# Validation of HAZUS Hurricane Model During Ike

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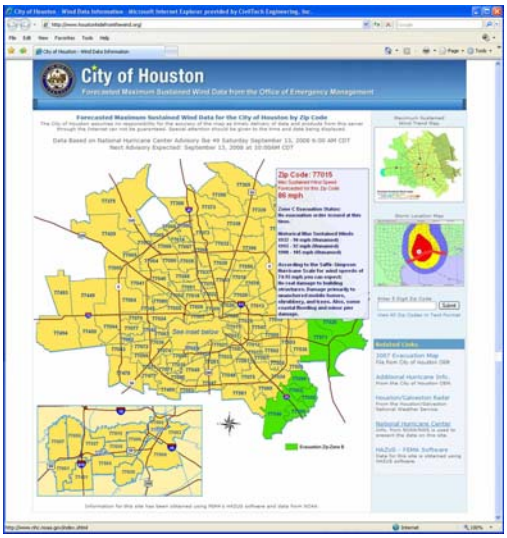
As Hurricane Ike approached the Texas coast on September 13, 2008, the City of Houston and nearby communities were ready. Improved evacuation plans and an emphasis on public education contributed to a smooth public response to Ike. An important component of Houston's readiness strategy is HAZUS-MH, FEMA's standardized loss estimation methodology. In order to help officials better prepare for Ike, CivilTech Engineering provided Economic Damage Advisories (EDAs) during the hurricane. The EDAs were created based on simulation model runs using HAZUS-MH for near real-time wind-induced damage assessments for hurricanes. Evacuation orders and forecasted wind speeds were depicted on a Houston area zip code map, which was displayed on the website "HoustonHideFromtheWind.org", which was developed by CivilTech.



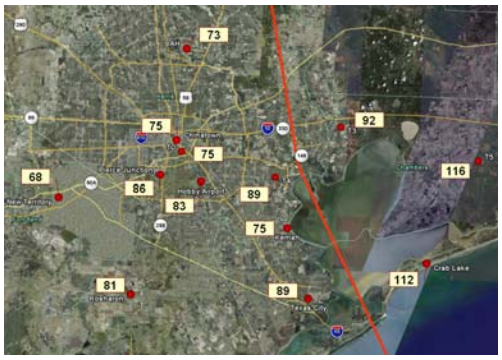

After Ike had passed through the area, CivilTech quickly deployed survey teams to collect field data in order to verify the results HAZUS had estimated.

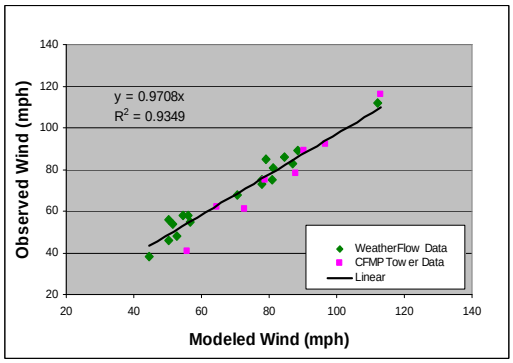
Three studies were done on: wind field validation, debris estimation, and building damages.

## Wind Field Validation

HAZUS can provide very cost effective economic damage estimates for communities that are threatened by hurricanes by utilization of the wind model.

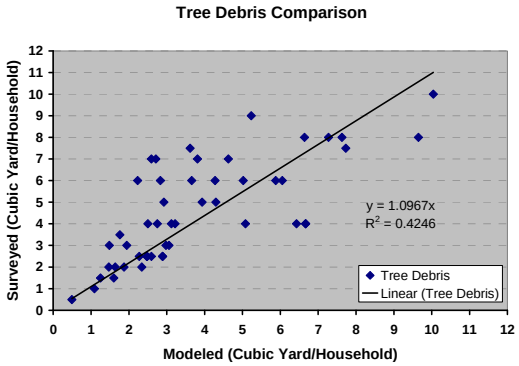
Wind data was collected from 15 stations that were well distributed throughout the Hurricane Ike storm system. Comparison of the wind data revealed that the HAZUS calculated winds had a significant linear correlation with the observed wind data.



## Debris Estimation

HAZUS estimated 4.5 million cubic yards of debris would be generated for the City of Houston and the actual debris picked up by the City of Houston was 4.3 million cubic yards. Harris County reported that debris collection for the county was significantly lower than HAZUS had estimated, however this was partially due to the burning of debris in the rural areas of the county, and many subdivisions/municipal districts did not report their debris amounts to the county.




Debris data was also collected for 49 census tracts spread throughout Harris County. HAZUS Level 1-modeled debris in general correlates to observed debris. However, uncertainties exist in both modeled debris and observed debris.

## Building Damages

Hurricane Ike damaged almost half the homes in Harris County according to a detailed assessment by the Harris County Housing Authority. Less than 1% sustained major damage. Ike's toll on county homes was estimated at $8.5 billion. A HAZUS Level 1 estimated $8.4 billion (2008 price value with consideration of 28% housing growth from 2000). The cost for the county study was $3.5 million, for which Harris County is seeking reimbursement from FEMA. In comparison, the HAZUS analysis proved to be an excellent housing damage assessment available in a timely manner.


CITY&STATE

Ike toll on county homes $8.5 billion

WIDESPREAD DAMAGE IN HARRIS COUNTY

Report indicates it will be far costlier than any other recent storm in the area

HAZUS Wind Model validation studies during Ike demonstrated the reliability of the wind field modeling within the HAZUS wind model used for hurricanes. The debris calculation and building damage results were reasonably accurate with a Level 1 analysis.

CivilTech is currently updating the HAZUS default data with extensive local data for this particular study region under a contract with the City of Houston, Office of Emergency Management. A more detailed study will be conducted in the near future utilizing a Level 2 analysis and validation of the results. to further validate the HAZUS wind model with a Level 2 analysis.