

# Residential Damage Estimation in Harris County (Texas) Using HAZUS-MH, THC Survey and Hurricane IKE Assessment

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**Abstract:** In the week following Hurricane Ike in September 2008, Harris County assembled and trained residential damage assessment inspection teams. An assessment was undertaken by Harris County Elected Officials to determine the damages to residential structures and utilities in the region. For analysis purpose, the damage due to hurricane was grouped into five classes (Level 1 to 5). In this study, the damage cost to residential structures during Hurricane Ike was quantified based on the assessment and compared to the HAZUS-MH hurricane model and the THC survey results.

## 1. Introduction

Hurricane Ike was the third costliest hurricane ever to make landfall in the United States (Liu and Vipulanandan, 2009). It was the ninth named storm, fifth hurricane, and third major hurricane of the 2008 Atlantic hurricane season. It was a special type hurricane, as it started as a tropical disturbance near Africa at the end of August. On Sep 1, 2008. Ike caused flooding and significant damage along the Mississippi coastline and the Florida Panhandle. Damages from Ike in U.S. coastal and inland areas were estimated at \$29.6 billion (2008 USD) with additional damage of \$7.3 billion in Cuba (the costliest storm ever in that country), \$200 million in the Bahamas, and \$500 million in the Turks and Caicos, amounting to a total of at least \$37.6 billion in damage. Ike was the third costliest Atlantic hurricane of all time, behind Hurricane Andrew of 1992 and Hurricane Katrina of 2005 ([http://en.wikipedia.org/wiki/Hurricane\\_Ike](http://en.wikipedia.org/wiki/Hurricane_Ike)). For determining future housing needs, based on damage sustained during Hurricane Ike, Harris County assembled and trained residential damage assessment inspection teams. Teams were deployed starting September 23, 2008 and remained in the field until November 13, 2008. The teams conducted damage assessments of single family, multi-family and mobile home units in the city of Houston, in the small cities with geographic boundaries within Harris County and in unincorporated areas of Harris County. Since HAZUS-MH can estimate potential losses from a hurricane, it can also be used to estimate the damage costs after Hurricane Ike. This software was explored in a user-defined scenario for Hurricane Ike. HAZUS-MH was used to analyze and estimate the hurricane damage from in Harris county compared with the results of the data regarding estimated cost of residential damage.

Region	Residential housing units	Amount	Description	Economic loss
Small cities and unincorporated Harris County areas	Total	over 532,000	NA	NA
	uninhabitable	approximately 3,800	level 3, which is major damage and level 4, which is destroyed	\$283 million.
	affected and minor damage	Approximately 227,000	estimated to be either level 1, which is affected, or level 2, which is minor damage	approximately \$3.6 billion.

Table 1 Residential Housing Loss in Harris County Area  
 (Harris County Elected Officials)

## 2. Objectives

The objective of this study was to assess damages caused by hurricane Ike in Harris County and utilize data collected from Harris County Elected Officials and THC-IH survey to compare residential damage costs in Harris County to HAZUS-MH model.

## 3. Residential Damage Estimation and Assessment

Table 2 Hurricane Ike Scenario Results (Harris County) using HAZUS-MH

	Damage State	Residential	Commercial	Other	Total
Number of Buildings Damaged	Minor	29,000	1,500	600	31000
	Moderate	4,100	400	100	4,600
	Severe	200	40	30	300
	Destruction	200	0	<10	200
	Total	34,000	1900	700	36,000
Economic Loss (\$Millions)	Total	602	40	15	657

According to THC-IH survey, the estimated cost of house hold damage in Harris county were 3 billion, 4.8 billion, 6.5 billion for Minimum, Medium and Maximum cost of damage. The damage cost to residential structures during Hurricane Ike based on the HAZUS-MH hurricane model. The damage due to hurricane was grouped into three classes (minor, moderate and major). From scenario result, Residential loss is \$602 million dollars (Table 2), which was less than the loss from Harris County Elected Officials, 3.9 billion and the result of THC-IH survey. The losses estimated by Harris County Elected Officials was six times higher than what was predicted by HAZUS-MH. Also the HAZUS-MH estimated less number of damaged residential buildings.

## 4. Conclusion

By comparing the loss assessed by HAZUS-MH and Harris County Elected Officials, HAUS-MH model predicted much less losses in residential building and the cost of damage compared to Harris County Elected Officials.

## 5. Acknowledge

The study was supported by the THC-IT (<http://www.egr.uh.edu/hurricane/>) with funding from the industry.

## 6. Reference

Harris County Elected Officials (HCHA), 'Hurricane IKE: Residential Damage Assessment, Executive Summary', 2008.

Liu, M. and Vipulanandan, C., 2009: "Hurricane Prediction and Damage Estimation Using HAZUS-MH and Hurricane Ike Survey", thesis, University of Houston.