GULF COAST RESIDENTIAL AND BUSINESS POPULAITONS IMPACTED BY HURRICANE : SOME BASIC DATA

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August 29, 2005 brought what turned out to be the costliest natural disaster in United States history. Hurricane Katrina easily surpassed Camille as the hurricane by which all others are compared in south Mississippi. The visual images of the destruction shown on television, newspaper pages and the internet have documented much of the damage. A more difficult proposition is to systematically assess the household and business damage. What were the demographics of the destruction? How many and what types of businesses were impacted? This paper begins to answer these questions.

Impact Estimates of Previous Hurricanes

Analyses of previous storms provide us with indications of what we might expect in Mississippi in the wake of Hurricane Katrina. Hurricanes Hugo (South Carolina), Andrew (South Florida), and Frederic (Alabama) provide useful examples of patterns of economic activity after destructive storms. Important points to note from the studies of these disasters:

- Income and employment in certain sectors were increased for a period of two to fou`r years following each storm, most notably:
  Construction
  Repair services
  Wholesale and retail trade
  Insurance reimbursements and government aid were far less than the overall losses experienced.
  Damages from Hurricane Hugo totaled about $6.4 billion, with reimbursements from private and public sources totaling about $3.4 billion, leaving $3 billion in un-reimbursed losses.

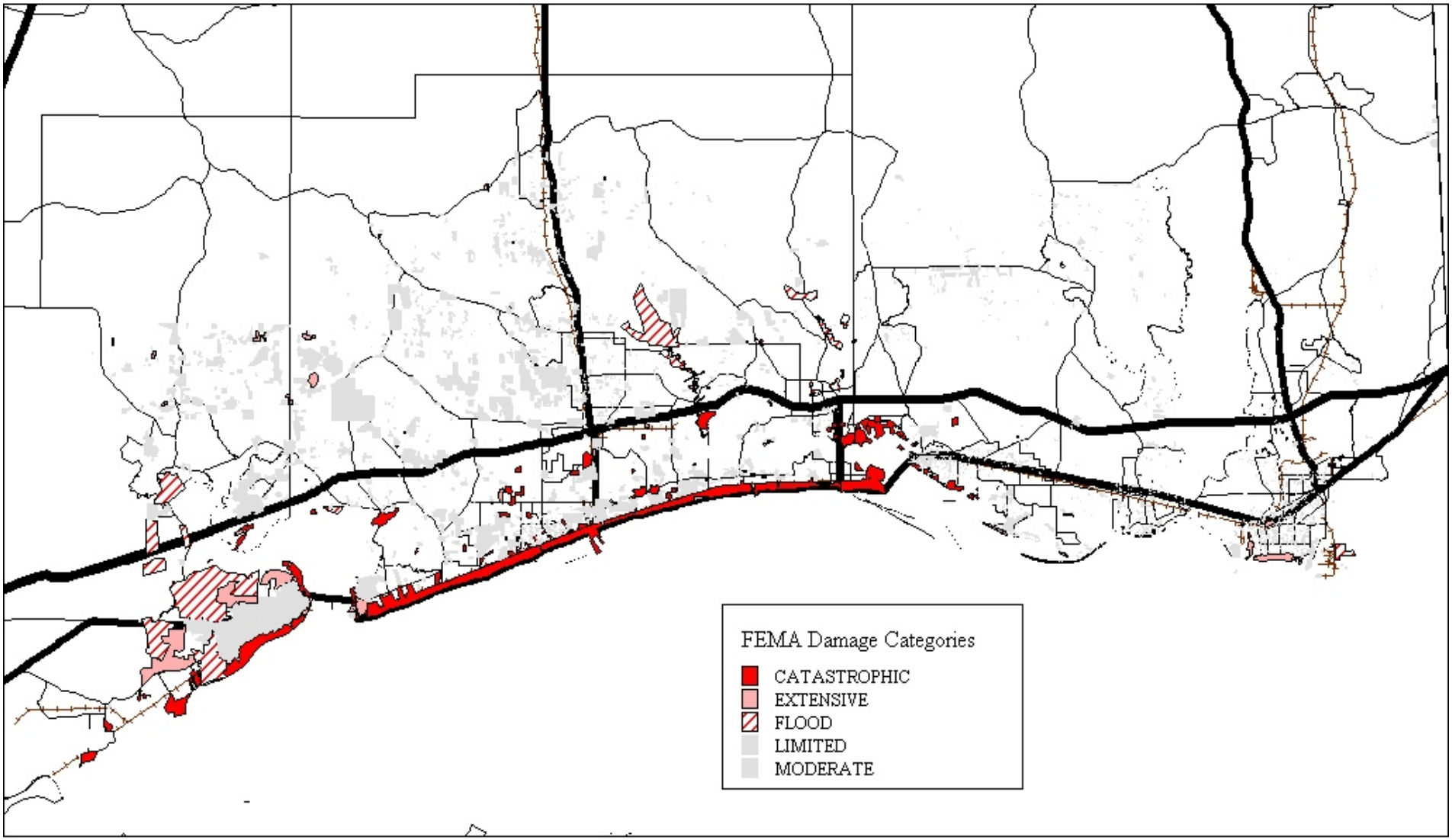
  Damages resulting from Hurricane Andrew totaled over $22.6 billion, $15.4 billion of which was covered by insurance, leaving $7.2 billion in uninsured losses.

- An extensive survey was conducted in the wake of Hurricane Andrew to determine the extent of housing damage, along with information about demographic changes in the area.[1] Over half (52%) of south Dade county residents were forced to move out of their homes as a result of Andrew.

  Two years later, only about 62% of those displaced households had returned to their pre-hurricane residence. A significant finding of their research was that households that moved farther away from their pre-hurricane residence were less likely to return to that original residence:

  Only 10% of south Dade County residents who moved out of Florida following the hurricane returned to their original home.

  72% of households that moved to another location within Dade County returned to their original home.



Map 1. **FEMA Damage Assessment of the Mississippi Coast from Waveland to Pascagoula.**

SOURCE: See References section – FEMA.

Hurricane Katrina Impacts on Homes and Businesses

One common aspect of all of the information listed above is that they were conducted two to three years after the storms. While this allows for more complete sources of data, there is certainly value in more contemporary estimates. Here a more indirect method using remote sensing techniques combined with census data was used to provide estimates of damages, just weeks after the storm (see appendix for a description of the methodology).

Map 1 displays the FEMA estimates of various damage levels on the Mississippi Gulf Coast[2]. The black line paralleling the coast is Interstate I-10. The railroad tracks south of I-10 have often been mentioned in news reports to be a dividing line between devastation and less severe damage. This is reflected in the FEMA map. The dark red strip (representing 'catastrophic' damage) that runs along the coast is bounded, with few exceptions, by the railroad tracks to the north. The total area of all five FEMA damage areas is about 140 square miles. The area of the two most extensive damage areas totals about 28 square miles.

Household Impacts

According to a February 2006 report published by the U.S. Department of Housing and Urban Development's Office of Policy Development and Research, just over 52,500 (about 37% of all occupied housing units in the three coastal counties) homes sustained over $5,200 in damage. A large majority of the total destruction occurred in the 'catastrophic', 'extensive', and 'flood' zones from Map 1. From here forward, these will be referred to as "serious damage" zones. There were over 21, 000 total homes in these zones. Based on a building-by-building survey conducted under FEMA's supervision, we now know that over 90% of the housing units in the three serious damage zones, or approximately 18,900 homes, sustained substantial damage[3]. Structures are defined by FEMA as substantially damaged when the cost of restoring the building would equal or exceed 50% of its pre-damage market value (FEMA 1991, p. 6). Table 1 displays some basic demographics on the households most significantly impacted by Hurricane Katrina.

Hurricane Katrina impacted a higher proportion of older persons than the population as a whole. Almost one quarter of persons over 85 lived in the most affected areas. This compares with one person out of ten in the overall population that was over 85.

Looking at the race statistics, the Asian population was hit proportionally harder than the population as a whole. Almost one-quarter of all Asian persons on the coast lived in the damage zones. Black persons were less likely to be in the most heavily damaged areas.

The housing data reveals that persons either on the low-end or the upper-end of the income spectrum were more likely to have been severely impacted by the storm. More rental housing, as opposed to owner occupied housing, was wiped out by the storm. One in five renter-occupied housing units was in the most significantly damaged areas, compared to about 13% of owner-occupied units.

Lower income households were more likely to be in the seriously damaged areas. This is in line with other data mentioned above. Both elderly persons and renters tend to have lower annual incomes than the overall population.

Not surprisingly, because of the damage along the beachfront, expensive homes were hammered by the storm. Over one-quarter of all owner occupied homes valued over $500,000 in the three county area were in the catastrophic damage zone. This is also reflected in the income data which shows that households with annual incomes over $150,000 were more likely to be in the catastrophic zone.

Business Impacts

Two out of every five businesses on the Gulf Coast were located in one of the serious damage zones. Table 2 shows a sectoral breakdown of employment in those businesses. Almost one-half of

Table 1. **SELECTED CHARACTERISTICS OF POPULATION IN THE THREE FEMA SERIOUS DAMAGE AREAS***

	Three Coastal Counties Total	Serious Damage Zone Total	Percent in Damage Zone
2005 Estimated Total Population by Age			
Total Population	370,396	49,471	13.4%
Age 65 and over	44,441	7,898	17.8%
Age 85 and over	4,254	1,003	23.6%
2005 Estimated Population by Race			
White Alone	273,529	38,510	14.1%
Black or African American Alone	76,590	7,049	9.2%
Asian Alone	8,758	2,106	24.0%
2005 Tenure of Occupied Housing Units			
Owner Occupied	97,830	12,376	12.7%
Renter Occupied	42,273	8,879	21.0%
Owner-Occupied Housing Value (2000 Census)			
Less than $59,999	28,590	3,735	13.1%
$60,000 to $99,999	34,547	4,154	12.0%
$100,000 to $149,999	17,394	2,262	13.0%
$150,000 to $499,999	12,634	2,031	16.1%
$500,000 or more	685	179	26.1%
2005 Estimated Households by Household Income			
Less than $24,999	39,409	6,891	17.5%
$25,000 to $49,999	44,134	6,897	15.6%
$50,000 to $149,999	52,243	6,718	12.9%
$150,000 or more	4,317	747	17.3%

*Percentages represent the portion of the total 3 county population that resided in the most severe damage categories (catastrophic, extensive and flood damage). For example, 17.8 of all persons over age 65 lived in one of these zones.

SOURCE: EDRC analysis of Claritas and FEMA data as explained in the appendix.

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all jobs in the retail, financial, and service industries were in the serious damage zones. Over 80% of the jobs in these zones were in those three sectors. Manufacturing was largely spared the destruction. Only about 10% of total manufacturing employment in the three coastal counties was in one of the serious damage zones.

It is important to note that some homes and businesses outside the FEMA damage zones sustained major damage. For example, FEMA's damage zones didn't quite cover all of the Northrop Grumman Shipyards in Pascagoula. News reports indicate that the company's facilities may have sustained up to $500 million in uninsured damages. Ship and boat building employment fell by over 20 from August to September 2005, but have now almost recovered to pre-Katrina

Table 2. **PERCENT OF TOTAL THREE COUNTY EMPLOYMENT IN FEMA DAMAGE AREAS**

Manufacturing	10.3%
Transportation, Utilities	34.3%
Wholesale Trade	21.0%
Retail Trade	42.4%
Finance, Insurance, Real Estate	47.5%
Services	49.3%
Government	42.7%

Percentages represent the portion of each category that falls in the FEMA serious damage areas.
SOURCE: See appendix.

levels. Also, businesses that sustained no physical damage were impacted by disruptions caused by displacement of employees who lost their homes or by suppliers or customers that were damaged.

Mississippi Employment Security Commission data shows that while there has been some improvement in unemployment rates in the months since the storm, there are still significantly fewer jobs on the coast. Unemployment rates in Hancock, Harrison and Jackson Counties were all around 22% in the month after the storm. As of February 2006, those rates had lowered to about 15%. As of February, the three coastal counties had about 25,700 fewer employed persons, or over 15% fewer jobs than in the previous year.

Mississippi State Tax Commission data reflects the destruction in the retail sector. Table 3 shows growth in retail sales tax collections from cities in southern Mississippi. Five cities, Waveland, Pass Christian, Bay St. Louis, Biloxi, and Long Beach had lower retail sales in the 4th quarter of 2005 relative to 2004. These cities all had significant portions of their retail sectors located in the catastrophic damage zone, as displayed in Map 1.

Cities with more protected retail sectors, notably Gulfport, D'Iberville, and Pascagoula, saw very large increases in retail sales. Also, cities in the counties directly north of the coastal counties saw large increases in retail sales. Wiggins, 30 miles north of Gulfport on Highway 49 saw almost a 70% increase in retail sales over the previous year.

These large increases north of the coastal counties reflect both commuters and displaced households. Commuters still live on the coast must drive to other cities, due to the destruction of the retail stores in their area. Displaced households have lost their homes on the coast and have relocated, either permanently or temporarily, to locations farther north. Another factor is a general increase in retail sales due to people buying home repair goods and household goods lost in the storm.

Data from the first quarter of 2006 shows that retail conditions are improving in most of the coastal cities. The notable exception to this is Pass Christian, which continues to have retail sales over 70% less than last year. As the coastal cities' retail sectors improve, the growth in Wiggins retail sales has subsided somewhat. Interestingly, Picayune continues to see extremely high growth. This is possibly due to higher levels of displaced households in Picayune relative to Wiggins.

Concluding Remarks

This article describes some of the populations impacted by Hurricane Katrina. In many cases these populations differ significantly from the overall Mississippi Gulf Coast population.

Table 3. **GROWTH IN DIVERSION TO CITIES FROM SALES TAX COLLECTIONS**

CITY	2005 4th Quarter	2006 1st Quarter
Picayune	74.3%	78.8%
Wiggins	68.5%	51.4%
D'Iberville	66.4%	62.8%
Pascagoula	60.0%	50.8%
Ocean Springs	48.3%	42.9%
Gulfport	42.7%	68.4%
Hattiesburg	41.1%	42.8%
Moss Point	21.7%	31.3%
Mississippi	17.3%	17.7%
Long Beach	-7.4%	11.2%
Biloxi	-26.2%	-22.3%
Bay St. Louis	-45.2%	-33.6%
Waveland	-69.0%	-27.7%

SOURCE: Mississippi State Tax Commission.

Groups more likely to live in the catastrophic damage zone include Asians, wealthy homeowners, and persons living in rental housing. In the business sector, retail, finance and services were damaged significantly.

One of the main focuses of recovery efforts should be on affordable housing. Policies focused both on both multi-family and individual homes will help the recovery proceed more smoothly. Without housing, businesses that are trying to reopen will struggle to find employees. Growth in housing will also bring back customers that retail and service businesses are looking for in the extreme southern parts of the coastal area.

Some areas of the recovery process are now being hampered by a lack of reliable data. Businesses that served coastal areas are reluctant to return because they are unsure of the local market for their goods or services. The data presented here were estimates based on 'remote sensing' techniques, that is, they were based on general assumptions about damage in wide geographic areas. Accurate data for planning and recovery purposes will have to be collected on the ground in the affected areas.

Going forward, this data, along with additional primary data, will be used as a basis for estimating the value of the destruction brought by Hurricane Katrina in Mississippi. The data can then be compared to the damage estimates in previous disasters. An estimate of the value of destruction from Katrina compared with the experiences from previous disasters will allow us to make predictions regarding economic activity during the recovery.

Notes

1. The survey asked respondents about the extent of damage to their homes, insurance settlements, living arrangements of those displaced by the storm, and whether displaced households had yet returned 2 years after the storm.

2. Definition of FEMA damage categories:
   Catastrophic Damage: Most solid and all light or mobile structures are destroyed.

Extensive Damage: Some solid structures are destroyed; most sustain exterior and interior damage (e.g., roofs are missing, interior walls exposed), most mobile homes and light structures are destroyed.
Moderate Damage: Solid structures sustain exterior damage (e.g., missing roofs or roof segments); some mobile homes and light structures are destroyed, many are damaged or displaced.
Limited Damage: Generally superficial damage to solid structures (e.g., loss of tiles or roof shingles); some mobile homes and light structures are damaged or displaced.
Flood Damage: Indicates a separate severe damage category related to the specific effects of flooding.

3. This number is greater than that found in the 2/12/06 HUD study which was also based on FEMA data. The difference may be due to differences in methods used to reduce double-counting.

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APPENDIX:

Methodology of damage estimates

One of the important sources of data for many of the previous studies described in the paper, the Federal Emergency Management Agency (FEMA), also provides important data for this study. In the days after the Katrina made landfall, FEMA provided a series of GIS map layers outlining areas on the Gulf Coast that were impacted at various levels. "Soon after the disaster event, FEMA managers and staff use GIS to visualize actual damages by analyzing collected aerial reconnaissance and ground truth data. Using GIS, MAC customers (i.e. Disaster Field Office (DFO), Emergency Support Team (EST) personnel, etc.) can see the spatial extent of damage, learn who was affected by the disaster and which resources were affected (FEMA, 2004)."

Based on the areas delineated by the FEMA maps, we estimated the number of households and businesses that were impacted by Katrina. Data estimates were obtained using a GIS based data analysis tool called PCensus. Census 2000 and Claritas 2005 demographic and business data at the Census block level were aggregated based on the areas outlined by each FEMA damage category. These aggregations were the source of the percentages presented in Tables 1 and 2.