

## Urban Lessons from Katrina

*The impact of Katrina on  
New Orleans raises important  
questions about disaster  
protection for other  
American cities.*

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**AFTER HURRICANE KATRINA**, some argued that New Orleans ought to be rebuilt on a smaller footprint, limiting rebuilding to those areas that were not flooded after the hurricane. The counter-argument was that flood patterns were meaningless as a guide to future planning since they merely reflected which parts of the flood protection had turned out not to work. The flooding of the city should never have happened. Just before hitting land, Katrina veered thirty miles to the east and diminished to a Category 3 storm. The levees and flood walls that failed in New Orleans were supposed to handle such a storm; the U.S. Army Corps of Engineers

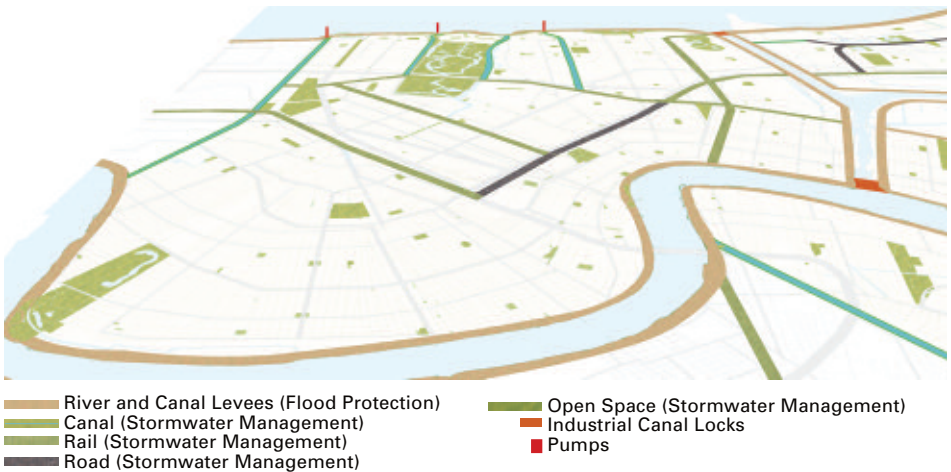
later acknowledged that the disaster was caused by design and construction failures. Using these accidental flood patterns as a rationale for downsizing the city would be unfair to the residents who had already suffered devastating damages, and defeatist for an economic comeback.

For the moment, it has been agreed that flood protection for New Orleans will be rebuilt to resist a Category 3 storm, flood gates along waterways will be added, and vulnerabilities, like the inland location of pumps, will be corrected. New Orleans will be replanned on the assumption that it can and will return to its former size, accepting that recovery will be slow for the most devastated parts of the city.

These decisions do not answer the criticisms of those who argue that the

city should not be rebuilt at all. They pose the question: what would have happened if the storm had not swerved to the east and if the winds had not diminished? Parts of the city of New Orleans are below sea level, but the historic central area is not. However, the entire city is below the level of the adjacent Mississippi River, which is controlled by an artificial channel. Some experts think that flooding from the Mississippi is New Orleans' biggest long-term problem (one it shares with Baton Rouge, where many people and businesses have relocated). A direct hit on New Orleans by a Category 5 storm would almost certainly have overtopped and possibly breached the Mississippi levees that withstood Katrina. The whole of New Orleans is likely to have flooded, including the

**Figure 1:** Flood protection measures from the Bring New Orleans Back Commission's Action Plan for New Orleans (Wallace Roberts & Todd, LLC)



Super Bowl stadium that was used as an evacuation center.

Global climate change is believed by some to be making hurricanes stronger and more frequent. The only reliable protection for New Orleans from all potential floods and storm surges would include both the prevention measures already being put in place, plus a restoration of a protective band of wetlands along the whole Mississippi delta, which could include modifications to the Mississippi River channel. Such a project would take decades, and would require the participation of three states and the federal government. In the meantime, New Orleans remains the only city along the Gulf Coast that has any significant hurricane protection, except for the seawall at Galveston, where some 8,000 people were killed in 1900 by a storm surge of more than 15 feet that swept across the entire Galveston Island.

On September 2, 2005, immediately after Katrina, Dennis Hastert, speaker of the U.S. House of Representatives, was reported as saying, “It makes no sense to spend billions of dollars to rebuild a city that’s seven feet under sea level.” He then went on to add, “But you know, we built Los Angeles and San Francisco on top of earthquake fissures and they rebuild, too.” After indignant reactions from Louisiana’s governor and congressional representatives, he issued a statement say-

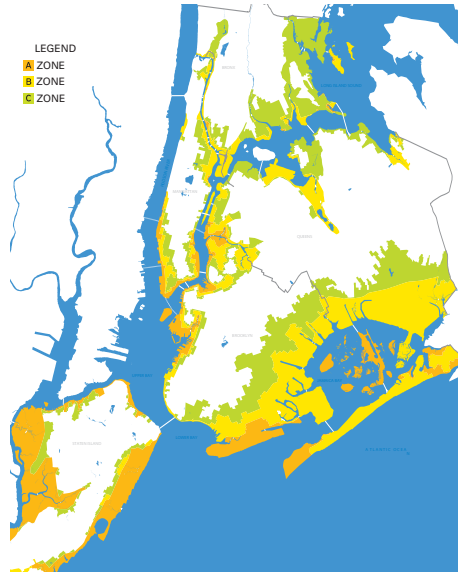
ing he was not advocating that New Orleans be abandoned or relocated. “My comments about rebuilding the city were intended to reflect my sincere concern with how the city is rebuilt to ensure the future protection of its citizens and not to suggest that this great and historic city should not be rebuilt.”

The rationale for spending billions of federal dollars on rebuilding and protecting New Orleans is that the city relied on a federal agency—the U.S. Army Corps of Engineers—for protection, and that protection failed in storm conditions that were supposed to be within its capacity. These circumstances have pushed aside any meaningful consideration of the city’s continued vulnerability, dysfunctional governance, and shrinking economic and population base, at least during the reconstruction process. New Orleans is an important part of the U.S. cultural and architectural heritage, a leading tourist destination and convention location, a regional business center, the home of a university of national importance, Tulane, and several significant local ones. It is also part of the world’s fourth or fifth largest port by tonnage—although not in numbers of containers, the more usual measure. All the same, the city remains in an exposed location, and until and unless a regional protection system is created for the Gulf Coast, a worse disaster remains possible.

## CITIES AT RISK

The cost of protecting New Orleans against flooding should be seen in the context of the vulnerabilities of other major U.S. cities. For example, New Orleans and the Gulf Coast are not the only parts of the United States facing flood surges produced by tropical storms. The storm evacuation maps displayed on an official New York City website show that a direct hit by a Category 3 hurricane will produce a flood surge—depending on the tides—of up to 30 feet. This surge would extend across Manhattan Island beyond Canal Street and affect most of the city’s shoreline, inundating both Kennedy and LaGuardia airports. Even a Category 1 storm will produce some flooding (Figure 2). Destruction would go beyond buildings at street level. Most of New York City’s subway lines converge in lower Manhattan, and water from a storm surge would flow down open subway stairs and through street ventilation grates. Many of the ventilation shafts for the Brooklyn Battery, Holland, Lincoln, and Queens Midtown Tunnels are in or near the river and are likewise vulnerable to a flood surge. So, too, are the Amtrak and the Long Island Railroad river-tunnels. A year after Katrina, 40 percent of New Orleans remains without electricity. How long would it take to repair New York’s subways and other underground

**Figure 2:** Flood zones from New York City’s official Hurricane Evacuation Map (Wallace Roberts & Todd, LLC)



infrastructure? What would the city be like in the meantime?

The configuration of New York Harbor makes Jamaica Bay, lower Manhattan and the East and Hudson riverfronts especially vulnerable to the wrong combination of winds and tides, but the odds of such a catastrophe afflicting New York City appear to be lower than the recurrence of a major hurricane in New Orleans. Hurricane Betsy in 1965 created a flood surge in low-lying wards of New Orleans similar to the surge from Hurricane Katrina, although not as severe. The last time lower Manhattan was hit by a flood surge from a hurricane was in the early 19th century, and the storm hit at low tide, which minimized the damage. Some think

that the route followed by Hurricane Carol in 1954 had the potential for catastrophic destruction in New York City, but Carol was a relatively small storm and turned out to be a near miss, veering east and striking Long Island and the Connecticut shore instead. Destructive storms surges from direct hurricane hits are also possible in other major coastal cities such as Baltimore, Philadelphia, and Boston. The historical example to consider is the 1938 hurricane that devastated the eastern end of Long Island and then made a direct hit on the Connecticut and Rhode Island shore. The storm surge in downtown Providence was 15 to 20 feet deep.

None of the cities on the east coast has any storm-surge protection, nor do Gulf Coast cities such as Corpus Christi. The entire state of Florida is vulnerable to hurricanes from both the Atlantic and the Gulf of Mexico. Rising ocean levels make storm surges more likely, particularly in south Florida where the land elevations are low. Miami and Miami Beach are both close to sea level. A one-foot rise in sea level is considered by some to be inevitable by 2050, which will increase the vulnerability of both cities to storm surges (Figure 3). If no protections are instituted, parts of these cities could be under water even on a normal day.

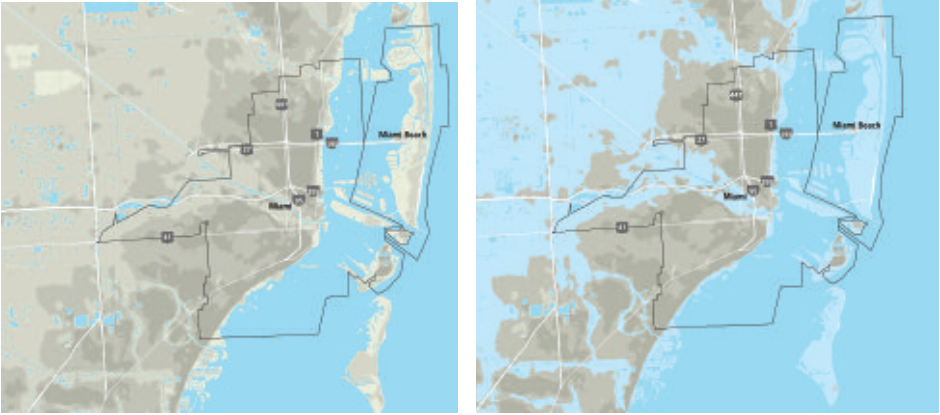
Earthquakes are less predictable than hurricanes but likewise unavoidable. San

Francisco and Los Angeles are obviously vulnerable, but so are San Diego, Oakland and the cities of the Pacific Northwest. What were probably the largest earthquakes in U.S. history did not occur on the West Coast. In 1811 and 1812, there were three great shocks along the New Madrid Fault in Arkansas, Missouri, Kentucky and Tennessee, an area then largely uninhabited. The quakes caused the Mississippi to take a new course and are said to have made church bells ring as far away as Charleston, South Carolina. Today Memphis is the major city most likely to be seriously affected by a recurrence. Salt Lake City and other population centers along the Wasatch Fault are also at risk. Charleston suffered a major earthquake in 1886, and Boston in 1775.

#### URBANIZING AREAS OUTSIDE CITIES

If a beach erodes in a storm, it has seemed to most reasonable people that it should be restored. However, if sea levels are steadily rising, then the decision to rebuild an eroding shoreline may no longer make sense. As Rob Evans of the Woods Hole Ocean and Climate Change Institute put it, “There is a price for living at sea level and building upon sand.” The one-foot rise in sea level pre-

**Figure 3:** The effect of a one-foot rise in seawater, predicted by 2050, overlaid on current USGS contour map of Miami and Miami Beach. Courtesy United States Geological Survey.



dicted by 2050 raises the risks because high tide comes farther up the shore and the effect of a storm tide becomes that much more severe.

Some experts think that global climate change since the mid-1980s has led to earlier spring thaws and warmer, dryer summers in the western United States, which in turn contribute to an increase in the number, extent, and duration of forest fires. Others say that it is not climate change, but failures in forest management and beetle infestations that have created tinder-dry conditions. Whatever the reason, wildfires are becoming more of a problem for places where people are living, at the same time that more people are living in places that are prone to wildfires. A recent op-ed piece in the *New York Times* by Roger Kennedy, a former director of the National Park Service,

states, “Half of the nation’s population growth is taking place in the 10 fastest growing states; seven of these states rank in the top 10 in the percentage of their population at risk from wildfire.” Kennedy’s prescription is a “National Flame Zone Atlas” that would inform homebuyers of potential risk and tell governments where not to encourage development.

The U.S. population is predicted to increase by 50 percent by 2050, with much of the growth going to vulnerable metropolitan areas, to coastlines, or to areas where there is a risk of wildfire. A first step would be to generalize from Roger Kennedy’s advice and make a serious national effort to catalogue the geographic extent of potential disaster areas and the probabilities that such disasters may actually happen. This information could inform decisions by local govern-

**Figure 4:** A map of the Northeastern United States with areas that could be affected by a one-meter rise in sea level, predicted by 2100, overlaid on a USGS contour map. Courtesy United States Geological Survey.



ments about zoning codes and other development regulations, and would be useful to insurance companies, investors, and home buyers. The reason for making such a catalogue a national effort is fairness to all property owners by discussing risks in every location.

#### GUARDING AGAINST URBAN FAILURE

San Francisco after the earthquake and fire in 1906, Galveston after the hurricane of 1900, and New Orleans after Katrina are examples of destruction so complete that an entire city ceases to function. If New

York City were hit by the kind of flood surge portrayed on its official website ([www.nyc.gov/html/oem/html/hazards/storms\\_stormsurge.shtml](http://www.nyc.gov/html/oem/html/hazards/storms_stormsurge.shtml)), it might well suffer systemic failure, as so much of its basic transportation infrastructure would flood. Miami Beach and Miami are at risk of widespread damage from a flood surge. San Francisco and Los Angeles are relatively well-prepared for an earthquake, but other cities with a similar degree of risk are not. Much of Boston is built on filled land that is vulnerable to earthquakes. Although seismic codes were introduced in Boston in the early 1970s, most buildings, including many historic structures and most of the utilities, do not have modern earthquake protection. The Salt Lake City, Pacific Northwest, and Memphis regions are other places where earthquake hazards are well known to scientists but that have no comprehensive protection against building and utility failures.

When we look at the level of disaster preparedness in New Orleans and the deficiencies in the response of the federal government after Katrina, it is not clear how well the U.S. economy could recover from comparable events in other major cities, particularly if several happened within a few years of each other. The potential damage to the whole economy from a cluster of disasters suggests that this is a homeland security issue, and that national expenditures for protection and prepared-

ness would be the prudent public policy. In flood-prone cities, levees and flood gates could be installed, particularly emergency protection for transit and vehicle tunnels. In earthquake-prone cities, programs that would help owners retrofit buildings for seismic protection, strong building codes for new buildings, and programs to retrofit utilities would be good long-term investments.

Since urbanization is no longer constrained by the location considerations that prevailed in previous centuries, it would be possible to direct expected increases in population growth away from areas at risk from flood surges, fire, or earthquakes toward relatively safe places. The U.S. Constitution leaves planning issues to the states, but national planning in relation to disaster preparedness is a legitimate federal role, like coastal zone management. In all the conversations about smart growth, little is said about putting new urbanization in harm's way. It is time to add such considerations to decisions about future development.