HURRICANE KATRINA: A MAN-MADE CRISIS?

“The New Orleans we all thought we knew is dead,” said the city’s former mayor Marc Morial after Hurricane Katrina ended the good times for the Big Easy, as the city is often called. Long before the Katrina disaster in the summer of 2005, Morial had criticized the city’s founders for selecting a site with so many water management problems. New Orleans was founded on a perilous location—a natural levee adjacent to the massive Mississippi River that was not embayed and therefore not protected from flooding. Geologists Kolb and Van Loplin described the location as “a land between earth and the sea—belonging to neither and alternately claimed by both.”

Even the city’s first chief engineer, Del la tour, considered the site inappropriate, but Jean Baptiste La Moyne, Sieur de Bienville, a French colonizer, believed that the site was strategically important for trade between North America and the rest of the world. The Mississippi River, with its vast network of tributaries, provided a splendid transportation system into the expansive interior of North America. Bienville believed that by reconstructing the landscape, the threat of the river’s floodwaters could be overcome. His decision to establish New Orleans as the capital of Louisiana in 1718 marked the beginning of a constant struggle by city authorities to keep the city dry. In fact, Bienville himself had to wait for water from the 1717 floods to recede before establishing the city on the peak of the natural levee that rose about 12 feet above sea level. That spot was still subject to regular flooding, but it was the best possible location because it was less susceptible to inundation than the rest of the levee and the first to emerge from abating floods.


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The “Impossible but Inevitable” City
New Orleans in fact faced two kinds of water hazards: riverine floods and standing water. The levee created by the Mississippi River gently sloped away from the river toward Lake Pontchartrain. However, the Metairie and Gentilly ridges obstructed drainage from the levee to the lake. Consequently, the area below the levee turned into a river-made topographical “bowl” that was highly prone to flooding and an impediment to urban growth. This low-lying area was, in the early years, covered with cypress swamps that graded into a grassy marsh over soils made up of fine-grained river sediments that tended to subside under their own weight. These soils were regularly replenished by floodwaters, and the underground moisture kept these soils above sea level.5

The French Reconstruct the Landscape
Early reconstruction efforts by the French were directed toward making the city economically self-sufficient. Del la Tour laid out the city in a grid pattern of 40 blocks, and the city engineers began clearing the sand bars that blocked the way of oceangoing vessels. To build the economy, the French promoted the production of rice among the inhabitants. Farmers were encouraged to build levees and use river water more efficiently to improve their crop production. By 1723, after a quarter century, the French had achieved a self-sufficient agricultural economy and considered exporting rice and tobacco. The arrival of slaves from Africa enabled the colony to rapidly increase production and generate a surplus for export. Increased production also led to further adaptations of the landscape and more extensive use of levees to restrict the river.6

In 1724, slaves helped complete construction of an elaborate system of ditches and levees stretching nearly 10 miles. But even this was not a sufficient barrier during the spring flooding. The city engineers responded by designing more substantial dikes made of timber with masonry reinforcements. Levees required investment, so colonial laws were enacted in 1728 and later in 1743 to externalize the costs of levee construction. Upstream farmers were required by law to build levees. By 1732, the levee system stretched 12 miles below New Orleans and 30 miles above, on both sides of the river. Work continued on extending the network even further.7

The levees built during this era were earthen, so they leaked. During floods, water seeped through them into drainage ditches. The ditches channeled the water into the swamps, where it collected and drained back into the river. Farmers diverted this sediment-rich water to replenish their land and irrigate their fields. Levees were thus the walls for protection, irrigation, drainage, and fertilization. Their construction, however, changed the landscape of New Orleans. The construction of the dikes pushed the houses built on the levee away from the river, placing them at greater risk of inundation.8

The French constantly struggled with engineering the appropriate height and width of the levees. In 1783, the water rose higher than the inhabitants had ever seen. For six months, from December to June, New Orleans remained under water. In response, the city raised

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5 Colten, An unnatural metropolis
7 Ibid
8 Ibid.
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the levees higher and built a more elaborate network of drainage channels. But the river rose still higher. The engineers were unable to erect sufficient barriers; higher and wider levees raised the height of the river, necessitating even higher and wider levees. But there was no looking back for the French; they had already made tremendous investments in controlling the environment, and they continued to pursue the policy of using levees to protect the city from the riverine floods.9

Riverine floods were not the only challenge the city faced. New Orleans also had to deal with the problem of standing water. Inundation turned New Orleans into a damp, smelly, and dangerous place to live. The levees kept the river back but had no control over the rain. In fact, they accentuated the city’s bowl-like features. The low-lying areas became breeding grounds for mosquitoes and led to the spread of disease. In the early years, only the small population size, around 5,000 people 8 years after the town’s establishment, kept diseases from reaching epidemic proportions. During the 18th century, the French were unable to construct sufficient barriers to keep away the floodwaters or overcome the hazards posed by standing water. In 1763, the French handed New Orleans and its surrounding plantations to Spain.10

The Advent of Steam Technology
In 1803, the United States bought the Louisiana Territory from France. New Orleans became a prominent city as U.S trade moved downstream. During this time, steamboats were also revolutionizing internal navigation and helping to transform New Orleans into a trade center. Before the advent of steamboats, the journey from New Orleans to the upper Mississippi Valley was arduous, taking three to six months. The steamboats reduced this to less than a week. Still, traveling the Mississippi was challenging. An 1830 survey found that nearly 10 percent of the steamboats traveling the Mississippi were destroyed by snagging on trees that had fallen into the river. As a result of the findings, Louisiana residents pressured Congress to take action. Congress enacted some of the first river improvement policies in the country and simultaneously took on a greater role in managing the region’s landscape.

The navigation problem was addressed by the use of snag boats, invented by an engineer named Shreve. However, the boats worked only in seasons of high water. In 1827, Shreve stated that the problem could be solved by cutting down all timber trees along the riverbank that they were likely to fall into the water. By June 1845, 75,000 trees had been removed. The forests were cleared not only to remove a hazard to steamboat navigation but also because they had become a marketable commodity as fuel for steamboats. However, the result was more frequent flooding, which caused greater erosion along the riverbanks.11

Pursuing a Levees-Only Policy
Environmental issues continued to pose problems for the city, but the city leaders, undeterred, continued reconstructing the landscape not only to address water problems

9 Ibid.
10 Colten, An unnatural metropolis
but also for expansion. After 1815, they began a campaign of draining swamps, closing natural outlets, and building more levees. A flood in 1828 spurred another levee-building campaign. Recurrent floods made some engineers question the reliance on levees for protection. Two schools of thought emerged: one group advocated a levees-only policy, and another advocated the use of outlets and reservoirs. State engineers Paul Octave Hebert and Absalom D. Woodbridge were among the first to question the long-term consequences of a levees-only approach, and they called for an approach that combined outlets and levees. They predicted that the Mississippi would eventually overwhelm the levee system and New Orleans would end up under several feet of water. They believed that floods were a natural result of the river trying to expand in order to absorb the spring waters that flowed into it. In the absence of the levees, the excess water was siphoned out through a system of natural outlets into the Gulf of Mexico. Using levees without any outlets disrupted this natural process, leading to higher and more destructive floods.12

The levees-only school of thought was represented by Caleb Goldsmith Forshey, Albert Stein, and William Hewson. Their theory was that the levees would confine the Mississippi to a single channel and would force the river to carve out a deeper channel for itself. Forshey urged the Louisiana legislature to create a statewide flood-control system by stating that “all levees are closures of outlets, and all outlets, not levied along their sides, are but the means of re-submerging the lands which levees reclaim.” He surveyed the area and calculated that more than 847 miles of levees stretched along the Mississippi and another 159 miles of levees were needed to fill the gaps. For the advocates of the levees-only policy, using outlets ran counter to the purpose of using levees, which was to master the river by forcing it into a single channel.13

Captain Andrew A. Humphreys and the U.S. Corps of Topographical Engineers were called in to explore the best method of protecting the Mississippi Valley from flooding. Humphreys refuted the assertion that the levee system allowed the river to deepen its channel. He said that hard clay prevented the current from scouring the river bed, and eventually levees would result in raising the river. However, he also admitted that by careful management, levees could be built to withstand flooding from the river.14

Despite all the levee construction, between 1850 and the early 1900s numerous floods produced crevasses, some as long as a mile that submerged thousands of acres of land. The levees constructed during this period failed because they were weak and were easily breached. Strengthening the levees required major funding. The federal government stepped in and enacted the Swamps Land Act of 1849. Congress dedicated proceeds from the sale of this land to levee construction and reclamation projects. Meanwhile, flooding continued, which heightened fears among residents of the flood-prone areas. Five years after the flood of 1874, Congress established the Mississippi River Commission, which began closing the crevasses and implementing the levees-only policy at full scale. Because crevasses were the result of poor planning and levee maintenance, levee construction and maintenance became the focus of flood management measures. By 1927, there were 28 levee boards between Cape Girardeau and New Orleans that raised

13 Ibid.
14 Ibid.
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revenue to maintain levees. The number of crevasses decreased from nearly 20 in 1820 to only three in 1912.\textsuperscript{15}

The city authorities also decided to reclaim more land wanted to attract more capital to New Orleans. Between 1880 and 1930, reclamation projects intensified in Louisiana. Riparian landowners expanded their land holdings by 13,800 acres by turning swamp at or slightly below sea level into arable land. The inadequate gradient within the city threatened public health, leading to frequent outbreaks of disease. The issue was resolved by installing heavy-duty pumps designed by A. Baldin Wood. Twenty-two pumps, including several of the world’s largest, drained New Orleans. Previously uninhabitable parts of the landscape were drained and settled. The city’s drainage system extended to 49,000 acres in 1950 and expanded 90,000 acres in 1983.\textsuperscript{16}

The Great Flood of 1927

\textit{At noon the streets were dry and dusty. By 2’oclock mules were drowning in the main streets faster than they could be unhitched from wagons. Before dark the homes and stores stood six feet deep in water.}\textsuperscript{17}

What the engineers Hebert and Woodbridge theorized became an unfortunate reality with the great flood of 1927, which was termed “the greatest peacetime disaster of all time.” It inundated 28,570 square miles of land through as many as 226 crevasses. This disaster reflected the complete failure of the levees-only policy. The U.S Army Corps of Engineers resorted to dynamiting a hole in the levee to lower the water level in New Orleans. The artificial outlet allowed the water to flow into New Orleans’ rural counterpart St. Bernard, displacing trappers and fishermen and destroying their muskrat harvest for years.\textsuperscript{18}

The flood prompted the enactment of the Flood Control Act of 1928. The main premise of the act was that the river could not be contained with levees alone and that spillways and reservoirs need to be included in the flood-management scheme.\textsuperscript{19}

Shifting Population Patterns

New Orleans in the 1850s was on the verge of becoming the second largest city in the United States, but its strategic advantage declined with expansion of the railroads. Moreover, the city had limited locations that were tolerant to the problems of drainage and flooding. As the population grew, more people settled in environments with inadequate sewer and drainage systems, which resulted in frequent epidemics. A yellow fever epidemic in 1878 killed more than 4,000. As a result, the growth of New Orleans slackened after the 1850s.


\textsuperscript{16} Colten, An unnatural metropolis


\textsuperscript{18} Ibid.

\textsuperscript{19} Ibid.
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In the mid-1920s, New Orleans was the 14th largest city in United States, with a population of around 390,000. Later, industrial growth fueled population growth in the city, with the population peaking in 1960 at 627,525. Increased urban growth was made possible by drainage technology that allowed the city to expand northward toward Lake Pontchartrain. But urbanization also exacerbated the city’s drainage problem. Inadequacies of the drainage system, especially in the low-lying areas, were exposed during the rainfall and flooding. As new highways and further land reclamation opened up new areas to suburbanization, more people and jobs started moving to outlying parishes. But blacks and the poor, who lacked economic mobility, were mostly left behind. Between 1970 and 2000, the city lost 18 percent of its population, a total of 109,000 people.20 The 2000 Census put the population at 484,674.21 (See Exhibit 1.)

The Industrialization of New Orleans

After 1945, Louisiana enacted favorable tax policies to attract manufacturing. The state already had its share of sugar and paper mills but lacked an industrial base. A 1951 report by U.S. Public Health Services counted 58 industrial plants along the lower Mississippi, six of which produced petrochemical products. This changed dramatically over the next few decades as petrochemical companies built massive refining operations statewide. The availability of salt, water, oil, and natural gas gave Louisiana a competitive advantage, and by 1971 the U.S Environmental Protection Agency (EPA) counted 60 “major” petrochemical plants along the lower river.22 Tourism, oil-related industries, chemical manufacturing, and port-related transportation industries became the drivers of the city’s economy.

The industrialization of the New Orleans region was also accompanied by investment in its infrastructure. The Mississippi River Gulf Outlet (MRGO) was one such investment. It was an outlet 76 miles long and 500 feet wide, dredged by the Army Corp of Engineers in the 1950s to enable container ships to travel straight from the Gulf of Mexico to New Orleans. The outlet cut across a marsh and four natural levees. Ominously, erosion from ships gorged its width to 2,000 feet and converted it into a treacherous freeway for future hurricanes that came in its direction.23

Engineering solutions and investment in highways allowed reclamation and development of wetlands, but surprisingly, after the 1970s the density of New Orleans barely changed. In fact, between 1982 and 1997, the metropolitan area lost 1.4 percent of its population while the amount of urbanized land grew by 25 percent.24 Public investment in infrastructure and industrialization allowed development of vast portions of the low-lying floodplains. By the 1990s, increased unsustainable development patterns pushed more New Orleanians into harm’s way.25 (See Exhibit 2.)

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22 Colten, Transforming New Orleans and its environs, p.142
24 The New Orleans metropolitan area includes seven parishes: Orleans, Jefferson, Plaquemines, St. Bernard, St. Charles, St. John the Baptist, St. Tammany. Orleans Parish and the city of New Orleans refer to the same geographical area.
25 The Brookings Institution, Orleans Parish after the Storm
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Racial and Economic Segregation
During most of the 19th century, New Orleans had little racial segregation because slaves were quartered close to their owners. Nevertheless, the free black population was pushed to the low-lying and poorly drained areas. Two of the city’s prominent social spaces reflected this segregation. Blacks dominated Congo Square, located next to the basin that linked New Orleans with Bayou St. John and Lake Pontchartrain. The Jackson Square area, about 10 feet higher, was occupied predominantly by European American citizens.

After slavery ended, municipal policy determined much of the city’s social geography. In 1924, the New Orleans city council passed an ordinance prohibiting blacks from residing in white neighborhoods. Property deeds during that time restricted the sale of certain property to African Americans. As a result, racial segregation became more pronounced by 1930, even though the city council’s ordinance was overturned three years later by the U.S. Supreme Court. Whites occupied Fourteenth Ward Uptown and the neighborhoods below the French Quarter. African Americans occupied the Second, Eleventh, and Tenth wards.26

In the 1950s, some all-white and all-black neighborhoods began to form. Federal housing policy, with support from the state and local agencies, exacerbated the economic disparities and racial segregation. The Housing Authority of New Orleans, created in 1937, received federal funds for slum clearance and subsidized housing. Its first six projects, which opened in the early 1940s, included four developments for blacks (Magnolia, Calliope, Lafitte, and St. Bernard) and two for whites (St. Thomas and Iberville). The 1949 Housing Act led to construction of 5,000 low-income dwellings next to the existing projects, further increasing the concentration of poor people. Three more projects, built between 1956 and 1964, placed a predominately black population into isolated pockets, cut off from the rest of New Orleans by the river, canals, and railroads. All told, these projects housed as much as 9 percent of the city’s population, creating highly racially segregated enclaves of poverty. The 10 big public housing projects, which were populated entirely by blacks by early 2000, were sited in flood zones. At the time of Hurricane Katrina, all but one of those neighborhoods had a poverty rate greater than 40 percent.27

Segregation was further reinforced by economic developments in the city and the region. Between 1970 and 2000, the city suffered a 23 percent decline in manufacturing jobs, while the service sector grew by 136 percent. This trend toward a service economy limited the jobs available for individuals without college degrees. Suburbanization also contributed to the city losing its ground as an employment center. In 1970, New Orleans had two-thirds of the metropolitan area’s jobs, but by 2000 its share had dropped to 42 percent. Meanwhile, job growth increased in the neighboring parishes; Jefferson Parish made a 157 percent gain in jobs between 1970 and 2000. Suburbanization resulted in whites leaving the central city. The black presence thus increased in formerly white and mixed neighborhoods. (See Exhibit 3.) In 1970, the city’s population was 45 percent black; by 2000, it was 67 percent black. Eight-four percent of the city’s poor population was black, and almost all of the extremely poor neighborhoods, such as B.W. Cooper, the Lower Ninth Ward, the Seventh Ward, and Gert Town, were predominately African

26 Colten, Transforming New Orleans and its environs
27 The Brookings Institution, New Orleans after the Storm
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American. These disparities also meant that poor minorities bore the brunt of the devastation caused by flooding.  

The City Remains Vulnerable
After the great storm of 1927, no serious hurricanes threatened New Orleans until the storm of 1947, which yet again demonstrated the city’s vulnerability. The Corps responded by undertaking projects to raise the levees to 14 feet. These structural improvements prevented flooding to a certain extent, but they did not eliminate the problem of breaches in the levee system. In 1956, Hurricane Flossy inundated large portions of the Gentilly neighborhood and breached the levee along the Industrial Canal. In 1964, Hurricane Hilda breached the levees and damaged businesses along the Industrial Canal. 

By 1965, New Orleans had one of the world’s most sophisticated levee and spillway systems. Louisiana Governor John J. McKeithen proclaimed with confidence, “We have spent hundreds of millions of dollars to protect ourselves from water, we feel now we are almost completely protected.” This sense of security was dashed in September 1965 when Hurricane Betsy caused the worst flooding ever in the state, with winds up to 160 miles per hour. Once again, the tidal surge breached the levee of the Industrial Canal, now known as the Inner Harbor Navigation Canal. Water reached as high as 8 feet in the low-lying areas. According to the Corps, the secondary levee built after 1947 prevented inland damage to areas such as Jefferson Parish. Except for the failure along the Inner Harbor Navigation Canal, the levee system had successfully protected the city from flooding. 

The flooding caused 81 deaths and injured 17,600. Six thousand houses sustained serious damage. The city had followed an emergency plan put in place after a hurricane in 1957 and managed to limit the scale damage to life from the hurricane. The relief operations were said to be unprecedented. The 4th Army stood ready with crates of sanitation equipment, drums of water, mattresses, blankets, and gas masks. The Red Cross served food and drinks. Rescue boats rushed in from as far away as Shreveport, and the U.S Air Force sent in 20 Coast Guard helicopters and radar support. 

As other towns and cities drained, New Orleans remained under flood water. Hurricane Betsy once again brought New Orleans face to face with the uncomfortable reality that its location might have been a big mistake. Despite its continued vulnerability, the city did manage to make a strong comeback—largely because of its businesses, including the petroleum industry, tourism in the French Quarter, and the NASA assembly facility.

More Hurricane Protection Plans
Hurricane Betsy exposed the inadequacies of the structural protection approach for low-lying areas and led to the implementation of the National Flood Insurance Program (NFIP) in 1968. NFIP’s basic intent was to force a shift from structural protection to a system whereby planning and construction codes would limit inappropriate development in flood-prone zones and make high-risk zones pay the cost for protection through high 

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28 Ibid. 
29 Colten, An unnatural metropolis 
insurance premiums. Much of the metropolitan area was within the flood plain zone defined by NFIP. However, neither New Orleans nor suburban Jefferson Parish fully adopted the land use controls.

For example, the Broadmoor neighborhood was situated near the “bottom of the bowl” and developed after the drainage improvements in the 1920s. It was a mixed-income area with influential neighbors. During storms and heavy rains, Broadmoor, along with the Ninth Ward, were the hardest hit. The intensity and the duration of Hurricane Betsy overwhelmed its drainage and pumping system. The Sewerage and Water Board began designing upgrades to improve its drainage capacity. The authorities did little to enforce NFIP and continued to rely on structural improvements. This approach allowed settlement in the higher-risk areas and did not fully address the problems of poor drainage. Compliance with NFIP codes was also slow because they had limited impact on older districts that were densely built and had to rely on structural measures. The oil bust also led to decline in population between 1980 and 2000, so there was less new constructions in areas where the codes could be applied.

The city applied for federal grants to raise homes in areas with repeated flood insurance claims and received two grants of $1.8 million with which it raised only 17 homes. In 2002, a tropical storm caused the closure of Interstate 10, the city’s critical evacuation route, raising concerns about the failure of the drainage system. Once again, the system’s weaknesses were exposed, and again the city responded by improving the pumping capacity.31

Other significant initiatives taken to counter future hurricanes included the Corps’ Hurricane Protection Program. The Corps was assigned the task of building new levees for New Orleans that were taller and made of stronger material and could withstand a fast-moving Category 3 hurricane like Betsy. In 1979, President Jimmy Carter created the Federal Emergency Management Agency (FEMA), whose initial mission was centered on natural disasters and civil defense.

Coast 2050: Planning for the Big One
After two centuries, New Orleans rediscovered the role of wetlands in protecting the city. Five state agencies and six local agencies shared jurisdiction over the wetlands, which complicated decision making. But the threat of the Big One—a Category 4 or 5 hurricane—pulled the agencies together. In 1998, the governor’s office, the state’s Department of Natural Resources, the U.S Army Corps of Engineers, the EPA, and all of the state’s 20 coastal parishes reached a consensus and published Coast 2050, a proposal to restore the Louisiana coastline. The cost of all of their proposed projects amounted to $14 billion.32 Key plans included building river diversions at critical spots to restore disappearing marshlands, rebuilding southern barrier islands using more than 500 cubic yards of sand, and cutting an alternative channel to MRGO that would allow its closure. Ivor Van Heerden, a geologist and a deputy director of the Louisiana State University Hurricane Center, commented that the scientists and engineers had come full circle. “If we’re going to succeed we’ve got to mimic nature,” he said. “Building diversions and

31 Colten, An unnatural metropolis
32 For more on the plan visit http://www.coast2050.gov/
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reestablishing barrier-island sediment flows are closest we can come.” However, Coast 2050 was never implemented because of inadequate funding.  

Katrina: A Disaster Years in the Making

At the start of the 21st century, New Orleans was as vulnerable as ever, if not more. The levees still accentuated the city’s bowl-like features, the pumps caused subsidence and sinking of the city, and the destruction of wetlands opened up its frontiers to the Big One.

Despite numerous predictions that a Category 4 or 5 hurricane could make landfall at New Orleans, little disaster planning and management had been accomplished by August 2005. (See Exhibits 6 and 7.) New Orleans had used $18 million in federal funding since 2002 to stage exercises, train for emergencies, and build relay towers to improve emergency improvements. State officials had yet to complete the disaster plan they had been working on for two years and were not prepared to tackle the issues of transporting evacuees and imposing law and order in the event of a severe disaster.

Hurricane Katrina made landfall at 6:10 am CDT on Monday August 29. After 11:00 am CDT, several sections of the New Orleans levee system collapsed. Levees protecting the Lower Ninth Ward and running along 17th Street and London Avenue were breached, and thousands of modest houses in the low-lying urban neighborhoods were inundated. Only the high-value French Quarter and downtown remained dry. Heavy damage was also inflicted on the coasts of Mississippi and Alabama. By early September, people had to be forcibly evacuated, mostly by bus to neighboring states. More than 1.5 million people were displaced. The National Hurricane Center estimated the damage at $75 billion (with other estimates ranging from $40 to $120 billion)—almost double the previously most expensive hurricane, Andrew. Katrina was the most destructive and costliest natural disaster in the history of the United States. As of January 18, 2006, more than 3,200 people still remained unaccounted for, and the death toll was expected to grow higher.

The storm’s impact on different communities exposed stark disparities in the city. The French Quarter (the oldest settlement on the natural levee), the Central Business District, the Garden District, Uptown, and the Audubon neighborhood escaped the worst flooding. The low-lying neighborhoods, including Leonidas, Mid-City, Gert Town, B.W. Cooper, the Seventh Ward, and the Lower Ninth Ward, were inundated. The poor and minority neighborhoods were most affected by the flooding. All the extreme poverty tracts in the city were flooded, and they were virtually all black. Significant numbers of people in the flooded areas lacked access to a car, which became critical during the evacuation period. (See Exhibits 8 and 9.)

Why Did It Happen?
The Army Corps of Engineers argued that the artificial flood barriers in and around New Orleans were never intended to withstand a storm as powerful as Katrina. Congress had

33 Fischetti, Drowning New Orleans
36 Ibid.
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told the Corps to build a network of levees and floodwalls that could withstand a
Category 3 storm similar to Hurricane Betsy, which flooded New Orleans in 1965. 
Katrina was a Category 4 hurricane when it hit. Some argued that inadequate federal 
funding for flood protection after the September 11 attacks prevented raising the levees 
high enough to withstand a Category 4 hurricane. But Lt. General Carl Strock, chief of 
the Corps, refuted the claim. “The important question is would that have made a 
difference?” he said. “And my assessment is no, it would not, because this was about a 
levee breach.”

Experts debated whether the levees failed because the floodwaters rose above them or 
whether they crumbled when the water was still well below their tops. The issue was 
critical to how New Orleans flood defenses should be rebuilt.

The Loss of Wetlands and Barrier Islands
With the runoff from a third of the nation, the Mississippi River built coastal Louisiana, a 
swath of marsh, islands, and swamp that covered more than 6,000 square miles (15,500 
square kilometers) by the early 20th century. The spring floods that pumped in a vital 
 supply of sediments and nutrients into the wetlands were restrained by the levees, leading 
to destruction of the wetlands. These wetlands were crucial barriers for the city. A 
hurricane’s storm surge can reach heights of more than 20 feet, but every 4 miles of 
marsh can absorb enough water to reduce it by 1 foot.

Urbanization and industrialization also led to dredging of miles of wetlands and coastline. 
By the 1960s, the Army Corps of Engineers had dredged 14 major ship channels to inland 
ports, while oil companies cut countless canals for pipelines and wells that resulted in the 
loss of wetlands. Adding in the toll from subsidence and the rise in sea level, and 
Louisiana lost 1,900 square miles (4,900 square kilometers) of wetlands from the 1930s 
to the present day, with another 700 square miles (1,800 square kilometers) likely to 
vanish by 2050. The city continues to lose an acre of wetland every 24 minutes.

Pumping Sinks the City
The soil in New Orleans is a tenuous composition of sand and silt that, over time, 
compacts under its own weight. The levees obstructed the renewal of the soil by the flood 
waters and caused the city to sink. The Corps also dug a maze of canals to collect 
rainwater and divert it to Lake Pontchartrain, and because the lake’s mean elevation was 
1 foot, they built pumping stations at the canal heads to push the collected runoff uphill 
into the lake. The pumps have served another critical function: Because the canals are 
basically ditches, groundwater seeps into them from the wet soils, but when the canals are 
full, they can’t take out water in a storm. So the city runs the pumps regularly to expel 
seepage from the canals, which draws even more water from the ground, leading to 
further drying and subsidence. The city’s present rate of subsidence is 3 feet every 100 
years; parts of New Orleans are 8 feet below sea level. The Mississippi precariously 
flows 10 to 15 feet above sea level.

37 Chicago Tribune, Retrieved January 20, 2006 from Proquest Database
38 Colten 2005, An unnatural metropolis
39 Fischetti, Drowning New Orleans
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Failures of Management and Leadership

Floods were always part of life in New Orleans. It was said that the city’s favorite concoction of liquor and fruit juices was named “the hurricane” because New Orleanians had stopped taking hurricanes seriously. But in the face of the imminent threat of a Category 4 or 5, as well as the experience of Hurricane Betsy and the narrow escape from Hurricane Andrew, why was the city so ill-prepared in terms of leadership, management, and capacity when Katrina struck? A post-disaster report by a special U.S. House committee remarked, “If this is what happens when we have advance warning, we shudder to imagine the consequences when we do not.”

The post-Katrina response also revealed an absence of leadership. The division of responsibilities caused delays in execution relief plans. Governor Kathleen Blanco controlled state agencies and the National Guard; Mayor C. Ray Nagin directed city workers; Michael Brown, head of FEMA, served as point man for the federal government’s response. No one person was in charge of coordinating efforts. The Department of Defense (DOD), FEMA, and the state agencies had difficulties coordinating with each other. The House report added that inflexibility and lack of agility also led to the failures: “Officials at all levels seemed to be waiting for the disaster that fit their plans, rather than planning and building scalable capacities to meet whatever Mother Nature threw at them.”

The officials failed to act decisively partly because of information gaps. There was no coordinated process for sharing the information that existed. The scale of the disaster overwhelmed the state and the local agencies, which had not anticipated the resource requirements, resulting in delays in provision of critical services. For example, the agencies failed to round up buses for 100,000 people who did not own private vehicles. Seventy percent of New Orleans’ 53 nursing homes were not evacuated before the hurricane struck. Two days after Katrina had drowned New Orleans, Governor Blanco was still frantically hunting for buses to rescue people from the Superdome and the convention center and was heard shouting in the state emergency center, “Does anybody in the building know anything about buses?” She complained that only a fraction of the 500 buses promised by FEMA had arrived. However, Natalie Rule, FEMA’s spokeswoman, said that FEMA stepped in to assemble a fleet of buses only after a request from the state arrived on Wednesday, August 31. A spokesperson for the Greyhound bus company, Anna Flomnsbee, said that Greyhound began sending buses into New Orleans within two hours of getting approval from FEMA on August 31. Blanco, amid reports of desperation and violence at the Superdome, signed an executive order that required parishes to turn over their buses. In all, it took three days for the agencies to work out the logistics of rounding up buses to evacuate people from the Superdome. These three days amounted to fatal delays in evacuating patients from nursing homes in the city.

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42 U.S. House of Representatives, A failure of initiative

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Failures of Planning and Execution
The emergency plan put forward by the state mandated that the mayor of the city initiate, execute, and direct the operations during a disaster or emergency. According to the New Orleans Plan, “actual evacuation will be the responsibility of the Mayor of New Orleans in coordination with the Director of the Office of Emergency Preparedness, and the OEP Shelter Coordinator. Special arrangements will be made to evacuate persons unable to transport themselves or who require specific life saving assistance. Additional personnel will be recruited to assist in evacuation procedures as needed.”

Despite adequate warnings that came 56 hours before Katrina’s landfall, Governor Blanco and Mayor Nagin ordered mandatory evacuation in New Orleans only 19 hours before the hurricane hit the city. The city failed to implement its evacuation plan—between the announcement of a mandatory evacuation and the time the storm hit, 70,000 people, many without any means of transportation, remained in the city. There were also critical gaps in provision of adequate food supplies and sanitation for the 24,000 people who gathered in the Superdome. Major Nagin and the city officials explained that they were not prepared for the delay in rounding up the buses. Chief Swain said, “I am angry that we couldn’t get the resources we needed to save lives, I was watching people die.” The people in the Superdome waited for days in unhygienic conditions without electricity and amid incidents of violence. Deployment of medical personnel to the Superdome was reactive, not proactive.” The biggest problem was that there wasn’t enough security,” said Captain Winn, the head of the police CWAT team. “The only way I can describe it is as a completely lawless situation.”

Lack of Preparedness at DoHS and FEMA
After the attacks of September 11, 2001, the administration of President George W. Bush made FEMA a part of the new Department of Homeland Security (DoHS), with a mandate to act only if needed by the local or state agencies. David Plassey, a FEMA spokesman, described FEMA’s typical role as “to work with the state in support of local and state agencies.” This meant that the agency with the greatest experience in managing disasters followed rather than led. The inadequate relief efforts were due both to the state and local agencies’ inability to estimate the needs of the devastated area and FEMA’s insistence on specific requests to initiate its efforts with respect to buses, food, troops, fuel, and rescue boats. Colonel Ebbert, the city’s emergency operations director, criticized FEMA’s response by stating, “When you go to war you don’t have time to ask for each round of ammunition that you need.”

After being subsumed into DoHS, FEMA began focusing on terrorism rather than taking an “all hazards” approach. Three-quarters of the $3.35 billion in federal grants were designated for fire and police departments. Critics complained that the agency had become politicized and thus lacked experienced and adequately trained staff for the Katrina response. Michael Brown, FEMA’s director, and Patrick J. Rhodes, the FEMA chief of staff, were appointed more for their political connections rather than their

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45 The New York Times, Breakdowns marked path from hurricane to anarchy.
46 Ibid.
emergency management experience. There was discontent among FEMA employees, some of whom wrote to Congress in June 2004 complaining that “[s]easoned staff members are being pushed aside to make room for inexperienced novices and contractors.”

Still, FEMA’s weak response was unwarranted given the fact that the agency had been aware of the prospect of a major hurricane hitting New Orleans. Joe M. Allbaugh, director of FEMA in 2002, had said, “Catastrophic disasters are best defined in that they totally outstrip local and state resources, which is why the federal governments need to play a role.” He pointed out that New Orleans was in this position. Yet FEMA failed to play its role effectively in New Orleans. Michael Chertoff, head of DoHS, told the special House committee investigating the government response to Hurricane Katrina said that FEMA had been “overwhelmed” by the disaster and “80 percent or more of the problem could be attributed to poor planning by FEMA.” Michael Brown resigned, and on February 10, 2006, he placed the blame on DoHS for the poor handling of the disaster, asserting that the anti-terrorism focus of the department had caused it to deny resources needed by FEMA for disaster assistance.

Lack of Capacity
State and the local agencies also failed to impose law and order. There were reports of looting by those who were left in the city, including inside the Superdome and the convention center. The New Orleans Police Department was ill-prepared for continuity of operations and was ineffective in restoring civil order. When the situation approached anarchy in New Orleans, the Pentagon, the White House, and Justice Department officials debated for two days whether the president should seize control of the relief effort from Governor Blanco. They decided against it. Defense Secretary Donald H. Rumsfeld noted at a news briefing, “The way it’s arranged under our Constitution, state and local officials are first responders.” They instead decided to speed up the arrival of National Guard forces. President Bush offered to federalize the National Guard to improve the command structure. However, Governor Blanco declined the offer, citing the need for flexibility in National Guard operations. Some questioned the response of the federal government in this emergency, but the federal government acted in accordance with the Posse Comitatus Act, which prevents ordinary use of the federal military force in support of federal and local law enforcement, as well as the Stafford Act, which prohibits the president from declaring a disaster in a state unless requested to do so by the state’s governor.

Governor Blanco was criticized for not having enough troops ready to ensure relief supplies to the evacuees. The Louisiana Guard had about 11,000 members, of whom 3,000 were stationed in Iraq. And of the remaining 8,000 in the Pelican State, fewer than half were on duty the day Katrina struck. Governor Blanco had also accepted an offer of National Guard reinforcements from New Mexico Governor Bill Richardson. Although this agreement was made on August 28, the day before Katrina struck, the paperwork required to deploy troops did not arrive from the federal government until September 1.

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48 Ibid.
49 The New York Times, Breakdowns marked path from hurricane to anarchy.
50 Ibid.
51 Ripley, A. 2005 ‘Kathleen Babineaux Blanco’ Time Magazine, 21 November
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A spokeswoman at Fort Polk said she did not know why the base received its deployment orders so late in the game. “You’d have to ask the Pentagon,” she said. A senior Army official said the service was reluctant to commit the 4th brigade of the 10th Mountain Division from Fort Polk because the unit, which numbered several thousand soldiers, was preparing for deployment to Afghanistan in January. Instead, the Pentagon chose to send more than 7,500 soldiers from the 1st Cavalry Division at Fort Hood, Texas, and the 82nd Airborne Division from Fort Bragg, North Carolina, along with Marines from California and North Carolina. Soldiers from the 82nd Airborne Division were able to deploy anywhere in the world in 18 hours, but it took them several days to arrive on the ground in Louisiana.52

Post-Disaster Analysis
After the disaster, President Bush instituted the 11-member House select committee that investigated the response to Katrina at the local, state, and federal levels. Its report, titled “Failure of Initiative,” stated, “At every level—individual, corporate, philanthropic and governmental—we failed to meet the challenge that was Katrina.” The committee's report noted widespread failures among government agencies to share critical information in the wake of Katrina and equally widespread confusion over issues of responsibility. The report criticized Michael Chertoff, head of DoHS, for being detached from events and for activating the government’s emergency response systems “late, ineffectively or not at all,” delaying the flow of federal troops and materiel by as much as three days. It also criticized the White House for not fully engaging the president or acting on the information at its disposal and “failing to confirm the collapse of New Orleans’s levee system on Aug. 29, the day of Katrina’s landfall, which led to catastrophic flooding of the city of 500,000 people.” The report found that “earlier presidential involvement could have speeded the response” because Bush alone could have cut through all bureaucratic resistance.53

New Orleans is an unfortunate reminder of the extent to which humans can play a role in intensifying and accelerating the damage caused by natural processes. How can a disaster such as Katrina be averted in the future? The House committee report concluded, “Government failed because it did not learn from past experiences, or because lessons thought to be learned were somehow not implemented.” It also recommended a National Action Plan—“Not a plan that says Washington will do everything, but one that says, when all else fails, the federal government must do something, whether it’s formally requested or not. Not even the perfect bureaucratic storm of flaws and failures can wash away the fundamental governmental responsibility to protect public health and safety.”54

53 U.S. House of Representatives, A failure of initiative, p. x
54 Ibid.
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Exhibit 1

![Population - City of New Orleans](image)

Source: U.S Census

Exhibit 2

Federally funded highways like Interstate 10 and U.S. 61 made the flood-prone marshlands along Lake Pontchartrain accessible to development.

![Map of Louisiana](image)

Source: The Brookings Institution, 2005
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**Exhibit 3**

**Between 1970 and 2000, the suburban parishes gained population while Orleans lost population**

Source: U.S. Census Bureau

Source: The Brookings Institution, 2005

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**Exhibit 4**

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>Total Population</th>
<th>Percent Non-White Population</th>
<th>Average Household Income</th>
<th>Poverty Rate for Total Population</th>
<th>Percent Owners-Occupied Housing Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.W. Cooper</td>
<td>4,339</td>
<td>99.8%</td>
<td>$13,786</td>
<td>69.2%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Lower Ninth Ward</td>
<td>14,068</td>
<td>99.5%</td>
<td>$27,522</td>
<td>36.4%</td>
<td>59.0%</td>
</tr>
<tr>
<td>Pontchartrain Park</td>
<td>2,630</td>
<td>99.4%</td>
<td>$44,507</td>
<td>10.2%</td>
<td>92.1%</td>
</tr>
<tr>
<td>Gert Town</td>
<td>4,748</td>
<td>97.1%</td>
<td>$22,288</td>
<td>48.6%</td>
<td>24.2%</td>
</tr>
<tr>
<td>Seventh Ward</td>
<td>16,955</td>
<td>97.0%</td>
<td>$26,470</td>
<td>38.6%</td>
<td>33.2%</td>
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<tr>
<td>Treme/Lafitte</td>
<td>8,833</td>
<td>93.1%</td>
<td>$19,479</td>
<td>56.9%</td>
<td>21.8%</td>
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<tr>
<td>Central City Neighborhood</td>
<td>19,072</td>
<td>90.1%</td>
<td>$23,046</td>
<td>49.8%</td>
<td>16.3%</td>
</tr>
<tr>
<td>Mid-City Neighborhood</td>
<td>19,909</td>
<td>76.8%</td>
<td>$31,437</td>
<td>32.1%</td>
<td>27.9%</td>
</tr>
<tr>
<td>Gentilly Woods</td>
<td>4,387</td>
<td>75.2%</td>
<td>$41,338</td>
<td>14.4%</td>
<td>75.7%</td>
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<tr>
<td>Gentilly Terrace</td>
<td>10,542</td>
<td>75.1%</td>
<td>$42,053</td>
<td>16.1%</td>
<td>68.7%</td>
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<tr>
<td>Lower Garden District</td>
<td>6,116</td>
<td>44.6%</td>
<td>$55,955</td>
<td>28.5%</td>
<td>24.8%</td>
</tr>
<tr>
<td>West Riverside</td>
<td>2,232</td>
<td>43.1%</td>
<td>$48,830</td>
<td>18.1%</td>
<td>40.8%</td>
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<tr>
<td>Uptown</td>
<td>6,681</td>
<td>42.2%</td>
<td>$55,367</td>
<td>23.9%</td>
<td>43.4%</td>
</tr>
<tr>
<td>Old Aurora</td>
<td>15,807</td>
<td>40.0%</td>
<td>$56,261</td>
<td>9.9%</td>
<td>73.7%</td>
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<tr>
<td>Touro</td>
<td>3,242</td>
<td>26.0%</td>
<td>$46,072</td>
<td>15.5%</td>
<td>32.3%</td>
</tr>
<tr>
<td>Audubon</td>
<td>14,898</td>
<td>13.9%</td>
<td>$109,097</td>
<td>17.9%</td>
<td>54.3%</td>
</tr>
<tr>
<td>Garden District</td>
<td>1,970</td>
<td>10.8%</td>
<td>$90,702</td>
<td>11.3%</td>
<td>49.1%</td>
</tr>
<tr>
<td>Lakeview Neighborhood</td>
<td>9,875</td>
<td>6.1%</td>
<td>$63,178</td>
<td>4.9%</td>
<td>69.5%</td>
</tr>
</tbody>
</table>

Source: Brookings analysis of U.S. Census data, Greater New Orleans Community Data Center
Exhibit 5

Predominately African American neighborhoods are clustered in the eastern and central portions of the city of New Orleans.

Source: The Brookings Institution, 2005
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Exhibit 6

LAST LINE OF DEFENSE: HOPING THE LEVEES HOLD

Army Corps of Engineers officials say hurricane levees in the New Orleans area will protect residents from a Category 3 hurricane moving rapidly over the area. But computer models indicate even weaker storms could find leaks in that armor.

BARRIERS OF EARTH AND CONCRETE

Levees and floodwalls that protect against flooding from both the Mississippi River and hurricanes are built by the Army Corps of Engineers and are maintained by local levee districts. The corps and the local districts share the cost of levee construction, while the Mississippi River levees are a federal project. Local levee districts also build and maintain reservoirs, floodwalls, and other levees to reduce the chance of flooding. 

LEVEE HOT SPOTS AROUND NEW ORLEANS:

1. ST. CHARLES PARISH
   - Construction of a new drainage structure west of New Orleans International Airport is part of an ongoing 10-mile levee from the Mississippi to the parish line, five miles inland from Lake Pontchartrain. Computer models indicate storms from smaller hurricanes would flood populated areas toward the river through gaps.

2. ST. CHARLES-JEFFERSON PARISH LINE
   - This 5-foot to 10-foot wall of sandbags and sheet piling ranges from 60 miles between Mandeville and Covington west of Lake Pontchartrain. Levees along the Mississippi between St. Bernard Parish and New Orleans, according to computer models, are not 100 percent effective.

3. JEFFERSON-BARBERY PARISH LINE
   - The levees on higher ground and from the water by 5 miles of marina need to be only 10 feet tall, while levees on lower ground in the Five Forks area need to be 17 feet tall or taller. As of now, the levee system is not 100 percent effective.

4. NEW ORLEANS
   - The Mississippi levee system is being replaced with a new, hurricane-resistant structure. Large sandbags are kept nearby to plug leaks in the barrier caused by the hurricane protection for Jefferson and Orleans parishes.

5. EASTERN NEW ORLEANS AND ST. BERNARD PARISH
   - A computer model indicates storm surge could come up to 12 feet in the Five Forks area, where levees meet at the parish line near the Caernarvon Freshwater Diversion Project along the east bank of the Mississippi River.

Staff graphics by Emmett Mayer III/www.mayergraphics.com

Exhibit 6
Hurricane Katrina: A Man-Made Crisis?

Exhibit 7

GOING UNDER

REVISITING BETSY

Hurricane Betsy flooded New Orleans with attic-high water in 1965, accelerating a massive public works effort to protect the area from storm surge and flooding. But advances in computer modeling show that dangerous weak spots in the levees could result in a catastrophic flood. Erosion and subsidence make south Louisiana all the more vulnerable to hurricanes.