.

Faced with those numbers, New Orleans officials have backup plans to move people without transportation: Regional Transit Authority buses and National Guard vehicles would take people out of the city. But the untested plan has raised serious questions from critics who say it could endanger hundreds of thousands of residents.

In an evacuation, buses would be dispatched along their regular routes throughout the city to pick up people and go to the Superdome, which would be used as a staging area. From there, people would be taken out of the city to shelters to the north.

Some experts familiar with the plans say they won't work.

"That's never going to happen because there's not enough buses in the city," said Charley Ireland, who retired as deputy director of the New Orleans Office of Emergency Preparedness in 2000. "Between the RTA and the school buses, you've got maybe 500 buses, and they hold maybe 40 people each. It ain't going to happen."

The plan has other potential pitfalls.

No signs are in place to notify the public that the regular bus stops are also the stops for emergency evacuation. In Miami Beach, Fla., every other bus stop sports a huge sign identifying it as a hurricane evacuation stop.

It's also unclear whether the city's entire staff of bus drivers will remain. A union spokesman said that while drivers are aware of the plan, the union contract lacks a provision requiring them to stay.

But RTA safety director Joseph Dorsey said the requirement is part of an operator's individual contract with the RTA. "Basically, when an operator is hired, there are certain things they agree to, such as working overtime hours when necessary and doing this job," Dorsey said. "They will participate."

A similar plan in Monroe County, Fla. -- the Florida Keys -- failed during Georges when drivers opted out. "The problem is that we may have the buses but we don't have the drivers," said Irene Toner, director of the county's emergency management office. "In Hurricane Georges we had 25 people on our bus-driver list and only five showed up."

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