Hurricane Harvey made landfall as a Category 4 storm on August 25 near Rockport—about 30 miles northeast of Corpus Christi. After hitting the Coastal Bend region, the storm trekked east and toward other cities near the Gulf of Mexico before it dissipated on its way inland. With more than 50 inches of rain in parts of Houston, Harvey broke the U.S. rainfall record for a single tropical storm.

Economic Costs
While it is still early for an official estimate of the total economic damage caused by Harvey, a recent survey of experts by the New York Times indicates that the total cost is likely to range from $80 billion to $108 billion.

Even the bottom estimate would rank Harvey above Sandy, the second costliest natural disaster at $70 billion of today’s dollars. The top estimate would put Harvey close to the scale of economic toll with Katrina, which cost about $160 billion and resulted in 1,833 deaths, according to the National Oceanic and Atmospheric Administration (NOAA). According to Texas officials, Harvey directly caused at least 82 deaths.

Record amounts of rainfall caused catastrophic flooding in southeastern Texas inland cities, such as Houston and Beaumont. In the Coastal Bend, most property and infrastructure damages were caused instead by destructive winds over 130 miles per hour and storm surge over 7 feet above ground. Harvey also intensified from Category 1 to Category 4 within the same day of hitting the Texas coast.

Typically, the forecast of a hurricane’s costs draws from weather models and damages from similar natural disasters in the past. Those models do not seem to perform well for Harvey partly because of its slow meandering track over the Gulf of Mexico and Texas.

Still disparate estimates of the economic cost of any major storm often arise from comparing apples with oranges. Most insurance companies report only property damages that are insured. However, the majority of flooded homes near Houston did not have flood insurance.

Most estimates of disaster-related costs focus on the direct impact on private properties and infrastructure. Even if the properties are insured, homeowners and businesses in disaster areas...
would likely pay higher insurance premiums in the future.

The impacted area may also suffer a permanent decline in population and businesses. According to the Department of Labor, over 40 percent of firms that experience a major natural disaster never reopen, and over 25 percent of the remaining businesses close within two years. This impact would likely be more relevant to those coastal communities, such as Port Aransas, with a disproportionately large population of Winter Texans.

**Lost Output**

In determining the economic toll of a natural disaster, economists focus primarily on the impact on output and employment, which may also include permanent lost business and employment in addition to temporary disruption to economic activity. This is another major discrepancy with other estimates, which are confined to property damages as opposed to the broader economic impact.

In the Corpus Christi metro area, the cities of Port Aransas, Aransas Pass, Rockport, Ingleside, Sinton, Taft, Portland and Gregory issued mandatory evacuation orders beginning the morning of one day before Harvey’s landfall. The City of Corpus Christi issued voluntary evacuation. Other than the public and personal expenditures involved in evacuation, most businesses were closed and industrial facilities like oil refineries were shut down for an average of one week. In this case, the economic impact includes the temporary disruption to the area’s economic activity, which can be measured by lost output and wage earnings. This transitory impact is due to a loss of customer base, personnel disruptions, and dislocations to the transportation network and supply chain.

**Direct Damage**

Communities in the path of Harvey experienced severe property damages. According to the Federal Emergency Management Agency (FEMA), the amount of Coastal Bend households registering for Individual Assistance that exceeds 33% of their area’s total housing units are mainly from the counties of Aransas, Refugio, and San Patricio. In Nueces County, Port Aransas is also among the cities with the highest storm impact.

Preliminary surveys suggest that Harvey completely destroyed or severely damaged about 80 percent of homes and buildings in Rockport and its nearby communities of Fulton, Bayside, Aransas Pass, and Port Aransas.

As opposed to flood waters in other parts of Texas, wind gusts and storm surge were the primary sources of damage. Strong winds tore off roofs, exterior walls and fences, demolished mobile homes, snapped or uprooted trees, and damaged power lines, business facilities and public infrastructure. In addition to houses and buildings, storm surge caused damage to boats, piers and vehicles.

Within two weeks of Harvey’s landfall in the Coastal Bend, scientists at Texas A&M University-Corpus Christi began flying Unmanned Aircraft Systems (UAS), commonly known as drones, over the hardest hit areas. The application of UAS technologies, particularly Digital Surface Models, generated more detailed and accurate information about damage to individual properties than conventional satellite or aerial images.

The surveillance data suggest that the equivalent of 43% of structures were destroyed or uninhabitable in Rockport and other parts of Aransas County. The corresponding share was 26% for Port Aransas. Property damages in other parts of the metro area were relatively modest and scattered.

**Extended Impacts**

Basically, the economy of a community devastated by a natural disaster would undergo three stages. Immediately after a storm hits the area, local economic activity declines along with a major loss in both residential and nonresidential capital stock. A resurgence of economic activity will take place when residents and companies begin to repair or replace damaged properties, and when businesses reopen.

**Road to Recovery**

The recovery period will last for years or even decades, depending on how soon capital stock is restored and how fast businesses bounce back to their pre-disaster conditions and take advantage of post-disaster market opportunities. The local economy will reach a new equilibrium in the long run, which could even be above the pre-disaster level.

To understand what the recovery phase would look like, model simulations were performed for each of the communities devastated by Harvey. The key assumptions of this regional economic model are: (1) all industries were shut down during the storm, (2) residential and nonresidential capital stock declined according to the observed damages and survey data, and (3) the area’s capacity in terms of resources are limited to its pre-Harvey conditions. The hurricane imposed no direct impact on land. Even without government intervention, the local economy can recover over time along with restoration of homes and businesses.

**Need for Speed**

However, it will take years for a typical impacted community to reach a new equilibrium in the long run. A natural disaster’s extended economic impact would be enormous in light of cumulative output losses over the years before the economy rebounds to its baseline or pre-disaster level.

**UAS Digital Surface Model**

![Image of UAS Digital Surface Model](image)
level. The results of model simulations for Port Aransas and the entire Aransas County suggest that the lost output in the wake of Harvey would more than double if a full recovery takes four years instead of a nearly instant recovery within one year. The total output loss would more than double again if the recovery period lasts for 10 years instead of four years.

These simulation results underscore the role of government in private sector recovery. Economic losses can be minimized by accelerating the recovery process through federal and/or state injection of financial capital and assistance to businesses.

**Policy Implication**

The simulation results also provide some valuable insights regarding Harvey’s impacts. Because of the limited capacity in the form of labor and capital resources in those small, suburban communities devastated by the storm, the recovery process will generate substantial indirect effects on the rest of the metro area and the Coastal Bend region. In other words, rebuilding activity will become a boon to the regional economy, particularly construction employment.

The policy implication of those simulation exercises is also clear. Federal or state government’s financial support and other assistance in the recovery process would greatly mitigate the extended economic impact of a given natural disaster. The earlier the local economy returns its baseline, the smaller is the economic loss. Yet it also seems far easier to rebuild houses and public facilities than to restore economic vitality to a community devastated by a hurricane.

**Notes:**

This article is an excerpt from a presentation at the Economic Briefing Workshop in Portland on October 11, 2017.
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