

# Hurricane Harvey Impact Assessment Compared to Katrina

A. R. Maddi and C. Vipulanandan, Ph.D., P.E.

Center for Innovative Grouting Material and Technology (CIGMAT)

Department of Civil and Environmental Engineering

University of Houston, Houston, Texas 77204-4003

E-mail: srmaddi@uh.edu, cvipulanandan@uh.edu Phone: (713) 743-4278

## Abstract:

In this study, the effect of hurricane Harvey and its impact on the Houston community was investigated. The impact of hurricane on the number of people affected, number of days, amount of loss, people registered for assistance have been reviewed. The impact of Harvey was compared to Katrina to understand the effect of impact. The responses documented by FEMA have been summarized.

## 1. Introduction:

The hurricane Harvey caused the second largest loss of over \$125 billion compared to Katrina in 2005. Hurricane Harvey, a category 4 storm that hit Texas on August 25, 2017 caused about \$125 billion in damage affecting about 13 million people from Texas through Louisiana, Mississippi, Tennessee, and Kentucky (Amadeo, 2018). More than 20 trillion gallons of rain water caused the damage and losses. This amount of water could cover three biggest states in the country, Alaska, California, Texas by an inch of water. Harvey had the record of total rain fall, record economic loss, recorded to be one of the strongest that hit US. The rainfall amounts across the Houston area rank as roughly a 1,000-year event. This does not mean that it will be 1,000 years before the next flood of this magnitude occurs. With climate change shifting the odds in favour of extreme rainfall events, return period calculations like this are becoming less useful to civil engineers who must design infrastructure to withstand historical floods. The three floodings in Houston 2015 Memorial Day flooding, 2016 – April Flooding and 2017 hurricane flooding. In 2015 flooding, Houston had about 12 inches in 10 hrs, 2016 Houston had about 15 inches in 24 hrs while in 2017 about 52 inches in 5 days with 26 inches in 24 hrs at some locations. In fact, the numbers of downpours measuring at least 10 inches have doubled over the last 30 years.

**2. Objective:** The objective of the study was to summarize the effects of hurricane Harvey on communities affected by it.

## 3. Discussion

Hurricane Harvey Impact



Fig. 1: Dickenson, Texas



Fig. 2: Interstate 45, Houston



Fig. 3: Buffalo Bayou, Memorial Drive



Fig. 4: Northwest Houston



Fig. 5: Port Arthur, Texas

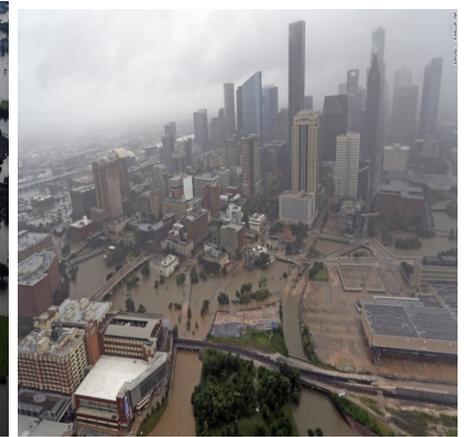


Fig. 6: Downtown, Houston

Hurricane Harvey caused about \$125 billion in damages according to the National Hurricane Center taking place next to Hurricane Katrina (Blake et. Al, 2018). The Houston metro area is the nation's fourth-largest city with 6.6 million residents and has the largest medical center in the world and the oil capital. A highest rainfall for a single tropical storm was recorded to be 51.88 inches during Harvey equivalent to annual rainfall of Houston. In comparison hurricane Katrina dropped just 5 to 10 inches in 48 hours. About 80,000 homes had 18 inches of rain and 23,000 of those with more than 5 feet of standing water. Twenty-four hospitals were evacuated, 61 communities lost drinking water capability, 23 ports were closed and 781 roads were impassable. Nearly 780,000 Texans evacuated their homes. In the days after the storm, more than 42,000 Texans were housed temporarily in 692 shelters. Local, state and federal first responders rescued 122,331 people and 5,234 pets. Harvey's impact spread across the country as gas prices rose due to closure of 25 percent of oil and gas production to shut down in the region. In the gulf area, about 1 million vehicles were estimated to be ruined beyond repair (Devika, 2017).

Neighbors, nonprofit organizations and governments at all levels joined together to mount an extraordinary effort to save lives and meet the needs of thousands of people who suffered from the storm and subsequent flooding. It was Texans helping Texans, aided by people who came to Texas from all parts of the nation. 3 million meals, 3 million bottles of water, 9,900 blankets, 8400 cots, 10,300 hygiene kits, and 300 volunteer organizations explain the response effort need to subside Harvey impact. About 87000 flood insurance claims, with \$608 million claim payments made. Within 30 days, more than \$1.5 billion in federal funds was paid to Texans impacted by the disaster, including assistance grants, low-interest disaster loans and flood insurance advance payments (FEMA, 2017).

Houston received \$91 million and Harris County received \$44 million to pay for debris removal. The storm left 200 million cubic yards of debris (Amadeo, 2018).

Harvey made landfall in Texas on Friday (Aug. 25) at 11 p.m. local time as a Category 4 hurricane, with maximum wind speeds surpassing 130 mph (209 km/h). Later downgraded to tropical storm status, Harvey has since deposited more than 20 inches (51 centimeters) of rain in regions of southeastern coastal Texas, according to the National Hurricane Center (Blake et. Al, 2018).

In the Houston area alone, reported rainfall was 30 inches (76 cm) over two days, NHC officials reported, and life-threatening flooding is underway across inland areas in south-central Texas, with storm surges of up to 5 feet (1.5 meters) anticipated in some areas, according to the NWS. Harvey was responsible for at least 68 direct deaths, all in Texas.

**Katrina**

Katrina formed as a tropical storm in the Bahamas on Aug. 24, 2005, first impacting the Florida coast on Aug. 25 as a Category 1 hurricane, then making landfall in southeastern Louisiana on Aug. 29 as a Category 3 storm, with sustained winds of 120 mph (193 km/h). Rainfall totals during Katrina were significantly less than those during Harvey — between 6 and 9 inches (15 and 23 cm) on the Mississippi coast, and around 5 inches (13 cm) or less in northern Mississippi into Ohio, according to NASA's Earth Observatory.

Accompanying Katrina was a massive storm surge — an abnormal rise in coastal sea levels, generated by storm activity — Storm with waters cresting at heights of 10 to 25 feet (3 to 8 m), which more than made up for the hurricane's relatively low rainfall. Floodwaters inundated coastal Mississippi and southeastern Louisiana, leaving 80 percent of New Orleans under water that was slow to drain and lingered for weeks.

Reasons for these huge flooding incidents and hurricanes in gulf could be due to rising sea levels made flooding more likely near Gulf Coast cities. The sea levels around Houston were six inches higher than 20 years ago. That's because warmer temperatures melted the ice caps in Antarctica. They have been shrinking at 1.6 meters per year, compared to 3.8 centimeters annually before 1992 (Vivien, 2007).

Studies found the amount of rainfall was between 15-38 percent higher because of global warming. There are three reasons for that. First, the Gulf region air temperatures were 2 to 3 degrees Fahrenheit hotter than in the past. That allowed the air to hold more moisture.

The city is relatively flat and is barely above sea level. Downtown is only about 50 feet above sea level, and there's only about a four-foot change between the highest and lowest parts of downtown. That means when rain falls, it has nowhere to go, and takes a long time to drain out.

Some experts also point to Houston's big building boom as a potential factor; in exacerbating the problem Development decreased the amount of wetlands in the city by almost 50 percent over the last 25 years.

**5. Conclusion**

Harvey's torrential rain, devastating winds and widespread flooding have so far cost at least 39 lives, driven over one million people to evacuate their homes in Texas and caused extensive destruction that will likely make it one of the costliest storms in U.S. history. The evidence of consecutive flooding in Houston region should raise alarms on the flooding's to come.

**6. Acknowledgements**

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