



# Report

## Hurricane Katrina

August 2005

**No 1** (September 7, 2005 – 6pm PST)

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Hurricane Katrina August 28, 2005 at 11:45 a.m.

***“The results are not acceptable”***



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### Introduction

Hurricane "Katrina" hit the US Gulf Coast of Mexico about 7 a.m. on Monday, August 29 with enormous destructive force. More than 240 people have been confirmed dead so far and that number is expected to go up significantly. Katrina will most likely be the costliest hurricane, if not the costliest natural disaster, that has ever hit the United States. Damage estimates range from US \$ 10 to 25 billion, whereas we at EDM consider damages and economic consequences of up to US \$ 100 billion as realistic predictions.

At least 1.3 million households were without power. Tens of thousands of houses and businesses are destroyed or severely damaged. Many transportation routes, including streets, waterways, and airports are not functioning or damaged.

Some areas have not been completely surveyed and searched and therefore information is not complete.

Until Friday, September 2, the situation in New Orleans had dramatically deteriorated and could only be described as catastrophic. Water continued to flow into the city from the broken levees. The situation was chaotic; electricity, phone, drinking water, and sewage services are still completely broken down.

Thousands of people have been air rescued and evacuated from rooftops mainly by the US Coast Guard and other military helicopters. Bodies have been floating in the waters or lying on the streets. Search and recovery operations started in New Orleans on Sunday, Sep 4. The number of deaths is still unknown, it may reach thousands. As of Sep 5, we at EDM expect a figure not exceeding 2,000, but that is a conservative estimate.

On Thursday, September 1, rescue boats and helicopters were attacked, and some supply vehicles had been stopped and robbed at gunpoint. On the same day, the situation of ten of thousands of people trapped at the Superdome, the Convention Center, and several other places within the city, had reached a point of suffering and calamity rarely seen in the western world. Many of those suffering included special needs or elderly people, as well as infants and young children.

On Wednesday, August 31, the entire federal disaster response machinery, which consist of tens of thousands of emergency workers and military personnel was activated and mobilized.

On Thursday, September 1, three days after impact, the federal government still did not seem to have even a general idea about the situation particularly in the city of New Orleans. Central coordination did not appear to exist as of the end of



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Thursday, September 1. A few thousand people have been bussed from the New Orleans Superdome to the Houston Astrodome, but tens of thousands of others were left at the Superdome and the Convention Center until Friday, Sep 2 without water, food, medical attention or security.

Communication between the city, the state, and federal agencies was virtually nonexistent. Until Friday, emergency services were rarely, if at all, seen in the city. Rumors and conflicting messages were widespread.

It seemed that only the media was able to provide some data and images from the area and its catastrophic conditions.

As of Friday morning, Sep 2, only a fraction of these much needed resources had reached the city of New Orleans. Remarkably, even US President Bush said, “the results are unacceptable”.



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Images of the Gulf Coast devastation remind us of the destruction left by the South Asian Tsunami in December of 2004.





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### Path of the Hurricane:

On Monday morning, August 29, around 7:15 am, Katrina made landfall in the state of Louisiana in the Parish Plaquemines south of the town of Buras, located approximately 50 miles (80 km) south of New Orleans.





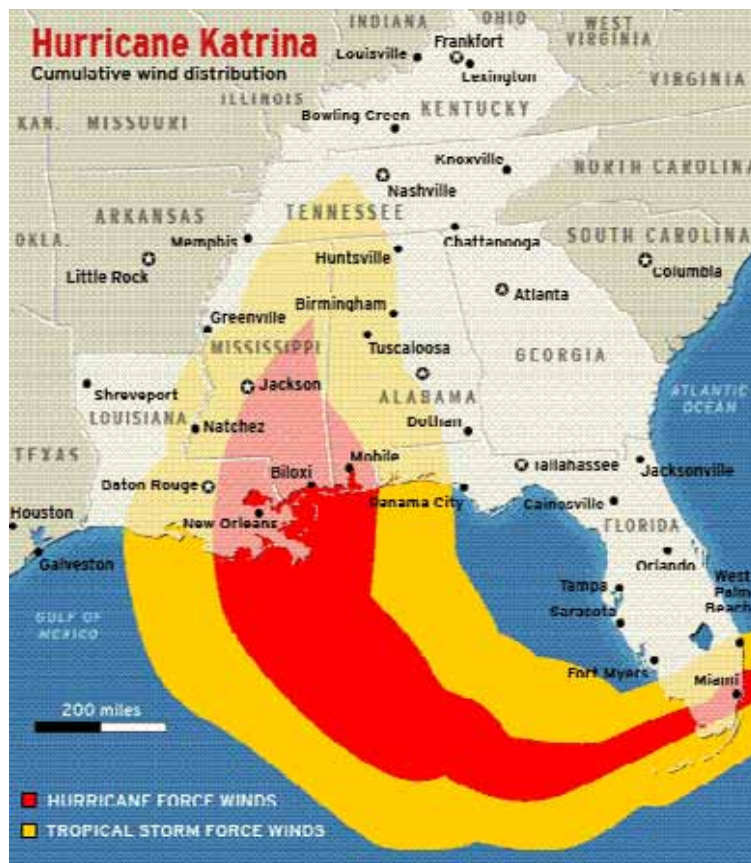
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With wind speeds of up to 140 mph (225 km/h), Katrina made landfall as a Category 4 hurricane.



The prediction of the hurricane path was extremely accurate. The National Oceanic and Atmospheric Administration (NOAA) National Hurricane Center anticipated landfall in the Gulf Coast region surrounding New Orleans 60 hours prior.

The predicted landfall 24 hours prior, was only 15 miles (24 km) off, and the 12 hours predicted landfall was less than 10 miles (16 km) off from the true landfall location.

Due to these exact predictions, the city of New Orleans and other coastal regions ordered a mandatory evacuation early on Sunday, August 28th. It is estimated that approximately 80% of the residents of New Orleans left the city.



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In the early afternoon of Tuesday, August 30, the storm system had moved to the state of Tennessee with wind speeds of 35 mph (56 km/h), Katrina was downgraded to a tropical depression. The storm system was still moving with the speed of 25 mph (34 km/h), dumped up to 8 inches (20 cm) of rain, and was accompanied by tornadoes in the inland areas.



Satellite image of Tuesday, August 30, 9:00 pm, Katrina nearly disintegrated





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### Impacted Regions and Cities

The path of destruction at the coastal areas spread over a distance of 200 miles from west of New Orleans to Pensacola in Florida. People, property, and infrastructure along the Gulf of Mexico in Louisiana, Mississippi, Alabama, and Florida were directly hit.

#### State of Alabama

- At least 2 deaths
- Approximately 720,000 households and businesses without electricity

#### City of Mobile

- Population 200,000
- Flooding reached 11 feet, matching a record set in 1917

The Cochrane-Africatown USA Bridge was struck by the PSS Chemul, a 13,000-ton semi-submersible accommodation/maintenance vessel owned by PEMEX. It had been drydocked on a heavy lift barge for repair and refurbishment when it broke free Monday about 11 a.m. The vessel collided with a dock, and struck a barge loader near the dock. The top of the Chemul reportedly struck a side of the bridge and vessel pivoted into the bridge, becoming lodged.

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### State of Mississippi

- Haley Barbour, Governor
- Population approximately 3 million
- Capital City Jackson
- Population density in the inland counties is approximately 10 people per square mile; density increases in the coastal regions to up to 250 people per square mile;
- only 44 miles of coastline.

August 30: at least 900,000 people without electricity

September 1: 841,000 people without power, electricity restored for 25,000  
Telephone services down;  
Highway 90 impassable due to sand, debris and other damage to pavement.

Coastal counties (from west to east):

Hancock County – Harrison County – Jackson County

Harrison County: Population nearly 200,000  
80 fatalities unconfirmed

City of Biloxi: Population 50,000  
significant damages to restaurants, shopping centers, churches: heavy damage particularly in the eastern part; neighborhood of Point Cadet completely isolated; multistory apartment complex at the beachfront collapsed, at least 30 people killed.



Biloxi: Hard Rock Casino partially destroyed



Biloxi: Pink casino ship thrown on land



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Biloxi: Downtown area



Highway 90: Bridge between Biloxi and Ocean Springs

- City of D'Iberville: Population 8,000  
Missionary Baptist Church destroyed, damage to local high school
- City of Gulfport: Population 75,000 on 57 square miles  
located 75 miles east of New Orleans
- Hancock County: Population 45,000



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City of Waveland: Population 7,000  
All structures within half a mile of waterfront were completely destroyed.



### Jackson County:

City of Long Beach: Population 15,500

City of Moss Point: Population 16,000

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### State of Louisiana

- Kathleen Blanco, Governor
- Mitch Landrieu, Lieutenant Governor
- Population 4.5 Million
- State is divided into 64 counties known officially as parishes
- Capitol City Baton Rouge (population 230,000, located inland 75 miles north of New Orleans)

### Impact:

- at least 715,000 households without electricity
- estimated 750,000 phone lines out of service in the most heavily damaged areas (according to BellSouth Corp., the region's leading local phone provider)

### Saint Bernard Parish

#### City of Chalmette

- Parish seat
- Population 33,000 on 7.3 square miles;
- Elevation: 7 feet
- Location 7 miles east of downtown New Orleans
- Flooded when segments of the Inner Harbor Navigation Channel gave way





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### Jefferson Parish



Population 480,000

The sprawling parish stretches from Grand Isle on the Gulf of Mexico to Lake Pontchartrain in the north, and includes some of the metropolitan area's most exclusive neighborhoods. Different from New Orleans, hurricane Katrina brought destruction to a much wider economic cross-section. With police checkpoints on every major street corner and ID checks for parish residents, even looting was not a major concern.

In the enclave of Old Metairie, the rows of mansions homes sustained little structural damage from the storm itself but had some of the worst flooding. Only a few windows were broken and the live oaks survived but the water rippled up the knobs at front doors and completely covered Mercedes-Benzes, pickup trucks and BMWs in garages.

On Monday, Sep 5 residents were allowed to return to their homes and were happy to see that the storm had spared most of their houses. About 15% of the parish is flooded. Some homeowners were considering a lawsuit against the



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federal government for having a levee that could survive no more than a Category 3 hurricane.



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### New Orleans

Metropolitan Area (identical with Orleans Parish):

- Population 1.4 million on a landmass of 180 square miles (470 square kilometers)

City:

- 490,000 people in 190,000 households
- Nearly 70% of the population is African-American
- Estimated 30% of the population lives below poverty line
- Median household income: nearly US \$ 30,000 annually
- Subtropical climate with mild winters and hot, humid summers; in January daily highs are around 62 °Fahrenheit, in July, lows average 74 °F, and highs average 91 °F. On average, 60 inches of precipitation falls annually.

Emergency Services:

The city maintains a fire department with 759 personnel operating out of 33 fire stations. The city's health department is responsible for EMS (Emergency Medical Services) which includes transport by ambulance.

Nearest major cities: Baton Rouge 75 miles to the north

Mayor Ray Nagin, elected into office in 2002







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Tuesday, August 30:

- Approximately 80% of the city is flooded up to 20 feet (7 meters) deep;
- Electricity, clean water, and sewage systems failed completely, as well as most of the phone system;
- Drinking water, ice, and gasoline is not available within a 45 miles radius of the city;
- At least 20 thousand people are sheltered in the Superdome in deteriorating conditions; power and A/C are out, toilets are not working and are overflowing;
- Hundreds of people were rescued by helicopters and boats from roofs or the attics of flooded houses.



Hyatt Hotel New Orleans  
nearly all windows blown out



French Quarter

The initial storm impact and subsequent destruction caused by the 145 mph winds was severe but sustainable. Some highrises, including the Hyatt Hotel had almost all windows blown out, street signs were mangled, brick walls crumbled and destroyed parked cars in the French Quarter, and trees had fallen on streetcar tracks and roofs.



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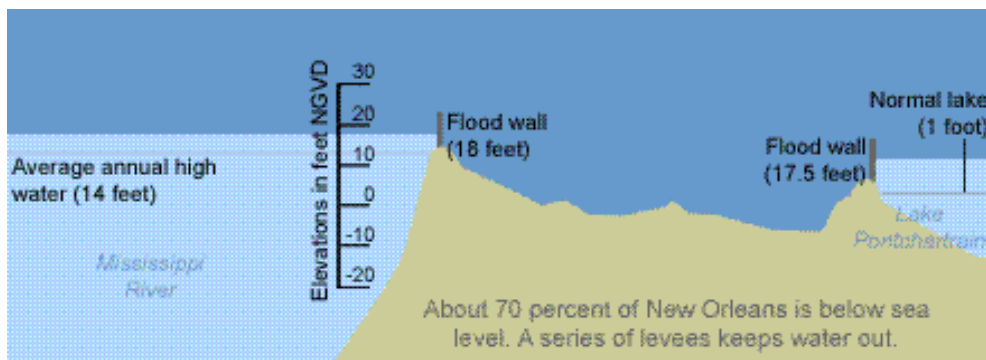


Downtown New Orleans: Canal Street, Marriott Hotel in background



Humanitarian Disaster with tens of thousands without water, food, medical attention

The flooding of the city was only indirectly caused by the hurricane. Large parts of New Orleans are located below sea level and the city is protected by a complex system of canals and levees. The New Orleans District has 350 miles of protection levees, built to withstand hurricane Category 3 storms.



The initial wave of storm surge that poured over the floodwall of the 17<sup>th</sup> Street Canal dug a 26-foot-deep gouge on the other side. This resulted in the failure of several wall panels. With another breach at the London Avenue canals, the city, and particularly the neighborhoods of Lakeview, Pontchartrain Shores, and Pontchartrain Gardens, became inundated with water up to 20 feet (7 meters) deep.

The south shore of Lake Pontchartrain forms the northern border of New Orleans. With a length of 40 miles (65 kilometers) and a width of 25 miles (45 kilometers), it is the second largest saltwater lake in the US. The lake averages a depth of 12 to 14 feet (3.6 to 4.2 meters). To the east, the Rigolets Strait connects to another lake, which in turn connects to the Gulf of Mexico.



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The US Army Corps of Engineers is responsible for repairing the dam breaks near the 17th Street canal and at the London Avenue canal floodwall at 6100 Pratt Drive. The federal agency has exclusive jurisdiction for maintaining the levee system and repairing the breaches.



As of Thursday evening, Sep 1, the breaches have not been fixed and the flow of water has not been contained. The gigantic pumps that keep the city dry under normal conditions have also not been working since Monday.

On Monday, Sep 5, engineers plugged the 200-foot-wide levee break at the 17<sup>th</sup> Street canal after hundreds of helicopter drops of 3,000-pound sandbags. Water was being pumped from the canal back into the lake. According to the US Army

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Corps of Engineers, once the canal level is drawn down two feet, Pumping Station 6 can begin pumping water out of the city.

According to Media reports on Sep 5, some parts of the city already showed slipping floodwaters, with the low-lying Ninth Ward water levels dropping more than a foot. In downtown New Orleans, some streets were merely wet rather than swamped.

On Friday, September 2, thousands of people still remained in the drowning city without electricity or drinking water in temperatures exceeding of 92° F (33° C) and accompanied by very high humidity.

Access to the city is permitted only to emergency vehicles, aid and recovery services, and official/governmental vehicles.



The flooding caught thousands of people by surprise and many may have drowned inside their residences. Thousands rescued themselves from the rising waters on the roofs and waited long hours, or even days, for help. On August 31, up to 40,000 buildings within the city had completely disappeared under water or were swamped up to the second floor.



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The hardest hit areas were home to mainly African-American and low income populations including senior citizens, the disabled, single mothers with children and others mainly dependent on governmental services. Many of them do not possess their own vehicle or other means for self evacuation.



People on rooftop desperate for outside help

In addition to the Superdome, the Ernest N. Morial Convention Center was used as a secondary refugee area since Wednesday evening. On Thursday, up to 20,000 people gathered there in deteriorating conditions, without water, food, or medical attention. CNN showed dead people in plain view, and a large number of desperate and obviously abandoned people. The unattended crowd included an astonishing number of some of the most vulnerable: from infants and young children, to exhausted seniors and the disabled.



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New Orleans Superdome before August 28 (left) and on August 31 (right)

### **New Orleans Fire Department**

The department provides fire and first medical response out of 33 stations with 759 personnel. According to information to be confirmed (TBC), the city's fire and EMS departments stopped responding to all emergencies when the winds from approaching hurricane Katrina hit 45 miles per hour shortly before Midnight on Sunday, August 28.

Before the storm, on duty personnel were moved from fire stations to more secure buildings in their primary response districts and apparatus were moved to higher ground, including the upper floors of parking garages.

TBC many firefighters, both on and off duty, were missing after the storm and the subsequent flooding. There was no real accountability system.

At the height of violence in the city, most fire department personnel had pulled out of the city and retreated to the suburbs of Algiers across the Mississippi River.

### **New Orleans Police Department**

P. Edwin Compass III, Superintendent of Police  
Warren J. Riley, Assistant Superintendent of Police



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Local media reported that as much as two-thirds of the New Orleans Police Department had abandoned their posts during the week. Some turned in their badges directly, while others left to ensure their families were safe.

However, according to the Commander of the Operations Bureau, Assistant Superintendent and Warren Riley, about 1,200 officers were on duty on Saturday, Sep 3.

Unfortunately, two officers took their own lives during the height of the crisis, on Friday, Sep 2 and another on Saturday, Sep 3.

One was described as a patrol officer the other was an aide to the Superintendent who had lost his home and had been unable to find his family.



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### Medical Services / Health Care Facilities

Most public hospitals, including Charity Hospital and Tulane Hospital were not functioning as of Tuesday, Aug 30, due to the lack of utilities and dwindling supplies. Since then, these medical facilities were in the process of being evacuated.

Evacuations at Charity Hospital, the largest public hospital and trauma center in the city, were suspended after gunshot attacks on Thursday. Efforts to bring more than 250 patients to safe facilities resumed on Friday.

These patients are being transported to hospital facilities throughout twelve Southern states.

As of Saturday, Sep 3, all patients and staff from the 11 hospitals in the New Orleans area have been fully evacuated. Three other area hospitals are fully functioning with fuel and power and have no need to evacuate.

According to the US Department of Health and Human Services nationwide 40,000 beds have been identified where patients can be moved to if needed.

The New Orleans Louis Armstrong International Airport is about ten miles west of downtown New Orleans. The facility, closed since the hurricane, was reopened Wednesday Aug 31, but air operations were restricted to emergency and disaster relief flights. The wind forces have damaged some airport structures, but the runways and taxiways are fully operative.

Parts of the terminals have also been transformed into a makeshift hospital.

Additional 39 medical shelters with 10,000 beds and 4,000 personnel are in the process of being deployed.

The US Navy will send the hospital ship USNS Comfort in the Gulf region within a few days.

One of the most common post-hurricane injuries is stepping on nails or other sharp storm debris. If such a wound comes into contact with contaminated water it may lead to the risk of tetanus or other serious infection.





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### Violence and Looting

In New Orleans and Biloxi, the first stores were looted on Tuesday, Aug 30. A police officer was shot and injured by a looter. On Wednesday, Aug 31, most of New Orleans, with the exception of some downtown areas and the French Quarter were without any police presence and protection. Lawlessness, looting, and violence increased dramatically on that day. Unconfirmed reports found that street gangs had stolen weapons and ammunition. On Thursday, at least one military helicopter was shot at.

The entire criminal justice system in the city has broken down. Police stations, jails, and prisons within the city are underwater or not functioning due to the lack of utilities, i.e. water, sewage, etc. The same applies to courthouses and other criminal justice facilities. Therefore, looters and other offenders could be arrested, but not be brought into a prison or in front of a judge.

As of Friday Sep 2, Police chased looters and other non-violent offenders away, but in some instances they had no choice but to simply watch the plundering occur. Sometimes police officers threatened looters at gunpoint, but so far (Friday, Sep 2), no thieves have been shot at.

On Thursday, Sep 1, New Orleans police officers had no communication with each other due to empty batteries in their radios. The entire 911 communication and dispatch system was reputed down. Media reported some instances in which police officers siphoned out gasoline from abandoned cars to fill up their cruisers.

All businesses within the city have been closed since the hurricane, and have been without power. This includes supermarkets, grocery stores, and convenience stores. Therefore, two kinds of looting have visibly occurred.

On one hand people took water, food, shoes, clothing, diapers, and other articles needed for bare survival. This may be due to the fact that at least until Friday morning, Sep 2, thousands of people have not been provided with those necessities.

On the other hand, individuals, and also entire groups, displayed significant criminal intent and broke into stores to steal valuable goods such as electronic devices, sporting goods, and other luxury items.

Another problem seemed to be a significant number of drug addicts who also lost their supply line were getting more desperate and violent for their drugs.



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New Orleans August 31: Police Patrol in Downtown



Guarding a Gasoline Tanker



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### Response and Relief Operations

The US Federal Emergency Management Agency (FEMA) is charged with preparing the nation for all hazards and managing federal response and recovery efforts following any national incident. FEMA also initiates mitigation activities, trains first responders, works with state and local emergency managers, and manages the National Flood Insurance Program and the U.S. Fire Administration. FEMA became part of the U.S. Department of Homeland Security (DHS) on March 1, 2003.

FEMA had already mobilized and activated its cadre of reservists. This included specialized Swift-Water Rescue as well as Urban Search and Rescue (USAR) teams from throughout the US.

One of many teams, a 14-member group of the Los Angeles County Swift-Water Rescue Team, left with their equipment for Louisiana on Tuesday, August 30. They were airlifted by a military cargo plane.



On Tuesday, Aug 30, the American Red Cross (ARC) expected the largest disaster relief operation in the history of the organization and announced to send 2,000 volunteers in the disaster areas in the very next days.

The impacted states of Louisiana, Mississippi, and Alabama have activated their National Guards, and, as of September 1, some of their units are already in operation at the disaster sites.

The US National Guard is a significant component of the United States armed forces military reserve, but remains under the authority of the states, unless called into federal service. The National Guard is not subject to the Posse Comitatus Act and can engage in law enforcement activities, except when federalized. National Guard units can be mobilized at any time by presidential order to supplement regular armed forces, and upon declaration of a state of emergency by the governor of the state in which they serve.



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**US Coast Guard helicopter rescue in New Orleans**

On Thursday, Sep 1, the US Department of Defense (DoD) announced that beginning with the week of Sep 5 around 24,000 military personnel, including 8,600 National Guard soldiers will be sent to the disaster areas to engage in the relief and recovery operations.

However, the Federal Response was not visible until Friday, Sep 2, the fifth day of hurricane Katrina's landfall when, after heartbreaking images on TV showing tens of thousands of people left unattended in absolute misery, the US government finally arrived in New Orleans with full force.

Military trucks and large convoys of emergency vehicles rolled into the city. Sufficient personnel from National Guard and other agencies began providing food, water, and medical care, particularly to the huge crowds at the Superdome and the Convention Center.

As of Tuesday, Sep 6, the state of California has sent nearly 200 emergency workers to the disaster area, including eight swift-water rescue teams, eight urban search and rescue (USAR) task forces, 23 incident support team managers, and three assistant fire chiefs. They supplement a contingent of 629 National Guard soldiers and 116 California Highway Patrol (CHP) officers with four helicopters.



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The response from all level of governments was unacceptably delayed during the first week of the catastrophe. However, it has to be made very clear, that from the beginning of the calamity in New Orleans and all the other disaster regions, numerous police officers, fire fighters, EMTs, nurses and physicians, and ordinary citizens answered the call immediately and went far and beyond to save and comfort others despite hazardous conditions and the inexcusable lack of resources and reinforcements.

### ***Martial Law vs. State of Emergency***

***Martial law occurs when the military assumes police powers because local authorities and courts aren't functioning. In the US, the president usually imposes martial law, but federal regulation allows for a "local commander" to do so "on the spot, if the circumstances demand immediate action." In practice, however, martial law has been all but barred since the late 19th century.***

***On Tuesday, August 30, reports began circulating that New Orleans officials had put the city under martial law. The attorney general's office of Louisiana quickly issued a denial. However, White House Press Secretary Scott McClellan told a group of journalists on Wednesday, August 31, that "martial law has been declared in Mississippi and Louisiana." On Thursday, September 1, National Guard Lt. Gen H. Steven Blum set the record straight, saying, "This is not, as it has been erroneously reported, martial law."***

***The Katrina relief efforts include military assistance, with National Guard units acting under the direction of governors, and federal troops providing humanitarian relief. Neither of these violates Posse Comitatus.***

***While martial law has not been imposed, a state of emergency has been declared in Louisiana, Mississippi, Alabama, and Florida, and mandatory evacuations and curfews have been ordered in many of the effected counties and cities.***



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### Activities Needed

- Search and rescue of survivors that are trapped in flooded buildings or buried under debris
- Provisions of drinking water, food, medication, and hygiene articles to evacuees trapped in disaster areas
- Evacuation of people out of hazardous areas
- Clearing of streets and transportation routes
- Medical treatment of injured and sick
- Recovery of bodies
- Provision of adequate supplies of water, food, sanitation, transportation, and shelter/accommodation for tens of thousands of people including services for special needs populations (chronically ill, disabled, children, etc).
- Security for and protection of shelters, abandoned buildings, businesses, and other assets
- Prevention of looting, theft, and vandalism
- Restoring electricity, phone, drinking water, sewage, and waste removal services
- Provision of health care and medication for exhausted, dehydrated, sick, and chronically ill evacuees
- Provision of water, food, accommodation and veterinary service for thousands, if not ten thousands of abandoned pets, livestock, and other animals in need
- Debris removal



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### Evacuations

On Thursday, September 1, approximately 25,000 people were evacuated with 500 busses out of New Orleans. This evacuation has been described as chaotic and unorganized, and the tremendous crowds that have congregated and were desperate for ride out of the city have caused further problems.

Many people came out of the high-rise buildings and hotels and tried to get a seat on the very limited number of buses. During the ensuing chaos, many families were divided. At least 25,000 evacuees were transported to the Sport stadium Astrodome in Houston, Texas, 350 miles (550 km) west of New Orleans. Thousands of cots were prepared on the field and water, catering, and hygiene articles were prepared for the refugees.



Inside view of the well-organized Astrodome in Houston

On the evening of the same day, the Houston Astrodome had been filled to capacity and additional evacuees could not be accommodated.



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On Saturday morning, September 3, Amtrak trains began evacuating residents out of New Orleans. Amtrak returned twice more on Saturday to evacuate more people to Dallas and other nearby metropolitan areas.

Amtrak will have two trains in place by Monday, Sep 5, allowing for a total of four trips that day, and the Department of Transportation announced that trains will continue operating for as long as necessary.

### **Houston, Texas**

Houston, with a population of 2 million on 580 sq mi. (1,500 sq km) is the fourth largest city in the US. The city is located approximately 350 miles west of New Orleans and is currently accommodating up to 200,000 people from New Orleans and other hurricane impacted areas.

The Astrodome, expected to house 23,000 people, was filled up on Thursday, Sep 1, within less than 24 hours to the allowed maximum occupancy of 15,000.

### **Shelter Management**

#### Postal Service

Displaced hurricane victims are asked by the US Postal Service (USPS) to complete a change-of-address form, visit the USPS website, or call a toll-free number to be reconnected with mail service.

#### Clothing

The US Customs and Border Protection (CBP) announced to distribute at the Astrodome on Tuesday, Sep 6, about 100,000 seized counterfeit clothing articles, including slacks, blouses, jeans, and shorts.

### **Galveston, Texas**

On Monday, Sep 5, two cruise ships chartered from Carnival Cruise Lines by FEMA started boarding evacuees. Both vessels have a capacity of up to 2,600 people each. The evacuees lodging on board the ships were pre-designated by local emergency officials with priority given to the elderly and people with special needs.

### **Mobile, Alabama**

As of Monday, Sep 5, an additional Carnival Cruise ship with a occupancy of 1,800 will be accommodating persons displaced by the hurricane, particularly elderly and people with special need requirements.





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### Los Angeles, California

The county and the city of Los Angeles offered shelter and aid for at least 2,000 evacuees.

### Temporary Housing

As of Monday, Sep 5, FEMA is looking for “manufactured housing” and recreational vehicles and has placed orders for more than 50,000 trailers.

### Sheltering throughout the US

(numbers provided by the New York Times)

Monday, Aug 29:	37,100 in 239 shelters
Tuesday, Aug 30:	42,100 in 208 shelters
Wednesday, Aug 31:	52,700 in 259 shelters
Thursday, Sep 1:	76,500 in 275 shelters
Friday, Sep 2:	94,300 in 308 shelters
Saturday, Sep 3:	96,200 in 361 shelters

According to the DHS on  
Monday, Sep 5: 229,000 in 679 shelters

### Missing Persons and Reunification

As of Wednesday, Sep 7, numerous people were still looking for loved ones. Parents were and still are looking for their children, and children were and still are looking for their parents.

As one of many examples, one hospital in Baton Rouge, Louisiana served as a clearinghouse for 121 newborns and premature babies evacuated from Orleans and Jefferson Parishes. Contact has not yet been established with ten of the parents.



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### Mass Fatality Management

On Monday, Sep 5 FEMA established a makeshift mortuary in a large warehouse in the town of St. Gabriel, about 65 miles north-west of New Orleans.

A staff of 90 medical examiners and technicians, part of the US Disaster Mortuary Operational Response Teams (DMORT) is tasked with identifying bodies and determining the day of death.

The facility can process up to 144 corpses a day and store up to 5,000 bodies in refrigerated trucks.

As of Sep 5, more than eighty bodies have been found and recovered in Louisiana, including at least 28 from New Orleans, 29 from Jefferson Parish, and 22 from St. Bernard Parish.



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### Donations

On Sunday, Sep 4, four children between 7 and 14 years old raised more than US \$ 11,000 for hurricane victims by selling cupcakes and chocolate chip cookies for at least US \$ 50 per piece. The proceedings were donated to the American Red Cross' Hurricane relief efforts.



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### Economic Impact

#### Oil and Gas Industry

There are hundreds of offshore oil and gas drilling platforms located in the Gulf of Mexico which were either shut down in preparation for the coming hurricane or damaged by the storm. The region normally produces 1.5 million barrels of crude oil a day, or about a quarter of the United States' domestic output.

In the immediate aftermath of the hurricane prices for oil, gasoline, and gas reached record levels in the United States, but also in Canada and Western Europe. The price for one barrel (1,260 liters) of crude oil reached US \$ 70.80.



Dauphin Island, Alabama: oil platform  
Broke away and washed ashore



Codin, Alabama: flooded refinery

Eight major refineries that produce gasoline, diesel, jet fuel, and heating oil were knocked out of commission and the output at two others was cut by the hurricane and subsequent flooding. That reduced overall U.S. refining capacity by more than 10 percent and contributed to a surge in retail gasoline prices and spot shortages around the country.

As of Monday afternoon, Sep 5, about 70 percent of oil production and half of the natural gas output remained shut down.



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Chevron Corp.'s 325,000 barrel-a-day refinery in Pascagoula, Mississippi, and ConocoPhillips' 247,000 barrel-a-day facility in Belle Chasse, Louisiana, south of New Orleans have suffered major damage and are unlikely to resume production for some time (Sep 5).

The ConocoPhillips facility, along with Exxon Mobil Corp.'s Chalmette, Louisiana refinery and Murphy Oil Corp.'s facility in Meraux, Louisiana, also have no power as of Sep 5. They represent nearly 690,000 barrels a day of refined oil products.

Four other refineries will restart within days:

Motiva Enterprises LLC, Marathon Oil Corp. and Valero Energy Corp. are expected to restart, and in some cases make fully operational, four of those refineries between Sep 5 and 12.

Motiva, a joint venture between Royal Dutch Shell PLC and Saudi Refining Inc., restarted its Convent, Louisiana, refinery on Sunday, Sep 4, and its refinery in Norco, Louisiana is expected to get started around September 8. Both are located west of New Orleans.

Marathon's Garyville, Louisiana, refinery, also west of New Orleans, should be fully operational around Sep 6.

Valero expects to restart its St. Charles refinery about 15 miles from New Orleans around the same time.

When running at 100 percent capacity, these four represent slightly more than 1 million barrels of refined oil product a day.



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### **New Orleans**

#### Tourist Destination

The city of New Orleans is one of the most popular travel destinations in the United States and is known worldwide for Bourbon Street, the French Quarter, Mardi Grass, and Cajun Cuisine.

In the year 2004, tourists spent up to US \$ 5 billion in the city.

#### Harbor

The Port of New Orleans is part of the Port of South Louisiana which is based in the New Orleans metropolitan area. In terms of raw tonnage it is the fourth largest port in the world.

### **Job Losses**

Hundreds, if not thousands, of businesses have been destroyed by the hurricane. Hundreds of thousands of people, not only in the city of New Orleans, but in the entire region lost their jobs and their main source of income.

The Louisiana Department of Labor announced on Thursday, September 1, that federal Disaster Unemployment Assistance will be available to residents or workers in 31 parishes. To qualify for benefits, applicants must have worked or were self-employed and prove that they have lost their main source of income due to the storm. The program will run through March 4, 2006.

The Louisiana Department of Social Services has received federal permission to establish an emergency food-stamp program for people displaced by hurricane Katrina. It can be expected that the federal government together with private and corporate donors will provide billions of dollars for that effort.

Some job losses may be compensated by the manpower and workers needed for clean up operations and rebuilding of entire communities, including infrastructure, houses, hotels, etc. The long term impact on the job market has yet to be seen.



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### Business Continuity and Recovery

#### Ports and Waterways

Status on Saturday, Sep 3

- Lower Mississippi River has been opened to deep draft vessels with a 35-foot draft or less for one way daylight traffic only
- Pascagoula, Mississippi: open to vessels with 12-foot draft or less;
- Mobile, Alabama: open to barge traffic only.
- Pensacola, Florida: open to vessels with a 31-foot draft or less.
- Destin, Florida: open to vessels with a 31-foot draft or less.
- Panama City, Florida: open to vessels with a 31-foot draft or less.
- Port of Gulfport, Mississippi, is the only port that remains closed to all traffic

A waiver of the Jones Act is in effect, allowing foreign flagged vessels to transport cargo from one U.S. Port to another U.S. Port.

As of Monday, Sep 5, the Louisiana Offshore Oil Port (LOOP), the largest oil import terminal in the US, has started unloading tankers, operating at about 75 percent capacity. It may hit full capacity around Sep 8.

#### Pipelines

As of Monday, Sep 5:

Colonial Pipeline Co. , which transports refined products from Houston to as far away as the Northeast, is operating at 76 percent capacity.

Kinder Morgan Energy Partners' Plantation Pipe Line Co., which transports fuel from refineries to Eastern markets, has been capable of full capacity operations once it receives fuel from downed refineries.

Shell Pipeline Co.'s Capline pipeline system, which transport crude oil into the Midwest, is operating at approximately 40,000 barrels per hour; the normal rate is 45,000 barrels per hour.

#### Insurance Industry

The insured damages may exceed US \$ 30 billion. Despite the enormity of the amount, no insurance company is expected to suffer huge losses. Combined, the industry has a capital base of US \$ 425 billion.

On the stock market, publicly traded property and casualty insurers lost on average less than 1.5% of their value, with the exception of Allstate that slid 5%.



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State Farm a leading home insurer in Louisiana (35% market share), Mississippi, Alabama, and Florida received 38,000 claims in the first days following Hurricane Katrina's landfall.

It is estimated that up to 150,000 houses and businesses have been flooded. A significant amount of the damage may not be insured.





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### Environmental Impacts / Water Contamination

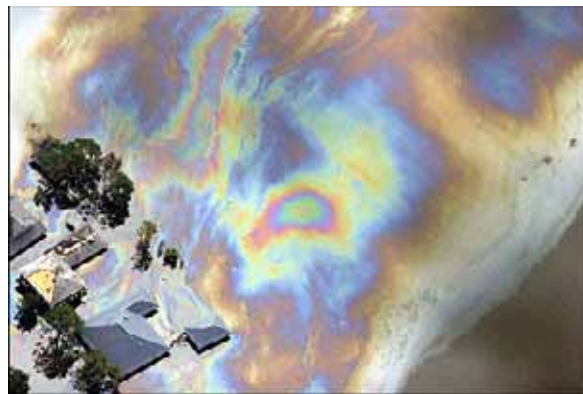
The surge waters of Hurricane “Katrina” and the breaches of the Greater New Orleans levee system have inundated residences, business and industrial facilities throughout the entire area, from Louisiana to Florida. The region is home to many oil refineries, chemical facilities, and other plants using hazardous and toxic materials. An unknown amount of gasoline, crude oil, and other toxic substances has washed into the Gulf with the receding waters or has been deposited in other places.

The storage tank of the 1985 built coastal tanker Stone Buccaneer was ruptured by the hurricane. About 50,000 gallons of oil leaked into the Gulf waters.

In the city of New Orleans the extent of the water pollution is much more dramatic. In the flooded areas water has become mixed with sewage and chemicals from thousands of households, businesses and industrial facilities.

Waste and water treatment facilities handling the garbage of most of the harbor city have probably also been impacted and flooded.

The “toxic soup” is stagnant within the city and is not diluted with ocean water or the flowing waters of the Mississippi River. The immense pollution is visible and odorous everywhere.



Effects of chemical water contamination

The wet environment in the aftermath of the hurricane, combined with the destruction of sanitation facilities and a warm tropical climate, can induce epidemics of disease which threatens life and health of affected people. Infections of cuts and bruises can be greatly exacerbated by wading in sewage-polluted water.



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The bacterial contaminated water may also cause other illnesses, ranging from stomach problems to nausea and diarrhea to life threatening diseases such as Cholera and Typhus.

The standing water combined with temperatures of more than 90° F (30° Celsius) creates a perfect breeding ground for mosquitoes. Mosquitoes that become infected by birds are transmitting the deadly West Nile virus.



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### Public Health

On Monday, Sep 5, the Center for Disease Control and Prevention (CDC) issued an official health advisory, distributed via Health Alert Network with information specific to the Hurricane Katrina situation:

*Interim immunization recommendations for individuals displaced by Hurricane Katrina*

*The purpose of these recommendations is two -fold:*

1. *To ensure that children, adolescents, and adults are protected against vaccine-preventable diseases in accordance with current recommendations.*

*Immunization records are unlikely to be available for a large number of displaced children and adults. It is important that immunizations are kept current if possible.*

2. *To reduce the likelihood of outbreaks of vaccine-preventable diseases in large crowded group settings.*

*Although the possibility of an outbreak is low in a vaccinated U.S. population, it is possible that outbreaks of varicella, rubella, mumps, or measles could occur.*

*Although measles and rubella are no longer endemic to the United States, introductions do occur, and crowded conditions would facilitate their spread.*

*Hepatitis A incidence is low in the affected areas, but post-exposure prophylaxis in these settings would be logistically difficult and so vaccination is recommended.*

*In addition, the influenza season will begin soon and influenza can spread easily under crowded conditions.*

#### *I. Recommended immunizations*

*If immunization records are available:*

*Children and adults should be vaccinated according to the recommended child, adolescent, and adult immunization schedules available at*

*[www.cdc.gov/nip/recs/child-schedule.htm](http://www.cdc.gov/nip/recs/child-schedule.htm) and [www.cdc.gov/nip/recs/adult-schedule.htm](http://www.cdc.gov/nip/recs/adult-schedule.htm).*

*If immunization records are not available:*

*Children aged <6 years of age should be forward vaccinated. They should be treated as if they were up-to-date with recommended immunizations and given any doses that are recommended for their current age.*

*This includes the following vaccines:*

- *Diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP)*
- *Inactivated Poliovirus vaccine (IPV)*
- *Haemophilus influenzae type b vaccine (Hib)*



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- Hepatitis B vaccine (HepB)
- Pneumococcal conjugate vaccine (PCV)
- Measles-mumps-rubella vaccine (MMR)
- Varicella vaccine if no history of chickenpox
- Influenza vaccine if in Tier 1.

\* This includes all children from 6-23 month and children up to age 10 with a high risk condition.

Hepatitis A is not routinely recommended in all states; state immunization practice should be followed.

Children and adolescents (aged 11-18 years) should receive the following recommended immunizations:

Adult formulation tetanus and diphtheria toxoids and acellular pertussis vaccine (Tdap)

Meningococcal conjugate vaccine (MCV (ages 11-12 and 15 years only)

Influenza vaccine if in Tier 1\*

Adults (aged >18 years) should receive the following recommended immunizations:

Adult formulation tetanus and diphtheria toxoids (Td) if >10 years since receipt of any tetanus toxoid-containing vaccine

Pneumococcal polysaccharide vaccine (PPV) for adults <sup>TM</sup>65 years or with a high risk condition

Influenza vaccine if in Tier 1\*

### II. Crowded Group Settings

In addition to the vaccines given routinely as part of the child and adolescent schedules, the following vaccines should be given to displaced person living in crowded group settings:

#### Influenza

Everyone <sup>TM</sup>6 months of age should receive influenza vaccine.

Children 8 years old or younger should receive 2 doses, at least one month apart.

#### Varicella

Everyone >12 months of age and born in the United States after 1965 should receive one dose of this vaccine unless they have a history of chickenpox.

#### MMR



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*Everyone >12 months of age and born after 1957 should receive one dose of this vaccine.*

### *Hepatitis A*

*Everyone >2 years of age should receive one dose of hepatitis A vaccine unless they have a clear history of hepatitis A.*

*Immunocompromised individuals, such as HIV-infected persons, pregnant women, and those on systemic steroids, should not receive the live viral vaccines, varicella and MMR.*

*Screening should be performed by self-report.*

### *Documentation*

*It is critical that all vaccines administered be properly documented. Immunization records should be provided in accordance with the practice of the state in which the vaccine is administered. Immunization cards should be provided to individuals at the time of vaccination.*

*Standard immunization practices should be followed for delivery of all vaccines, including provision of Vaccine Information Statements.*

### *Diarrheal diseases*

*Vaccination against typhoid and cholera are not recommended. Both diseases are extremely rare in the Gulf States, and there is no vaccine against cholera licensed for use in the United States.*

*Rabies vaccine should only be used for post-exposure prophylaxis (e.g., after an animal bite or bat exposure) according to CDC guidelines.*

### *\*Influenza Tier 1\**

*Tier 1 recommendations include the following priority groups:*

- Persons ages >65 years with comorbid conditions*
  - Residents of long-term care facilities*
  - Persons aged 2-64 years with comorbid conditions*
  - Persons >65 years without comorbid conditions*
  - Children aged 6-23 months*
  - Pregnant women*
  - Healthcare personnel who provide direct patient care*
  - Household contacts and out-of-home caregivers of children aged <6 months.*
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On September 07, 2005, the CDC issued another Health Advisory regard cases of cases of *Vibrio vulnificus* identified among Hurricane Katrina evacuees:

*To date, seven people, in the area affected by Hurricane Katrina, have been reported to be ill from the bacterial disease, Vibrio vulnificus. Four have died. The first cases were reported by the Mississippi Department of Health. V. vulnificus can cause an infection of the skin when open wounds are exposed to warm seawater. People at greatest risk for illness from V. vulnificus are those with weakened immune systems and the elderly. Because V. vulnificus is a bacterium in the same family as the bacteria that causes cholera, some media reports have confused the two pathogens.*

*As part of the current investigation, CDC and other response agencies are working with health departments in affected states to help identify persons who might be at increased risk for V. vulnificus and recommend appropriate treatment for them.*

*What is Vibrio vulnificus?*

*Vibrio vulnificus is a bacterium that is a rare cause of illness in the United States. The illness is very different from cholera, which is caused by different bacteria, called Vibrio cholerae. V. vulnificus infections do not spread directly from one person to another, and are a serious health threat predominantly to persons with underlying illness, such as liver disease or a compromised immune system. The organism is a natural inhabitant of warm coastal waters. Infection can occur after a wound is exposed to warm coastal waters where the V. vulnificus organism is growing. Infection may also be acquired by eating raw or undercooked seafood from those waters.*

*CDC receives reports of over 400 Vibrio illnesses each year. Of those, about 90 per year are due to V. vulnificus. Most Vibrio vulnificus illness occurs during warm weather months.*

*Symptoms of infection with V. vulnificus*

- *Acute illness, with a rapid decline in health following exposure*
- *If exposed by contamination of an open wound, increasing swelling, redness, and pain at the site of the wound*
- *Illness typically begins within 1-3 days of exposure, but begins as late as 7 days after exposure for a small percentage of cases*
- *Fever*
- *Swelling and redness of skin on arms or legs, with blood-tinged blisters*
- *Low blood pressure and shock*



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*By contrast, the symptoms of cholera are profuse watery diarrhea, vomiting, cramps, and low-grade fever.*

### *Illness caused by V. vulnificus*

*Wound infections may start as redness and swelling at the site of the wound that then can progress to affect the whole body. V. vulnificus typically cause a severe and life-threatening illness characterized by fever and chills, decreased blood pressure (septic shock), and blood-tinged blistering skin lesions (hemorrhagic bullae). Overall, V. vulnificus infections are fatal about 40% of the time. Wound infections with V. vulnificus are fatal about 20% of the time, and aggressive surgical treatment can prevent death.*

### *How people become infected*

*V. vulnificus is found in oysters and other shellfish in warm coastal waters during the summer months. Since it is naturally found in warm marine waters, people with open wounds can be exposed to V. vulnificus through direct contact with seawater, shellfish, and marine wildlife. There is no evidence for person-to-person transmission of V. vulnificus.*

*Persons who have immunocompromising conditions, and, especially those with chronic liver disease, are particularly at risk for V. vulnificus infection when they eat raw or undercooked seafood, particularly shellfish harvested from the Gulf of Mexico, or if they bathe a cut or scrape in marine waters. About three-quarters of patients with Vibrio vulnificus infections have known underlying hepatic disease or other immunocompromising illness. Otherwise healthy persons are at much lower risk of Vibrio vulnificus infection.*

### *Concerns in hurricane-affected areas*

*Persons with immunocompromising conditions and especially those with chronic liver disease should avoid exposure of open wounds or broken skin to warm salt or brackish water, and avoid consuming undercooked shellfish harvested from such waters. More information on caring for wounds may be found in the CDC document Emergency Wound Management for Hurricane Professionals.*

*After a coastal flood disaster, large numbers of persons with illnesses that affect their resistance to infection may be exposed to seawater. Injury prevention is especially important in high risk persons. Wounds exposed to seawater should be washed with soap and water as soon as possible, infected wounds should be evaluated by a doctor, and clinicians should aggressively monitor these wounds.*

### *Diagnosis*

*V. vulnificus infection is diagnosed by microbiologic culture of the wound, by blood cultures, or by stool culture in the case of patients who consumed raw or undercooked seafood.*



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### *Treatment*

*V. vulnificus* infection is treated with antibiotics. When this infection is suspected, treatment with a combination of a third-generation cephalosporin (e.g., ceftazidime) and doxycycline is recommended. *V. vulnificus* wound infections should be treated with aggressive attention to the wound site; amputation of the affected limb is sometimes necessary.

### *Recovery*

*V. vulnificus* infection is an acute illness, and those who recover should not expect long-term consequences.

Information about *Vibrio* surveillance may be found at [http://www.cdc.gov/foodborneoutbreaks/vibrio\\_sum.htm](http://www.cdc.gov/foodborneoutbreaks/vibrio_sum.htm)





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### Animals

Thousands of animals have been left stranded in the wake of Hurricane Katrina.





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### Outlook

Until Friday, Sep 2, about 100 hours after the hurricane hit, the conditions in the city of New Orleans had been increasingly worsened.

Even in other impacted areas around the coast, the situation had not been stabilized or contained. Most areas are still true disaster zones: streets and bridges are impassable, no electricity, no fuel, no phone service and lack of other basics. However, on Labor Day weekend the situation seem to somewhat stabilize. The large crowds of people had been evacuated out of New Orleans and most of those evacuees are mostly provided with food, clothing, shelter, medical care, and means of communication.

A poll in the US conducted on Thursday, Sep 1, showed that more than 50% of those asked are dissatisfied with the speed and scale of the disaster response and relief efforts. A critical discussion about the response efforts and federal activities started in the US Media on that same day.

On Monday, Sep 5, the Times-Picayune, Louisiana's largest newspaper, published an open letter to Bush, called for the firing of every official at the Federal Emergency Management Agency.

The Washington Post reported on Wednesday, Sep 7, that Vice Admiral Thad W. Allen, the Coast Guard's chief of staff, was assigned on Monday, Sep 5, to be the deputy to FEMA director Mike Brown. Vice Admiral Allan will take over operational control of the search-and-rescue and recovery efforts along the Gulf Coast. He is described as an unflappable, engaging and intensely organized leader and expert who is familiar with the inner workings of the Department of Homeland Security. The newspaper article names his ability to reach out to other agencies to develop "big-picture" approaches to homeland defense.



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### Political Developments

#### US Government

US President Bush visited the affected region on Friday, Sep 2 and met with the Governors of Alabama, Mississippi, and Louisiana. That evening he conferred for two hours with the Mayor of New Orleans on board of Air Force One at New Orleans Airport.

#### US Senate

US Senate Majority Leader Bill Frist, R-Tennessee, directed the Homeland Security and Governmental Affairs Committee to examine the preparations and response to last week's deadly storm, focusing particularly on the Department of Homeland Security (DHS) and FEMA.

The committee announced Sep 2 that Homeland Security officials would brief the panel Wednesday at a meeting that also will be attended by senators from stricken areas. The committee then plans to hold more extensive oversight hearings when there is "adequate control" of the situation.

The committee has a "responsibility to investigate the lack of preparedness and inadequate response to this terrible storm," said a joint statement by panel Chairwoman Susan Collins, R-Maine, and ranking Democrat Joseph I. Lieberman of Connecticut.

Senator Jon Kyl, R-Arizona., who chairs the Judiciary Subcommittee on Terrorism, Technology and Homeland Security, said he too plans to hold hearings on the disaster when the situation is under control. He questioned whether there had been adequate plans for evacuations, relief and ensuring the operation of "critical systems" in Louisiana.

Senator Mary L. Landrieu, D-Louisiana, suggested that FEMA should be removed as a leading agency in responding to hurricanes.

#### US Congress

US Representative Peter T. King, R-New York wants Congress' Homeland Security Committee to hold hearings once there is a "semblance of calm" in the affected areas. As the chair of the Homeland Security Subcommittee on Emergency Preparedness, Science and Technology he will seek testimony from Homeland Secretary Michael Chertoff and FEMA's director, Michael Brown. According to his view "much of what could have been done better, was local government's responsibility." According to the Homeland Security Department's



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National Response Plan, released in January, puts much of the responsibility for evacuations in the hands of mayors.

The ranking Democrat on the subcommittee, Representative Bill Pascrell Jr. of New Jersey, said FEMA might need to be removed from the Homeland Security Department because it has become “emaciated.”



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### Formation of a Hurricane

A hurricane is a tropical storm with speeds of more than 33 meters per second (73 miles per hour, 120 kilometers or per hour, 63 knots) that is generated in the Atlantic Ocean or the Caribbean Sea.

Official hurricane season runs from June 1 to November 30. Within the US those areas most threatened by the effects are the entire Atlantic East Coast from Florida to the New England States, as well as the coastal regions in the Gulf of Mexico.

Hurricanes are often generated in the Atlantic Ocean off the Coast of Africa. In order to initiate such a tropical storm system the ocean's surface temperatures must be above 26.5 degrees Celsius to at least a depth of 50 meters. Warm waters are the energy source for tropical cyclones.

Water evaporates, raises into the atmosphere and forms large thunderclouds. Above the warm ocean waters a vacuum is created because of the raising air masses. Due to the air pressure differences, air from the outside moves in. The constantly rising air masses are put into rotation by the Coriolis effect (force created by the earth's rotation), creating a spin. The energy released by the condensation process (forming of the clouds) is transformed by the Coriolis effect into rotational energy, which continuously increases the size and the speed of the storm system.

At windspeeds below 62 km/h the system is called a tropical depression. Starting at 62 km/h the system is called a tropical storm. Under the right conditions, the system's windspeed steadily increases while the storm system moves westwards. A tropical storm generated in the Atlantic Ocean with speeds exceeding 73 mph or 120 km/h is called a hurricane.

It can take up to four weeks from its forming as a tropical depression to make landfall or to disintegrate above cooler ocean waters.

### Hurricane Effects:

High winds - Hurricane strength winds can damage or destroy buildings, buildings, bridges, and other infrastructure. High winds also turn loose debris, such as glass and building materials, traffic signs, tree branches, etc. into flying projectiles, creating additional opportunities for injuries and destruction.

Storm surge – Hurricanes cause an increase in sea level up to 20 feet high, which can flood coastal areas. The force of the waves often destroys beach front infrastructure and buildings.



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Heavy rains and tornadoes – Hurricanes come with intense rainfalls that cause rivers and streams to overflow. This leads to flooding of coastal and inland areas, impassable transportation routes, and landslides. In addition the broad rotation of a hurricane often generates tornadoes.

Secondary effects range from the breakdown of utilities (power, phone, water), to the disruption of all kinds of transportation modes (airplane, motor vehicle, train, ship) due to damaged or flooded streets and bridges, airports, harbor facilities and washed out railtracks. This may lead to a collapse of all public and private sector services.

### Saffir-Simpson Hurricane Scale

- Category 1: Wind speed 74 – 95 miles per hour**  
**Barometric pressure at least 29.94 inches**  
**Storm surge 4 – 5 feet**
- Category 2: Wind speed 96 – 110 miles per hour**  
**Barometric pressure 28.50 – 28.91 inches**  
**Storm surge 6 – 8 feet**
- Category 3: Wind speed 111 – 130 miles per hour**  
**Barometric pressure 27.91 – 28.47 inches**  
**Storm surge 9 – 12 feet**
- Category 4: Wind speed 131 – 155 miles per hour**  
**Barometric pressure 27.17 – 27.88 inches**  
**Storm surge 13 – 18 feet**
- Category 5: Winds more than 155 miles per hour**  
**Barometric pressure 27.16 inches**  
**Storm surge more than 18 feet**



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### History of Hurricane in the US

In the last one hundred years only three category 5 hurricanes made landfall in the US.

- In 1935 the “*Labor Day*” Hurricane
- In 1969 Hurricane *Camille*
- On August 24, 1992 at 4:30 a.m. Hurricane *Andrew* made landfall with sustaining winds of 145 mph and gust exceeding 175 mph (260 km/h) in the southern part of the greater Miami area; up to 50 people died and damages exceeded US \$ 20 billion.

Shortly after noon on August 25, Hurricane Andrew was about 150 miles south of New Orleans, threatening to strike the Louisiana coast with sustained winds at 140 mph. Avoiding a disastrous outcome for the city, the hurricane changed course to the west and made landfall between the cities of New Iberia and Lafayette in Louisiana.

### Other notable hurricanes

- On September 8, 1900 strong winds of up to 195 km/h and a massive surge destroyed most of the harbor city Galveston, located at the Gulf Coast in Texas. At least 6,000 of its 37,000 residents were killed and another 6,000 died along the Gulf Coast region.

### Hurricanes and Flooding in New Orleans

1915 Category 4 Hurricane

1927 Widespread flooding along the Mississippi River; thousands of people lost homes and were left without food

1957 Hurricane *Audrey* with a storm surge of up to 12 feet (4 meter)

1965 September Category 3 Hurricane *Betsy* at the time the most destructive hurricane in history; hit the South Florida region and made again landfall with wind gusts exceeding 145 mph before midnight on the September 9 over the low Mississippi River Delta; in Louisiana more than 27,000 houses were destroyed or severely damaged; 17,000 people were injured and 58 people died;

New Orleans: the Mississippi River rose more than ten feet.

The city's levee system could not hold back the large quantities of water; the massive pumping system, even in 1965 the largest in the world, failed



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when nearly all parts of New Orleans lost power. More than 300 city blocks were submerged and countless residents had to rescue themselves on the rooftops.

Some residences were flooded to ceiling level in less than thirty minutes, in other areas the inundation was delayed until hours after the storm had passed.

Throughout the US the hurricane caused 75 deaths and damages of up to US \$ 7.4 billion.





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### Internet Resources:

NOAA (National Oceanic & Atmospheric Administration)	<a href="http://www.noaa.org">www.noaa.org</a>
FEMA (Federal Emergency Management Administration)	<a href="http://www.fema.gov">www.fema.gov</a>
Amerikanisches Rotes Kreuz	<a href="http://www.redcross.org">www.redcross.org</a>
National Hurricane Center	<a href="http://www.nhc.noaa.gov">www.nhc.noaa.gov</a>
Louisiana Homeland Security and Emergency Preparedness	<a href="http://www.ohsep.louisiana.gov">www.ohsep.louisiana.gov</a>
Media	<a href="http://www.msnbc.com">www.msnbc.com</a> <a href="http://www.nola.com">www.nola.com</a>

### About the Author:

Gunnar J Kuepper is Chief of Operations with Emergency & Disaster Management in Los Angeles, California. This independent firm advises private sector, non-profit organizations, and governmental institutions throughout the world in emergency management programs and conducts comprehensive vulnerability studies. He has analyzed, lectured, and published his findings of the response operations in many catastrophic incidents, ranging from passenger transportation accidents, to fires and explosions, to acts of terrorism and ultraviolence.

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# Report

## Hurricane Katrina

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### Images





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### People of interest

- George W Bush, President of the United States
- Michael Chertoff, Secretary of the Department of Homeland Defense (DHS)
- Michael D. Brown, Director of FEMA  
Republican lawyer;  
Worked for the International Arabian Horse Association;  
Brought to FEMA in 2001 as general counsel by then director Joe M. Allbaugh, promoted to deputy director in 2002 and to director in 2003
- Russel L. Honore, Army Lt. General, Head of the military's Joint Task Force Katrina
- Thad W. Allen, Vice Admiral, US Coast Guard  
Deputy FEMA Director (assigned Sep 5), Operational Chief
- Thomas H. Collins, Commandant US Coast Guard
- Haley Barbour, Governor of Mississippi  
Former Chair of the Republican National Committee
- Babineaux Blanco, Governor of Louisiana
- C. Ray Nagin, Mayor of New Orleans
- Dr. Louis Cataldie, Louisiana Department of Health and Hospitals



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<b>Quotes</b>
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**The results are unacceptable**

George W Bush, US President, Sep 2

**We 're going to do what we need to do**

Rick Perry, Texas Governor

**The federal government did not even know about the convention center  
people until today**

Mike Brown, FEMA Director

**This is not, as it has been erroneously reported, martial law**

H. Steven Blum, National Guard Lt. Gen, Sep 1

**At the end of the day, FEMA was not ready for this**

Jerome M. Hauer

**I will never again tell people that help is on the way**

Thomas M. Stone, Fire Chief, St. Bernard Parish

**Too many people assume that in any disaster, government agencies will  
step in to save them**

Gunnar Kuepper, IAEM Region 9 President, Sep 1

**If you 're not getting info on the area, you have to assume it's bad**

Lt. Col. Pete Schneider, Louisiana Army National Guard