Urban Functionality and Extreme Natural Disasters; The New Orleans-Katrina Case for New Federal Policies and Programs for High Risk Areas

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Abstract

This paper addresses the federal government's historic and current programs and policies and how these policies encourage, and have encouraged, urban growth in areas having relatively high risk potential for recurring natural disasters. While FEMA and local authorities respond to emergency situations during crisis events, this paper explores the concept that such disasters, and additional emerging loss of life and property, could easily be avoided through changes in current federal government flood insurance programs, grants, flood "protection" programs, loans, loan guarantees and federal banking policies that subsidize and/or encourage high risk urban development, which otherwise would not be funded or insured by private enterprise or priced much differently then less risky areas. Various federal programs and policies are considered together with recommendations. A cycle of federal programs which perpetuates urbanization of high risk areas (hurricane, flood, and earthquake areas) is offered as well as insight on residential value trends of previously flooded areas (high risk areas) highlighting even more that building or rebuilding in areas which place the public or public tax payer funds at greater financial risks and/or costs does not exceed the long term benefits obtained. Key words: Katrina, Coastal Zone, Floodplain, Earthquake, Flood Insurance, Disasters.

1. Introduction

Hurricane Katrina has unfortunately offered a perfect and timely opportunity to seriously reconsider if the federal government's current and past policies actually conflict with the concept of protecting the health, welfare and safety of the public and property at large by encouraging urban development and redevelopment in known high risk areas through federal programs. There are two ways the federal government can "control" urban growth in high risk areas: (1) In coordination with local governments to impose or encourage local zoning restrictions (police power) or (2) Federal financing and related programs.

While private enterprise and land owners should have the right to build or rebuild in high risk areas, which would otherwise most likely not be achieved by private investors, this paper concludes that it is not in the best interest of the public's federal tax dollars or of safety to encourage development or redevelopment in high risk disaster areas of the US.

2. Disasters and Recovery Plans

The U.S. has sustained various types of catastrophes throughout the years impacting both lives and property on various scales. Only from a hurricane intensity perspective, at least seventy-five (75) hurricanes of Katrina's land-fall strength (category 3) impacted the U.S. mainland from 1851-2005 (White House Report, 2006). This represents an average of one (1) storm of the same strength (3 or above) every 2.5 years. Focusing on insured losses, a very disturbing observation can be made from Figure 1 which shows that 77% of the insured losses (2005 dollars) from 1996-2005 was sustained after 2000. Looking at the ten most costly recent catastrophes, 67% was sustained after 2000 (Figure 2). In contrast to Figures 1 and 2, which present aggregate data for the whole U.S. we focused further on specific disasters and recovery/rebuilding efforts, also highlighting the financing used to rebuild (Figure 3).

Figure 1. Insured losses, U.S. catastrophes, 1996-2005 (1)

Year	Number of catastrophes	Number of claims (millions)	Dollars when occurred (millions)	In 2005 dollars (2) (millions)
1996	41	3.9	$7,375	$9,180
1997 (3)	25	1.6	$2,600	$3,164
1998	37	3.5	$10,070	$12,065
1999	27	3.3	$8,321	$9,754
2000	24	1.4	$4,600	$5,217
2001	20	1.6	$26,548	$29,276
2002	25	1.8	$5,850	$6,351
2003	21	2.6	$12,885	$13,676
2004	22	3.4	$27,300	$28,225
2005	24	4	$56,800	$56,800

(1) Includes catastrophes causing insured losses to the industry of at least $5 million in 1996. Data for 1997 to 2005 include catastrophes causing at least $25 million in losses.
(2) Adjusted to 2005 dollars by the Insurance Information Institute.
(3) 1997 was the first year that ISO increased its dollar threshold defining catastrophes from $5 to $25 million The number of catastrophes fell from 41 in 1996 to 25 in 1997, mostly due to this reclassification.
Source: ISO; Insurance Information Institute.

Figure 2. The ten most costly recent catastrophes, United States (1)

			Insured loss ($ millions)	
Rank	Date	Peril	Dollars when occurred	In 2005 dollars (2)
1	Aug. 2005	Hurricane Katrina	$38,100	$38,100
2	Aug. 1992	Hurricane Andrew	$15,500	$21,576
3	Sep. 2001	World Trade Center, Pentagon terrorist attacks	$18,800	$20,732
4	Jan. 1994	Northridge, CA earthquake	$12,500	$16,473
5	Oct. 2005	Hurricane Wilma	$8,400	$8,400
6	Aug. 2004	Hurricane Charley	$7,475	$7,728
7	Sep. 2004	Hurricane Ivan	$7,110	$7,351
8	Sep. 1989	Hurricane Hugo	$4,195	$6,607
9	Sep. 2005	Hurricane Rita	$5,000	$5,000
10	Sep. 2004	Hurricane Frances	$4,595	$4,751

(1) Property coverage only.
(2) Adjusted to 2005 dollars by the Insurance Information Institute.
Source: ISO; Insurance Information Institute.

Figure 3
Examples of Disaster/ Recovery/ Rebuilding/ "Costs"/ and Loss of Life

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	Location	Disaster	Type of Loss	Lost Lives	Cost	Rebuilt	Financing of Rebuilt
Oct 8 1871	Chicago	Urban Fire Storm	CBD Lost		Unknown	Yes	Private Funding
1889	Johnstown	Flood	City Lost		Unknown	Yes/Moved Town	Private
1906	San Francisco	Earthquake	City Lost, 29,000 buildings	3,000	Unknown	Yes	Private Funding
1900	Galveston, TX	Hurricane ("Galveston")	City Lost	8,000	Unknown	Yes	Private
1968	US/Nationwide	Federal Flood Insurance Program for Hurricanes, Tsunamis, Flooding	Private Property losses in Floodplains/ Coastal Areas/ Waterways		2006 Fed Budgeted/ Borrowing Limits raised from 1.5 billion to 20.8 billion.	Allows Loss Claims, limits Rebuilding and/or repairs in flooded area	(New Policy to raise homes 3 feet announced 4-10-06)
1969	Texas	Hurricane	22,000 Homes Real Estate	395	$8 billion	Yes	Private/Public Insurance Programs
Aug 1992	Texas Gulf Coast	Hurricane "Andrew" Florida, Louisiana	19,683 Homes, Real Estate		$33 Billion (Fed)	Yes	21.5 billion Private-Insurance Companies- 12 Billion Fed Government funding, Grants, Loan
Jan 1994	Northridge, California	Earthquake	Real Estate Highways		$17.8 Billion + Fed	Yes	Private Insurance Company and Federal Grant Loans
Sept 2001	New York, Trade Center	Terrorist attack and fire storm	Office building	2,862	67.3 Billion	No/Pending	Private/ Public Combination Proposal
Sept 2004	Gulf Coast	Hurricane "Ivan"	37,772 Homes, Real Estate Public Input	57	$11.0 Billion + Fed/Local Gov	Yes	Private Insurance Company and Federal Program
Sept 2004	Gulf Coast	Hurricane "Charley"	Real Estate		8.0 Billion + Fed/Local Gov. $	Yes	Private Insurance
Aug 2005	Gulf Coast of Louisiana, Mississippi and Alabama	Hurricane "Katrina"	300,000 Homes, Cities Lost	1,330	$300 Billion + (96 Billion reported by White House)	Pending	Private Insurance 60 Billion Federal Government Flood Insurance Grants, Loans
Sept 2005	Texas Gulf Coast	Hurricane "Rita"	21,000 Homes, Real Estate		26 Billion	In process	Private Insurance and Federal Programs
March 16, 2006	United States	Federal Debt Limit Raised to 9 Trillion	$30,000 per US Citizen		$9 Trillion	NA	Public Debt Increased Taxes
April 2006	San Andres Fault/ California*	Pending	CBDs, Urban/	NA	Unknown	NA	

*Plate boundaries at surface precisely measured by GPS at 2 inches per year.

Federal policies and programs can discourage urban growth based on an area's disaster risk assessment. We will consider three (3) categories of disasters (hurricanes, flooding and earthquakes) as the primary types of avoidable urban property risk exposure. The risk and degree of property loss can be controlled by initially not encouraging development or initiating redevelopment after a disaster using federal programs.

Bin et al. (2006) study of the effects of flood hazard on flood zones and coastal property values for Carteret County, N. Carolina (9/2000-2004) indicates that location within a floodplain lowers property value and that the price differential for higher flood risk areas is significantly larger than that of lower risk areas. The results suggest that location within a floodplain lowers the average property's value by 7.3% ($11,598). Location within a 100-year floodplain lowers the average property's value by 7.8% ($12,325) while location within a 500-year floodplain lowers average property value by 6.2% ($9,849). Another study by Bin and Kruse (2005) for the same area and period, but focusing on wave action, indicates that on average property values are 5% to 10% lower if located within a flood zone that is not subject to wave action, with these numbers increasing if there is wave damage. They also find that, in most inland areas, price differentials for flood risk are roughly equivalent to the capitalized value of flood insurance premiums. Bin and Polasky (2003) studied residential property values before and after Hurricane Floyd in N. Carolina (1999). Their results indicate that location within the floodplain lowers the estimated residential sales value for an average property by 5.8% ($7,529). The post-Floyd estimated discount is $10,774, which is more than double the pre-Floyd discount ($4,933). Dei-Tutu (2002) study of Pitt County, North Carolina (1/1998 – 6/2002) also finds that the market value of a house located within a floodplain is significantly lower than an equivalent house located outside the floodplain. The price differentials range from $5,000 to $11,000 for houses sold between $50,000 and $225,000. In addition, the average house located in a floodplain is discounted by 6.6% of the property value, while the capitalized insurance premium value represents approximately 4% of the house's selling price. Tobin and Montz (1997) study of Linda and Olivehurst, California, where the levee systems were compromised on several occasions (1955, 1986 and 1997), indicate that property values decrease immediately following a flood because the utility that can be derived from that parcel of land is reduced. Properties that experienced flooding in 1986 did eventually recover to near pre-flood levels, but the recovery length of time varied with depth of flooding. For houses experiencing greater depths, the recovery period was in excess of 10 years, confirming that the flood had been capitalized into property values in spite of the repairs. In addition, some houses remained abandoned for many years after the 1986 flood. The results also indicate that 68% of flooded properties in 1986 sold below the median price of that submarket, compared to 55% of non-flooded properties and only 29% of the 1997 flood properties. Properties within the old flood zones flooded to more than 10 feet experienced a very significant post-flood decline in sale prices, with prices being almost 30% lower than pre-flood levels even a year later. The prices rebounded somewhat at the end of the 10-year period after significant investments in repairs. An earlier study of the same area (Linda and Olivehurst) after the 1986 floods indicates that properties flooded to 10 feet or more experienced some recovery after the initial drop, but prices never got higher than 80% of pre-flood levels, and later they experienced another decline (Montz and Tobin, 1988). Another study by Montz and Tobin (1990) on a flood in Wilkes-Barre, Pennsylvania in 1972, which led to the flooding of certain properties to more than nine feet and others with less than nine feet (the mid-range depth for this event) showed that properties with less than nine feet recovered rather quickly, and prices exceeded pre-flood values within one year of the flood.

Except for the research conducted on the impact of floods on residential markets, other studies focus on the impact of earthquakes on residential values. Although the U.S. has not a significant frequency or spread within the country of this phenomenon as other countries around the world, earthquakes are always of interest especially for the earthquake prone California. Recent studies of both U.S. and non U.S. earthquakes highlight that earthquakes have an impact on residential values. Loukaitou-Sideris A. and Kamel (2004) examined the effectiveness of the six major federal residential recovery programs[1]in Los Angeles after the Northridge earthquake of January 1994. This earthquake prompted the distribution of more than $12 billion in public and private funds for residential recovery. Although the results of the study show that the Los Angeles region has recovered nonetheless, residential recovery was not uniform. Areas that received less assistance relative to reported damage experienced a net loss of population, a reduction in the number of housing units and lower occupancy rate. A closer look at the extent and quality of reconstruction showed that although 90% of the red tagged properties have been rebuilt, their reconstruction time was longer than expected: about two years on average. Murdock et al. (1993) study of the Lom Prieta earthquake on San Francisco Bay area housing values indicated an area wide property value reduction of at least 2%. The results also indicate that Bay area properties have a significant "risk premium" embedded in the market price for corresponding increases in hazard risk.

On an international level, Nakagawa et al. (2004) analysis of the Tokyo Metropolitan areas find that land prices are substantially lower in risky areas than in safe areas even after controlling for other possible effects on land pricing. Land with the highest earthquake risk is discounted by around 10% against land with the lowest risk. That impact became more evident in the 1990s than in the 1980s, indicating that households and firms were becoming more sensitive to earthquake risks. Onder et al. (2004) study of the public perception of earthquake risk on Istanbul's housing market indicates that distance from fault lines is an important factor in explaining house values and its impact on house values increased after the 1999 Kocaeli earthquake. Sims (1999) also concludes that the 2,000 deaths of the 1999 Taipei earthquake were primarily caused because the government allowed the development of high-rise apartment buildings without consideration of the proximity to known earthquake faults.

The synopsis of recent literature on the effects of floods/hurricanes and earthquakes on residential values concurs on the decrease of values through time, especially for low-income areas. In addition to these types of disasters, other disasters are also possible and when they happen within a dense urban area have more significant impacts than in rural areas. An additional list of disasters with U.S. examples, frequency, predictability and risk is highlighted in Figure 4.

[1] Small Business Administration (SBA) loans for homeowners, property loss, and business loans; Department of Housing and Urban Development (HUD) grants and loans; Federal Emergency Management Agency (FEMA) minimum home-repair grants, and FEMA individual and family grants for property losses

Figure 4
Types of Disasters and Emergencies and Their Long Term Effect on Local Real Estate Markets

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Type	Source	Damage Location	US Examples	Frequency	Location Predictability	Risk
Flooding	Hurricane	Coastal Zone	Katrina/Rita (2005) and Figure 1	"Average" * 1/decade	High	Medium
	Torrential Rains	100 year floodplain	Pennsylvania, New Hampshire (2005)	Various topography <1/100 years	Random along streambeds	High
	Broken Levees	Flood "Protected" Areas/Projects	Katrina (2005)	Variable	Medium	Medium
	Failed Man-made Dams	Downstream (previous flood prone areas)	California (2002)	Variable	Medium	Inspection/ Maintenance Dependent
	Tsunami	Pacific Islands/West Coast	None	Rare	Low (coastal)	Low
Wind/ Rain	Tornadoes	Random / Midwest/ South	Hurricanes Katrina (2005)	Annual	High (Regional)	Low
	Hurricane	Coastal Zones	Rita (2005) Charley (2004) Ivan (2004) Andrew(1992)	"Average" * 1/decade	High	Medium
Urban Firestorm	Terrorism	Central Business District	NY 9-11-01	1/ decade	Low	Medium
	Accidents	Anywhere	Common		Low	Low
	Arson (individual)	Anywhere	Common		Low	Low
	Code Violation	Anywhere	Common	Variable	Low	Low
Rural Firestorm	Natural (Lighting)	Grassland/ Forest	Texas 3-06 850,000 Acres	Variable	Low	Low
	Accidents	Grassland/Forest				
	Arson	Grassland/Forest	California (2003)	Variable	Low	Low
Disease Epidemic	Natural	Rural/ Urban	Avian Flu (2005?)	Low	Medium	Medium
	Terrorism	Rural/Urban	Anthrax/ Washington DC (2001)	Low	Medium	Medium
Earthquake	Natural	Western US/ Arkansas, Illinois	Northridge, California 1994 Charleston Mo, 1895	Low	High	High

* Frequency of Hurricanes has been increasing drastically from the previous 1/decade to several per decade or per year. Attributed to changing weather patterns and "warming" seas due to "global warming."

3. Federal Government pro-development policies and agency recovery flow chart

The federal government has developed a number of programs encouraging urban development in various areas and under different conditions. The main goal is to develop market efficiency which can be accomplished faster through economies of agglomeration. The initial government thinking was that market forces alone will not allow the development of certain areas of high risk and therefore only the government could step in and become the facilitator of urban growth. However, the existence of various pro-development tactics unfortunately led to dense concentrations of commercial and residential assets in high risk areas. This concentration along with the increase of severe storm phenomena these past few years due to global warming or other factors might create additional government funding and create an unbearable burden for victims, tax payers, and government decision makers.

The federal government's direct and indirect programs and policies which encourage development and redevelopment in high risk coastal zones, floodplains, and known earthquake-prone areas are presented in Figures 5 and 6.

The immediate and necessary flow of emergency funds and services during disasters found in Figure 6, is complicated and highlights how complicated the government response to a disaster is, not allowing expedited solutions to life threatening problems. However, less citizens and property would be at risk if those same federal decision makers and departments as found in Table 4 would stop encouraging long term policies and funding (Figure 5) of urban growth in high risk areas. Figure 5 offers examples of various Federal programs and IRS tax reduction incentive that tend to the encourage rather than discourage development in the coastal and earthquake areas of the US.

Figure 5
The Federal Government's Encouragement in Developing High Risk Coastal Urban Areas. (Grants, Debt Forgiveness, Interest Free Loans, Federal Debt Limit extension (3-16-2006)) to $9 trillion or $30,000 per US Citizen

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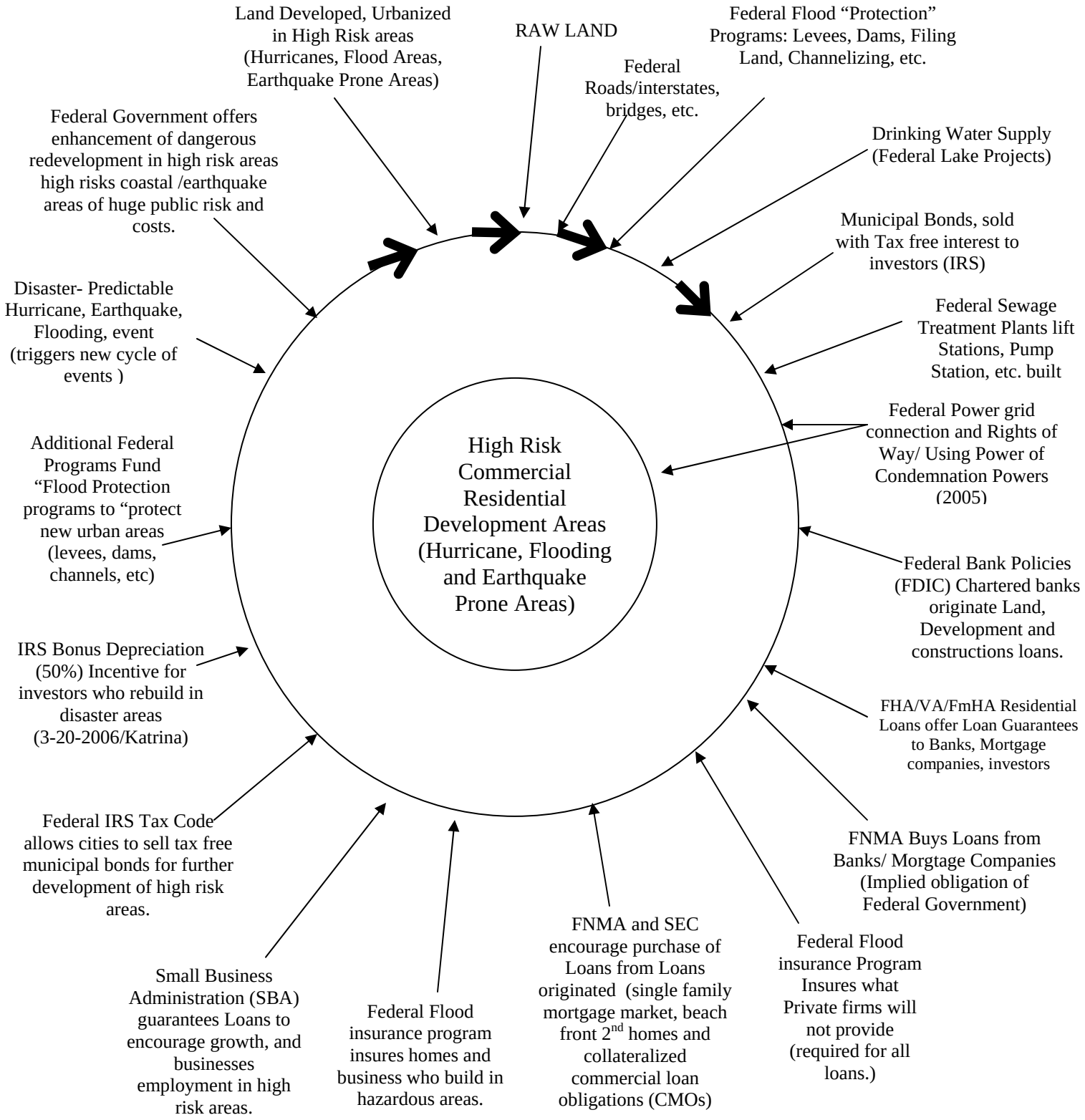

Figure 6

U.S. Government Disaster, Rebuilding, Recovery and Agency Response Flow Chart

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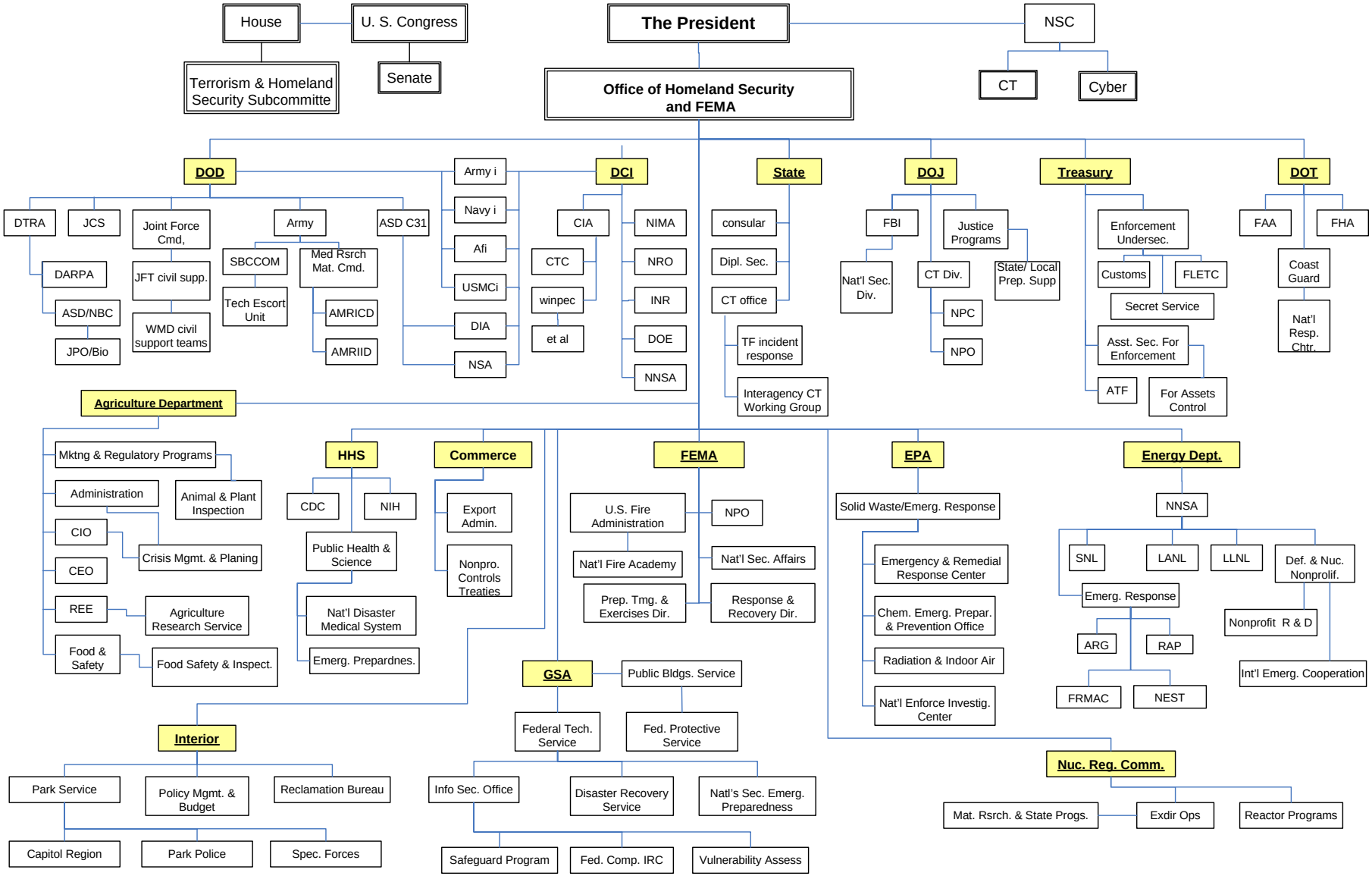


4. Overview of Hurricanes Katrina & Rita

New Orleans suffered a devastating flood from Hurricane Katrina at an unprecedented level. The majority of the city is below the sea level but the Flood and Hurricane Protection System in place consists of 350 miles of levees (White House Report, 2006). The system includes floodwalls, hundreds of bridges, closable gates, culverts and canals that facilitate transportation in and out of the system. It is comprised of a series of four main compartmented basins designed to limit the flooding impact on the entire system resulting from individual failure of levees and floodwalls (White House Report, 2006). Figure 7, highlights the extent of the levee system in New Orleans with additional information on the height of the barriers and canals. Currently, the levees offer protection ranging from eleven (11) up to approximately seventeen and a half feet (17.5) above sea level. The levee system was designed to withstand a Mississippi River flood the size of the flood of 1927 and a hurricane with wind conditions similar to a very strong Category 2 hurricane (White House Report, 2006). Although not all the levee system was compromised during Katrina, the surf generated along with the high winds led to water overtopping certain levees and eventually leading to breaches in those areas (Figure 8). These breaches led to the uncontrollable flooding of almost 80% of the urban area overwhelming the pumping stations (Figure 9). Among the hardest hit parishes were Orleans and Jefferson (Fig. 10). Brookings Institute (Katz et al. 2006) reports that pre-Katrina the New Orleans metro area had a population of 1.34 million and in October the population dropped to 725,704 and until February 2006 it increased only by 21%. At the same time, the Orleans parish had a pre-Katrina population of 463,000 and in October the population dropped to 138,681 with a higher increase until February 2006 of almost 31%. Figure 10 also highlights some additional estimates of the population and housing units in the areas which suffered the most significant flooding from the levee breach. The estimated housing units lost from Katrina in downtown New Orleans are almost 300,000. Although New Orleans was the hardest impacted major city from Hurricane Katrina, surrounding areas and six states were impacted by storm surge flooding, significant rainfall leading to flooding and damaging winds (Figures 11, 12). The fear of Katrina and the impact it eventually had led the vast majority of New Orleaneans to relocate for short or long term depending on the effects of the hurricane in their area. Obviously, cities in close proximity were the first to receive Katrina evacuees, but the available facilities were quickly overwhelmed leading to relocation patterns throughout the U.S. (Figure 13). As Figure 13 highlights, 53.8% evacuees relocated greater than 100 miles from their primary residence. If Katrina (8/29/05) was not enough evacuees in Texas were further affected by Hurricane Rita (9/24/05) less then one month after Katrina's landfall (Figure 14 and 15). The damages were not as significant or as widespread as Katrina, but certain areas sustained significant damages due to high surf, flooding and winds.

While Katrina far exceeded property damages and costs beyond any other American disaster (White House Report 2006), it is important to realize the references and estimates of "costs" are many, inexact and growing. The costs are also more related to short-term losses rather than long-term financing and business losses that are difficult to quantify.

$ 9-16 Billion[1] (Aug 30, 2005)	$ 300 Billion[4] (Sept 29, 2005)
$ 150 Billion[2] (Sept 6, 2005)	$ 96 Billion[5] (Feb 23, 2006)
$ 200 Billion[3] (Sept 7, 2005)	

1 Governor Kathleen Babineaux, Associated Press 8-30-05
2 Senate Democratic Leader Harry Reid, Wall Street Journal 9-7-05
3 Mr. Bregg, Wall Street Journal 9-7-05 p. A4
4 Donna Cassator, The Associated Press, 9-29-05
5 Federal Response to Hurricane Katrina White House Federal Report

The above costs do not account for the 20.8% of all single family loans which are in default in Louisiana (3-17-06) and 16.9% of loans in Mississippi (Mortgage Banker Association). This is another major issue for the entire area and is just beginning to be realized in terms of their total financial costs.

The direct and indirect costs of Katrina can perhaps best be preliminarily indicated by a combination of private insurance claims, federal emergency funds spent during the first six (6) months and other factors as indicated below. Speculation as to the total long term costs could be expressed as follows

TC = (FEF) + (FRC) + PvtIC + U.I Pvt + GovU.I.L + LGLC/R+ OTHER (Figure 17)

TC	= Total Cost/losses
FEF	= Federal Emergency Costs
FRC	= Federal Repair Costs
PvtIC	=Private Insurance Claims Paid
U.I Pvt	= Uninsured Private Repairs/ Replacement Costs
GovU.I.L	= Government Uninsured Repair/ Replacement Costs (cities, county, state building/schools)
LGLC/R	= Long-term Government Losses or cost to repair
OTHER	= Various direct and indirect property/business related losses (see Figure 17).

In the absence of hard data on many aspects of the total cost of Katrina, the only alternative is to try to establish a theoretical cost/benefit analysis framework of rebuilding in the same high risk areas with equal or greater chances of another disaster event versus investing the same amount of funds in safer areas. While political and emotional realities often result in unsound, unsafe and poor investment of the public tax dollars, it is the ultimate responsibility of the Government Accounting Office and Office of Management and Budget to consider not encouraging continued development or redevelopment of high risk areas using future federal programs. Figure 17 highlights the Katrina/Rita costs associated with the reconstruction of the city without accounting for the levee system upgrades. Figure 18 highlights the positive real estate impacts of the evacuee relocation throughout the U.S. Finally, Figure 19 and 20 focus on future federal disaster assistance and recommendations to reduce human and financial risk of developing in high risk areas

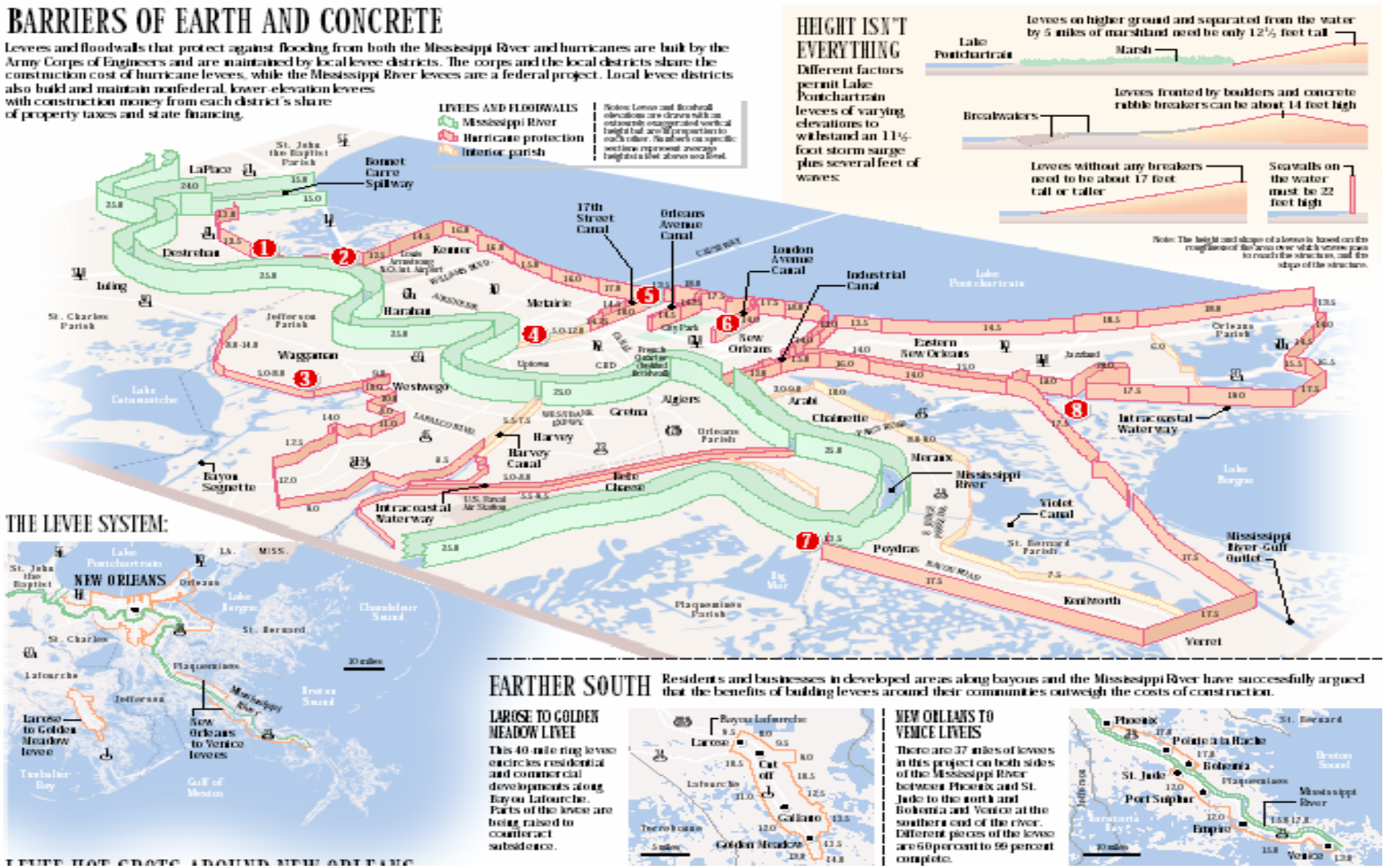


Figure 7. New Orleans and surrounding area levee system (Source: NOLA.com)

Figure 8. New Orleans levee system breaches (Source: CNN.com)

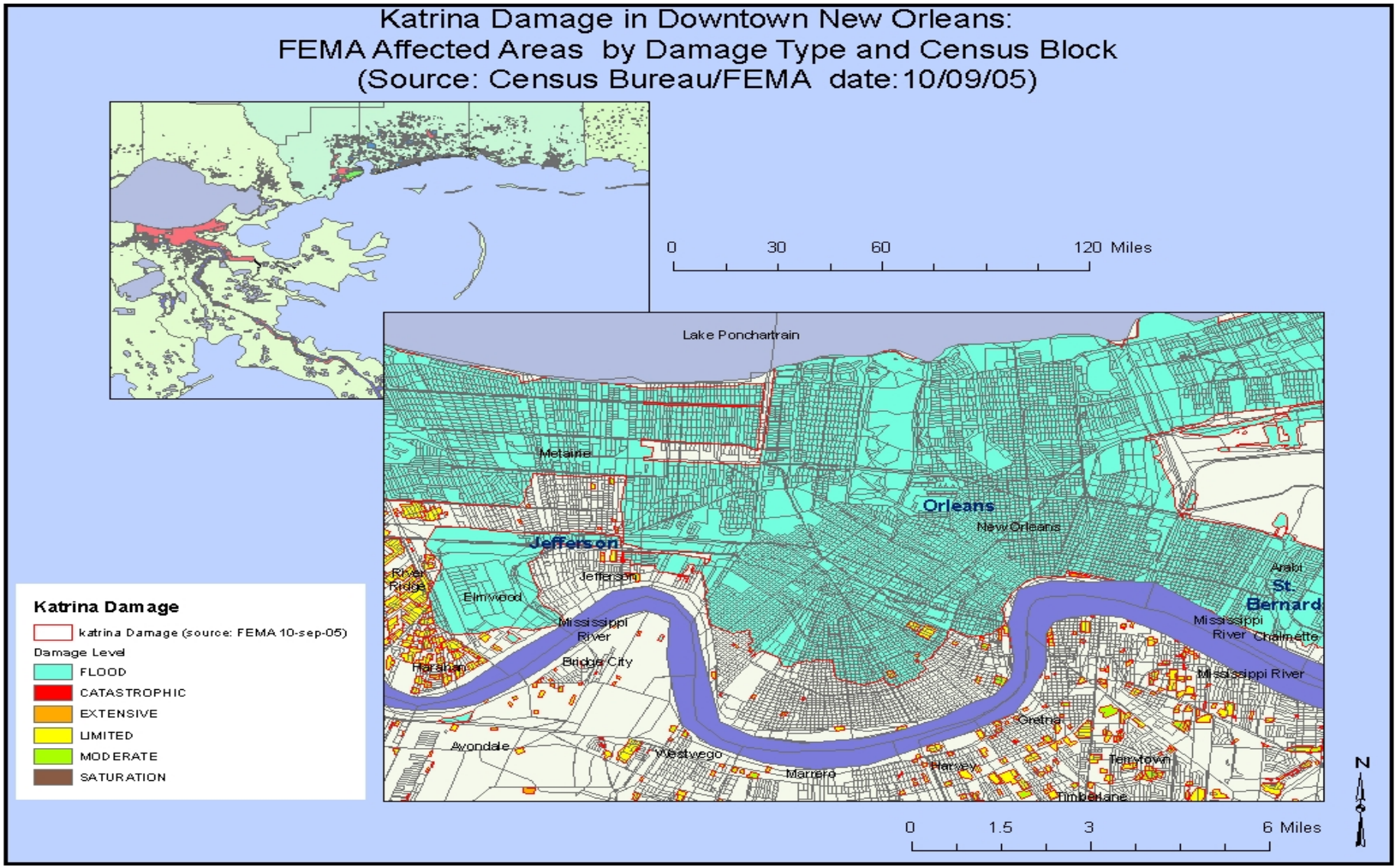


Figure 9. New Orleans damage from Hurricane Katrina (Source: US Census)

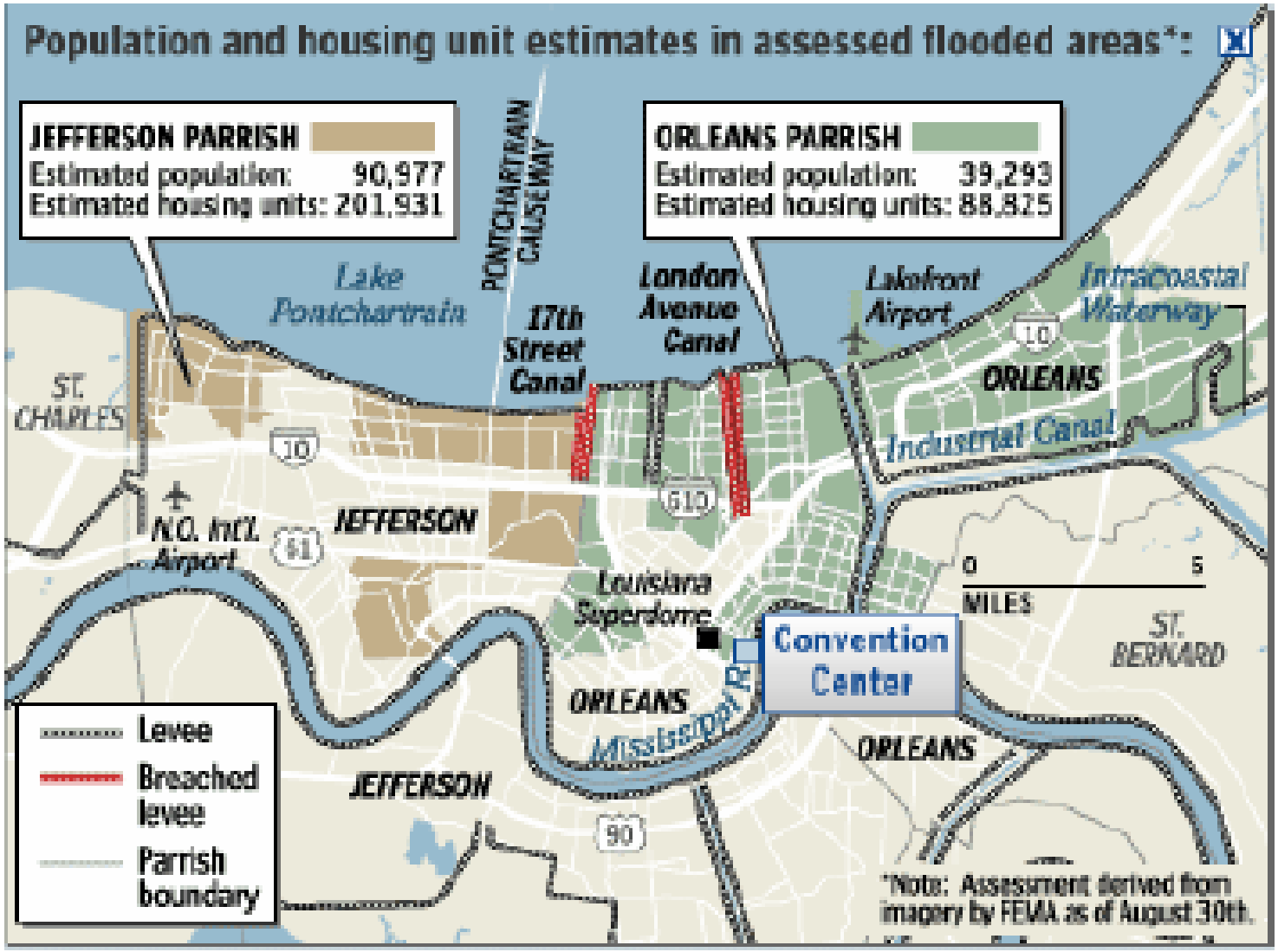


Figure 10. New Orleans selected area population and housing units (Source: Washington Post)

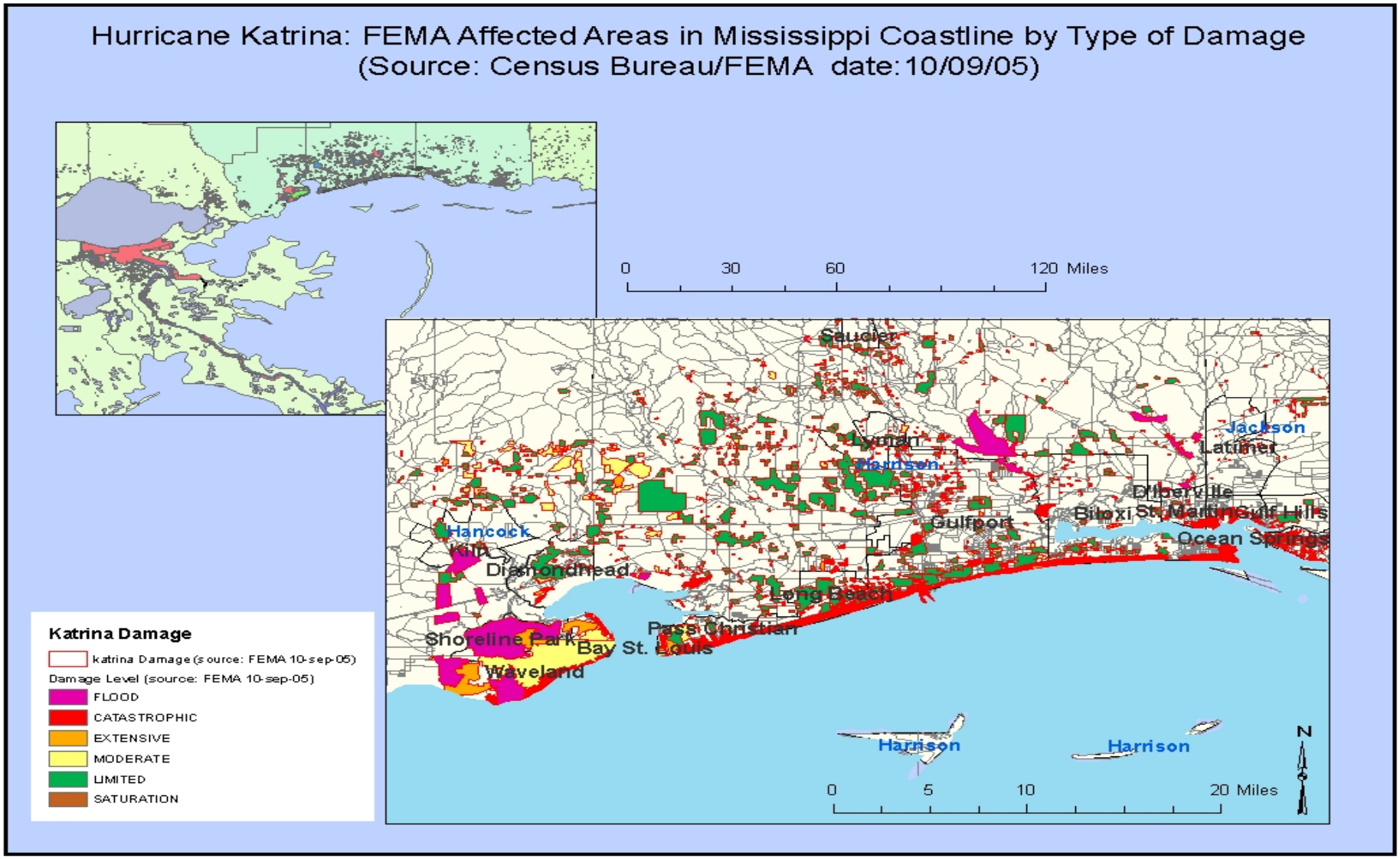


Figure 11. Mississippi affected coastline from Hurricane Katrina (Source: US Census)

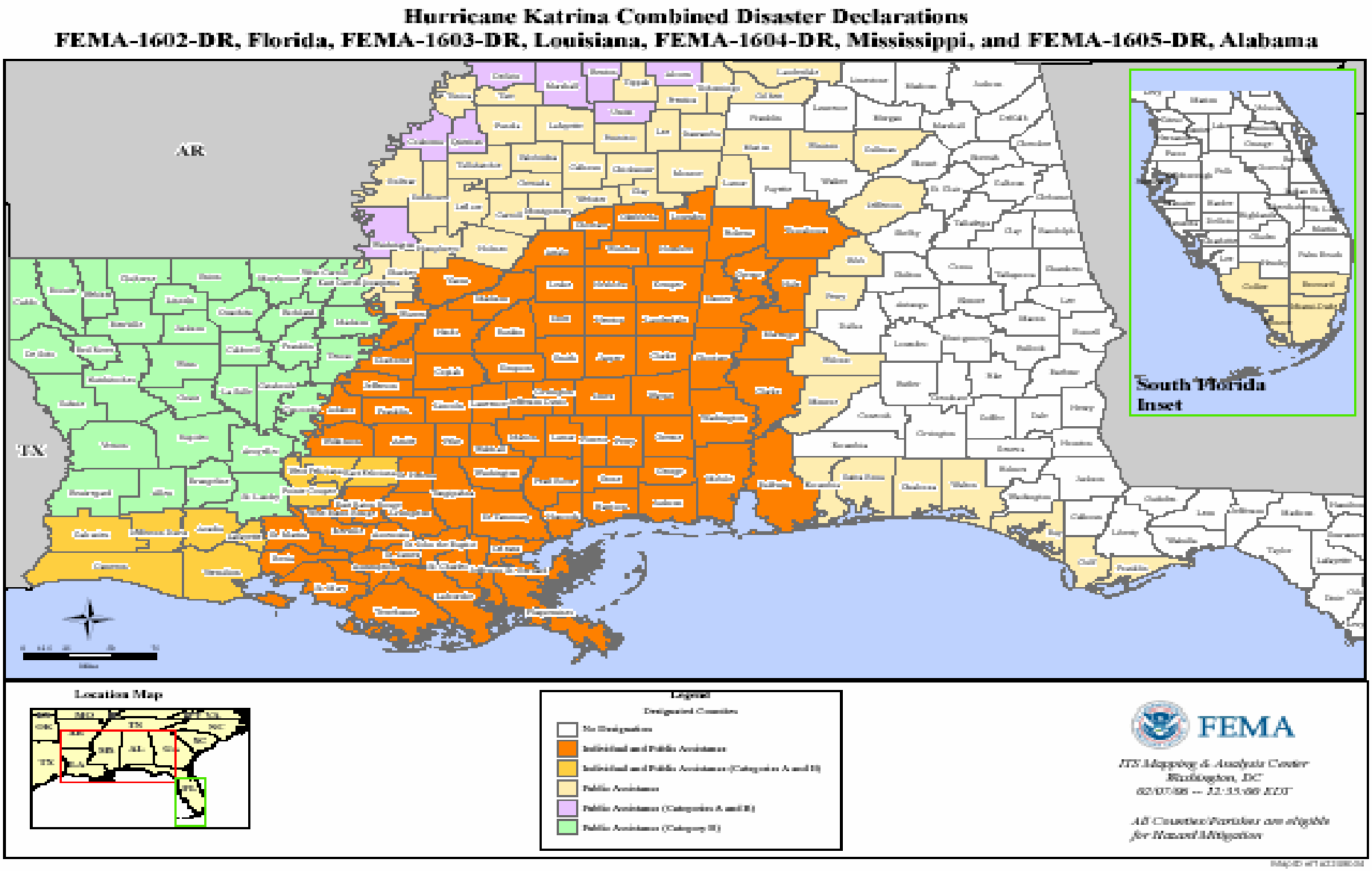
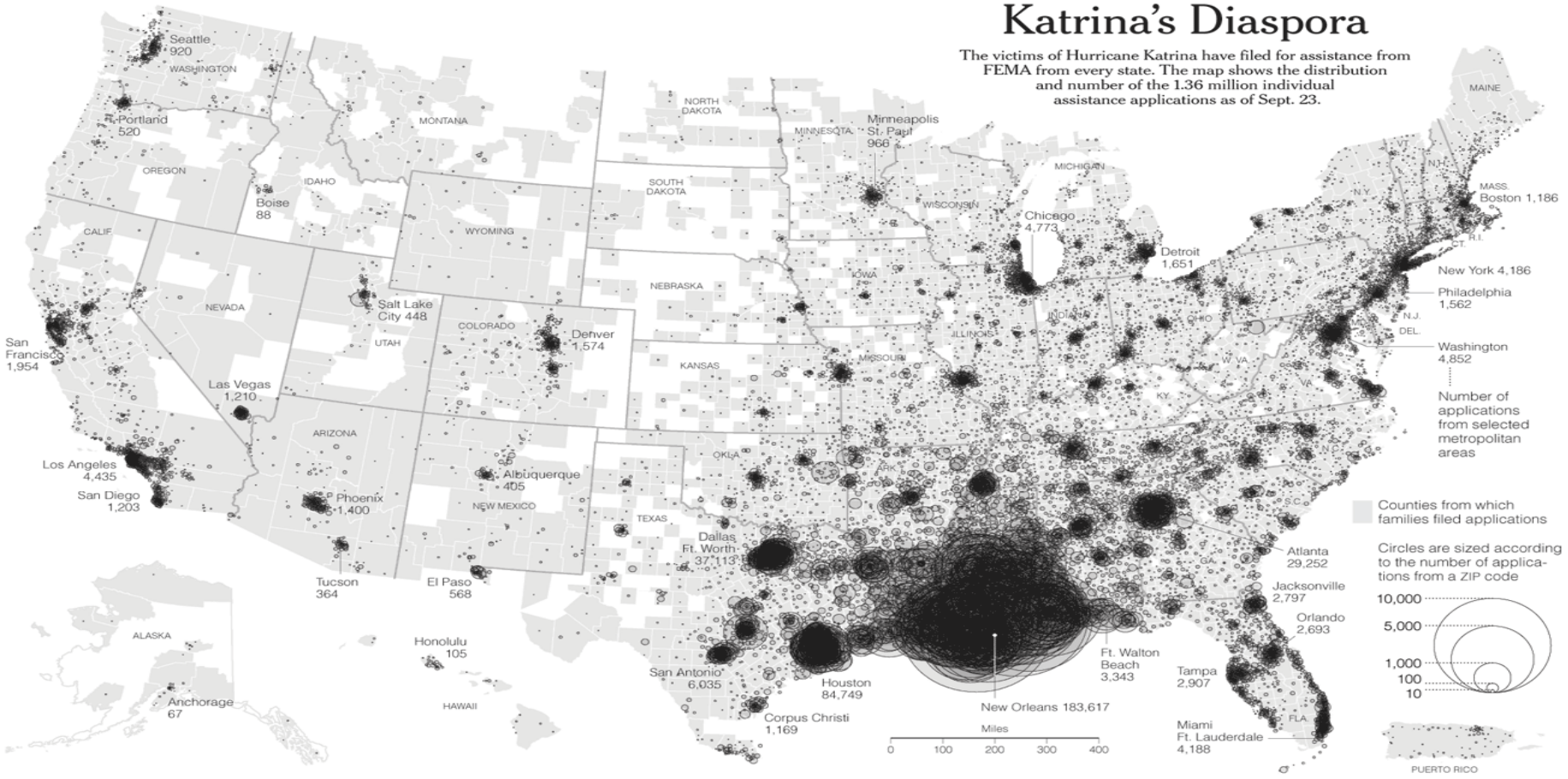


Figure 12. Hurricane Katrina Disaster Declaration areas (Source: FEMA)



They are scattered through all 50 states, the District of Columbia and Puerto Rico — 623 in Utah, 1,114 in Kansas, 101 way out in Alaska. They are clustered by the thousands in large Southern cities like Dallas, Atlanta and Memphis, and huddled in handfuls in unlikely hamlets like Shell Knob, Mo. (pop. 1,393) and Fountain Run, Ky. (pop. 236).

Evacuees fled Hurricane Katrina and the floods that followed in caravans of cars and fleets of buses, on helicopters and chartered planes, by boat and, a few, on foot. A month after the storm, a map emerges of where they landed, based on ZIP codes from which applications for aid were submitted to the Federal Emergency Management Agency as of Sept. 23.

Of 1,356,704 applications, 86 percent came from Louisiana, Mississippi, Texas and Alabama. But 35,539 families were more than 1,000 miles from the Gulf — among the farthest: one in Nome, Alaska, 3,931 miles from the French Quarter and another in Lihue, Hawaii, 4,279 miles away.

Residents of New Orleans, a city that was two-thirds black, seem to have flocked to the nation's African-American population centers. On average, the applicants came from counties where blacks were 28 percent of the population, more than twice the national average.

Baton Rouge, La., appears to be temporary home to 10 percent of evacuees, Houston 6.25 percent. But after the top 18 hubs, applicants are spread like the wind that whipped through their old neighborhoods: none of the other 900-plus metropolitan areas has even 1 percent of the total.

Some 4,000 ZIP codes — among them Pocahontas, Miss.; Promise City, Iowa; and Hope, Mich. — had just one applicant.

Applications by state

Louisiana	523,149	38.6%
Mississippi	383,840	28.3%
Texas	156,895	11.6%
Alabama	109,469	8.1%
Georgia	35,342	2.6%
Florida	31,005	2.3%
Tennessee	15,529	1.1%
Arkansas	11,027	0.8%
California	10,953	0.8%
Illinois	6,430	0.5%
Others	73,065	5.4%

Applications by distance from New Orleans

MILES	APPLICANTS	PCT.
0-100	626,232	46.2%
100-200	338,080	24.9%
200-400	184,169	13.6%
400-800	143,497	10.6%
800-1,600	45,371	3.3%
1,600-3,200	13,403	1.0%
3,200+	232	0.0%

Distances could not be calculated for 0.4 percent of applications.

Sources: FEMA; Census Bureau; Queens College Sociology Department

Matthew Ericson, Archie Tse and Jodi Wilgoren/The New York Times

Figure 13. Hurricane Katrina Nationwide Diaspora Map (Source: FEMA; Census Bureau; Queens College Sociology Department, Matthew Ericson, Archie Tse and Jodie Wilgoren/ The New York Times)

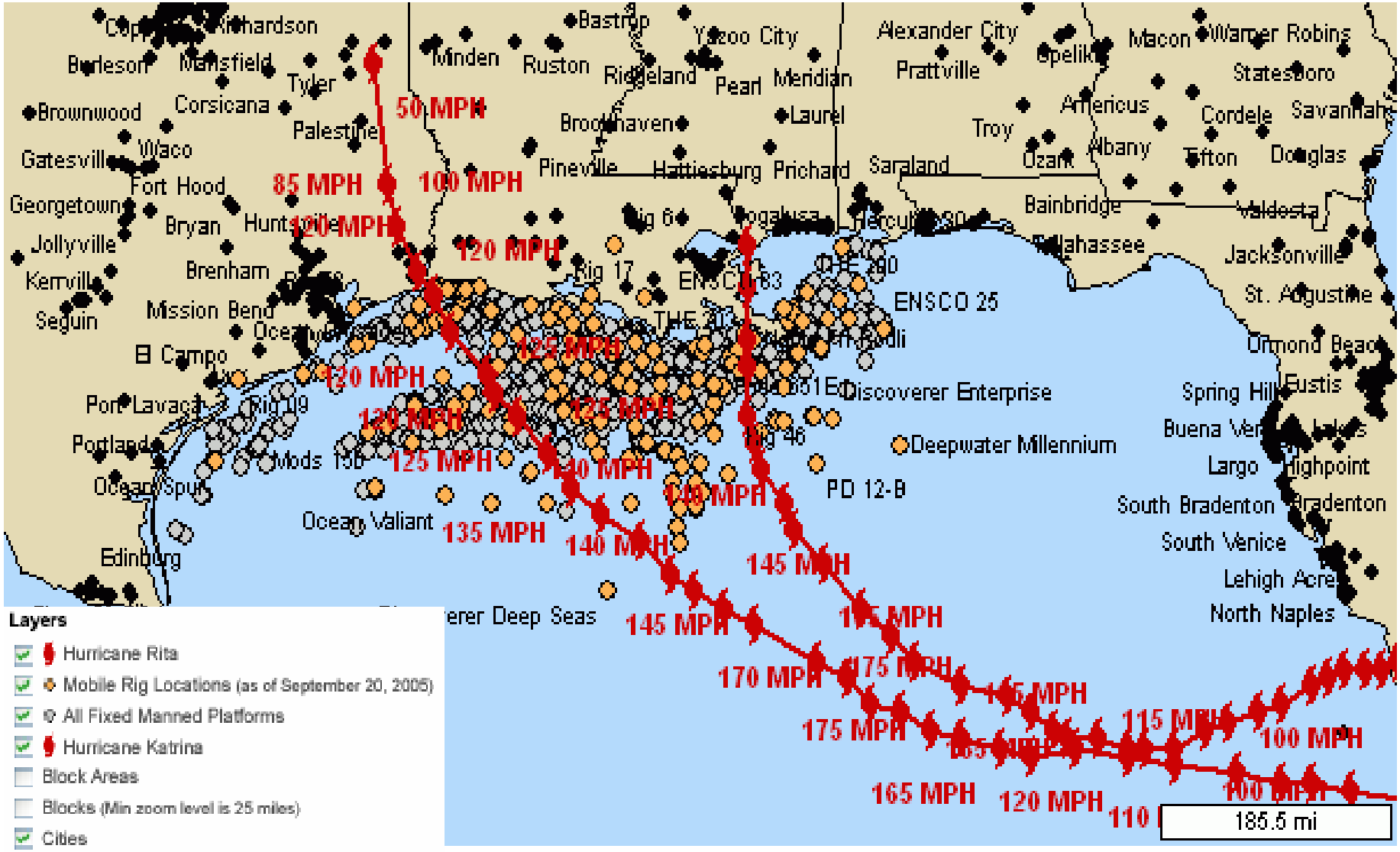


Figure 14. Mobile offshore rig positions and 24-hour manned platform locations as of September 20, 2005 with Hurricane Katrina & Rita paths (Source: Rigzone.com)

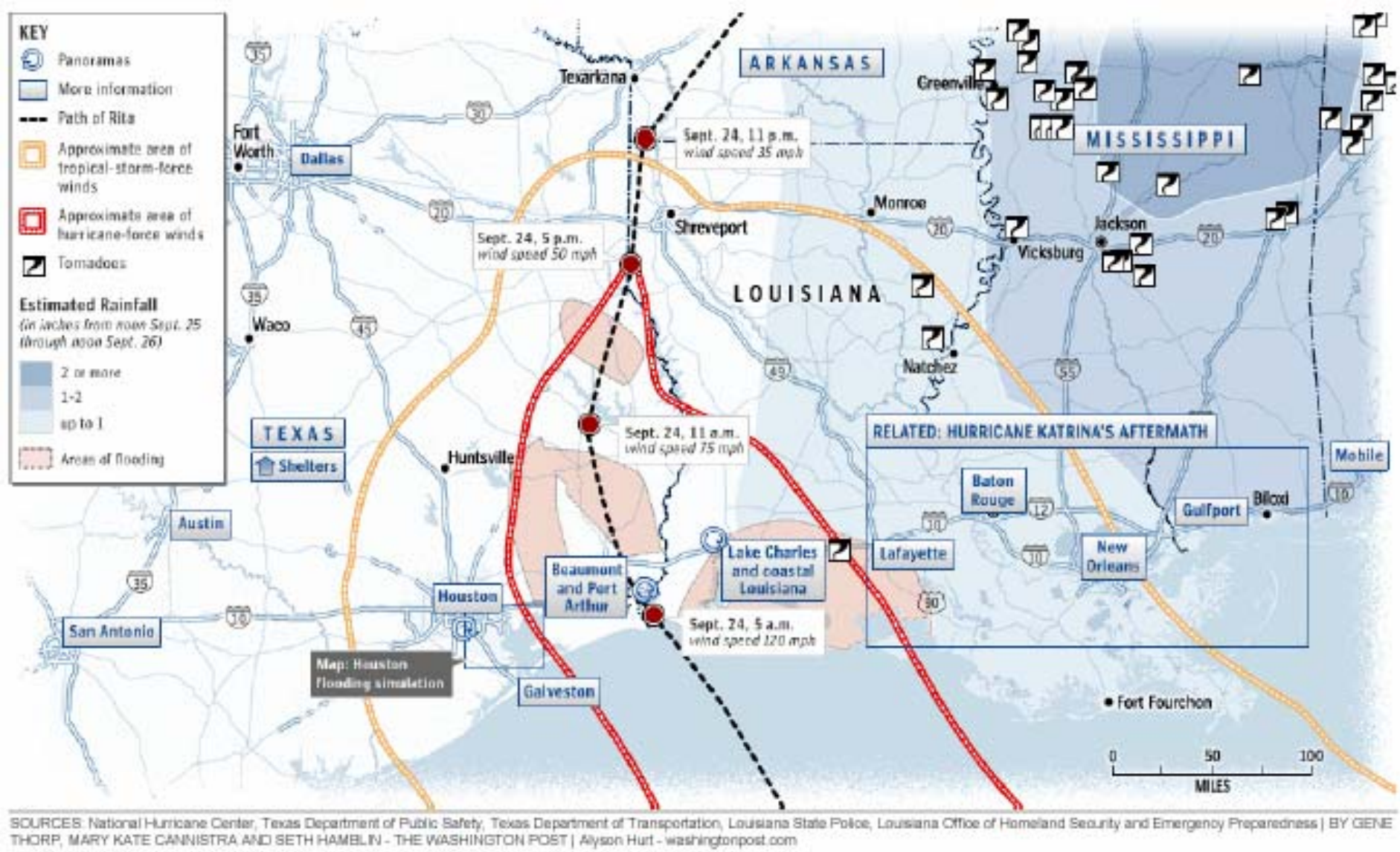


Figure 15. Hurricane Rita's Impact landfall path (Source: Washingtonpost.com)

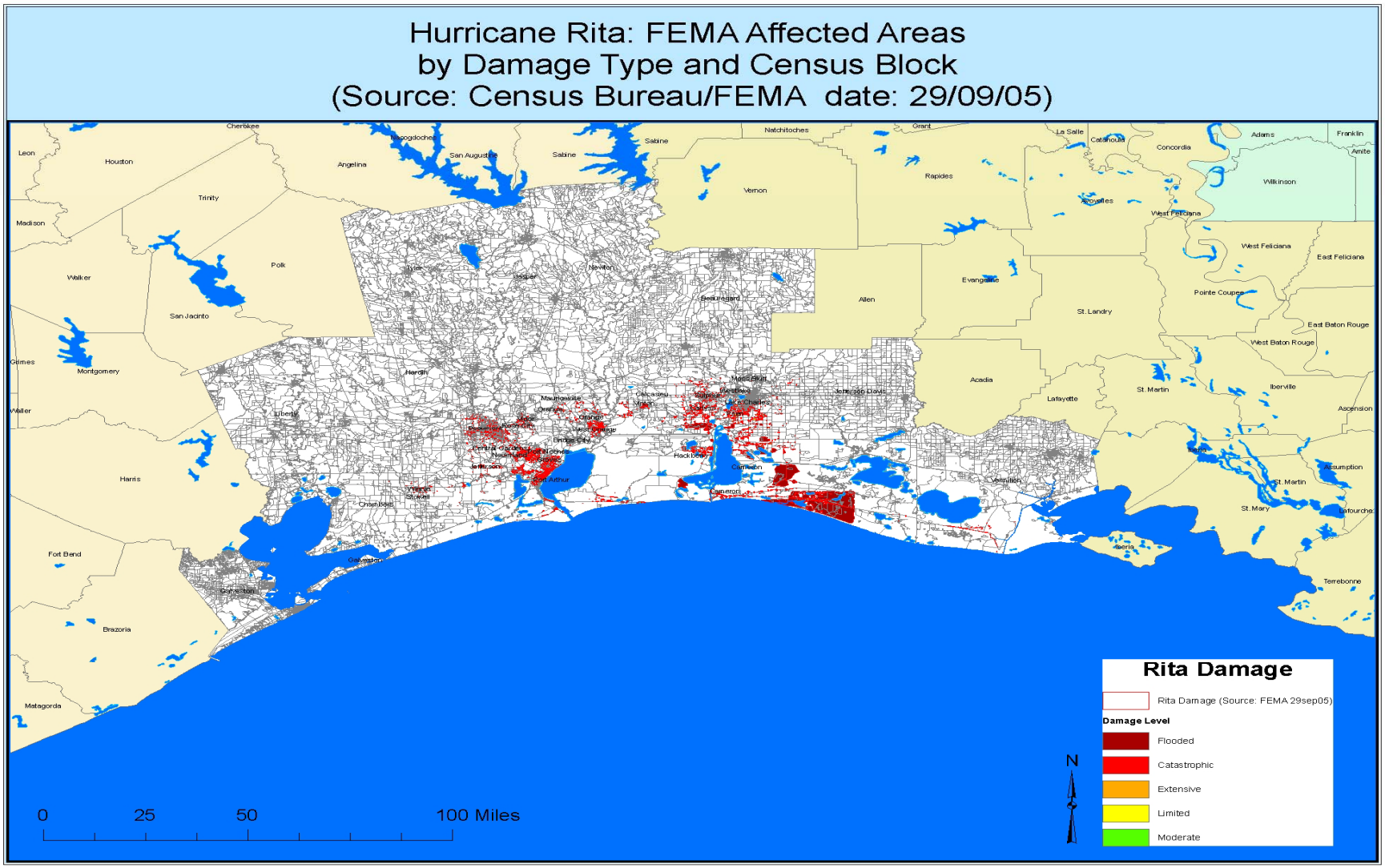


Figure 16. Hurricane Rita's affected areas (Source: U.S. Census)

Figure 17
Katrina/Rita Release
Baen J, Dermisi S., "Urban functionality and extreme natural disasters; The New Orleans-Katrina case for New Federal Policies and Programs for High Risk Areas" American Real Estate Society Annual Conference, Key West, April 19-22, 2006.

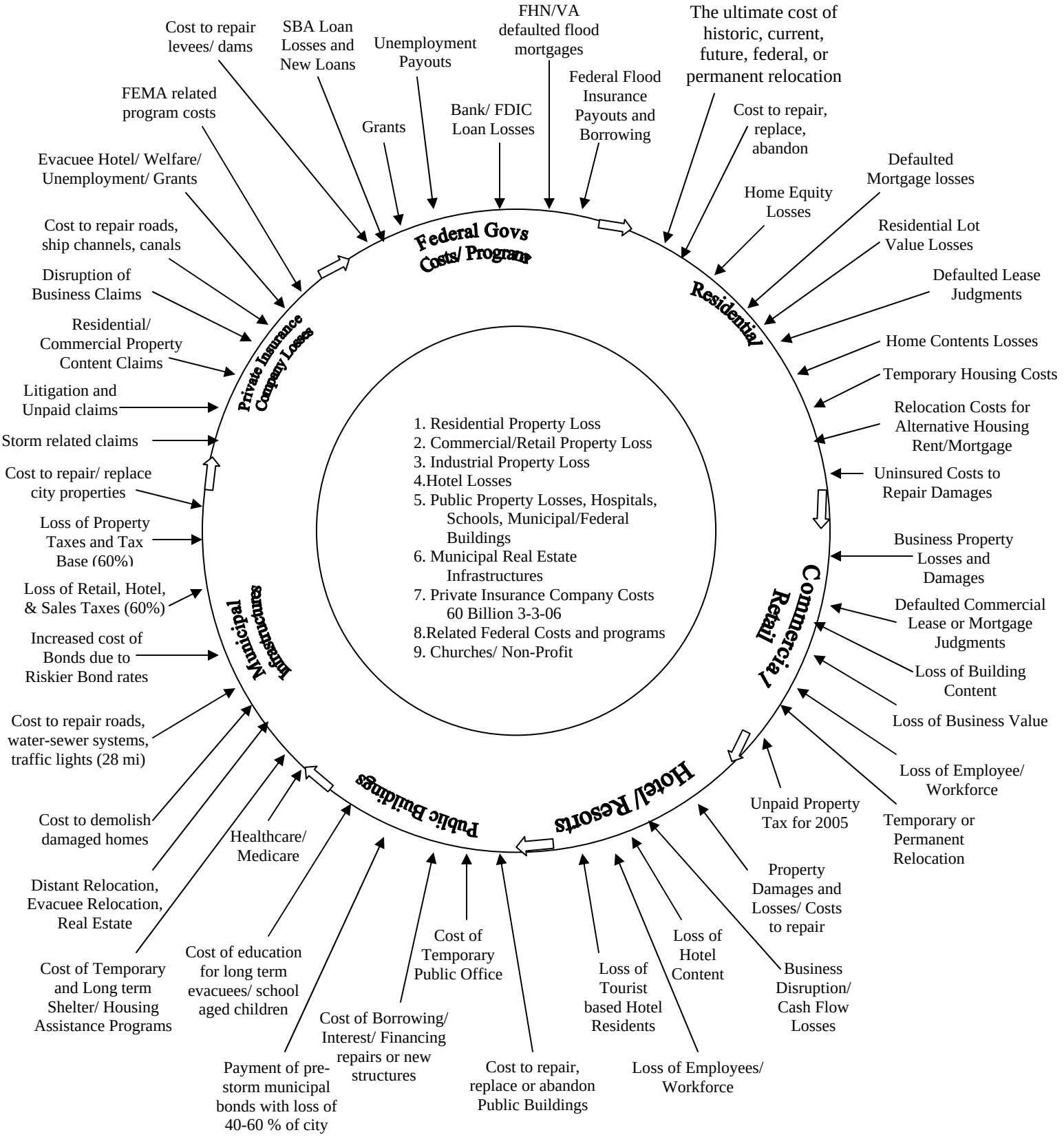


Figure 18
Positive Indirect Long-Term Effects of Katrina On Real Estate Markets

Baen J, Dermisi S., "Urban functionality and extreme natural disasters; The New Orleans-Katrina case for New Federal Policies and Programs for High Risk Areas" American Real Estate Society Annual Conference, Key West, April 19-22, 2006.

1) Katrina caused over 1.3 million people to relocate inland from affected areas. Over 723,000 relocated "temporarily" over 100 miles from their homes. Large numbers of these citizens will eventually permanently relocate to safe areas or stay in areas to which they evacuated. (Figure 13 Katrina's Diaspora Map).

2) Real estate markets, both residential /commercial sales and rental markets added to the local demand, reduced vacancy and will add to more construction in inland locations where relocated people/ business move permanently.

3) The urban poor who relocated permanently to Texas, Florida, etc. will likely be less concentrated, dispersed geographically and could theoretically be collectively absorbed with less impact to distant local economics in terms of public assistance, health care, education, and public support from state and local communities.

4) Additional demand for residential and commercial space will eventually lead to increases in values and spur new construction, construction jobs, etc.

Figure 19
Why Increased Risk Exposure and Further Federal Disaster Assistance is Likely in the Future.

Baen J, Dermisi S., "Urban functionality and extreme natural disasters; The New Orleans-Katrina case for New Federal Policies and Programs for High Risk Areas" American Real Estate Society Annual Conference, Key West, April 19-22, 2006.

1) Significant growing frequencies and intensities of category 4 and 5 hurricanes from 1990-2004 due to rising world-wide ocean temperatures correlated and documented (Hoyos, et.al 2006).

2) Increases of both commercial and residential development immediately along the coastal zones of the US. It is estimated that sixty percent (60%) of the US population is located in the "coastal zone".

3) Increased development of the one hundred year floodplain land, increasing the size, area, and eventual water level of the FEMA map known as the 100-year floodplain land areas (as often defined by often outdated FEMA maps) are growing due to development of upland weather sheds due to paving, roof tops and less exposed soil, and more urban storm runoff.

4) Continued federal policies, programs, and loan guarantees allow and encourage both new development and redevelopment of long-term hazardous area along the coastal zone, major water ways and known earthquake high risk areas.

5) Federal flood "protection" programs (levees, dams, channelization, etc) combined with increased silting.

6) Rising water levels of the world's oceans adds additional risk to buildings anywhere within the coastal zone.

7) Gradual land subsiding in New Orleans, LA; Houston, TX; and parts of Florida gradually adds exposure to properties in those areas due to geological changes, underground aquifer depletion, etc.)

8) Poor design, construction and maintenance of federal-sponsored levees, dams and other "flood" control projects, such as channelization, raise the risk factors for all classes of real estate in these high risk area.

9) Significant property price appreciation along the coastal zone due to increased demand (immigration and baby boomer retirees) increases the financial exposure over time due to market forces and perceived or implied federal protection or restoration policies when disaster strikes.

10) Rebuilding destroyed properties and communities at the public's expense encourages similar developments in other high risk, disaster prone areas.

Figure 20
Federal Policies Recommendations to Reduce Human and Financial Risk of Developing or Redeveloping in High Risk Disastrous Areas of the US.

Baen J, Dermisi S., "Urban functionality and extreme natural disasters; The New Orleans-Katrina case for New Federal Policies and Programs for High Risk Areas" American Real Estate Society Annual Conference, Key West, April 19-22, 2006.

1) Federal Flood Insurance Programs and FEMA
   Immediately stop offering flood insurance until such time as private industry offers a similar product that is priced properly for flood and earthquake risk. Existing Federal policies should be honored but with existing flood and earthquake insurance premiums increased. Federal Flood maps need to be quickly updated to define realistically where floodplains occur. The flood maps are outdated and dangerous. Effects:
   1. Property prices/values will fall due to additional total costs of ownership as flood insurance will raise total monthly payments for homes.
   2. Tax base and revenues will fall due to drop of values due to higher premium costs.
   3. Dramatic drop in construction due to additional cost of insurance to future homeowners private flood/earthquake
   4. Fewer homes built equates to slower urban development of other classes of real estate (retail, office, etc.).

2) FHA, VA, SBA, Federal Bank Loans Indirectly Insured by FDIC Banks
   Federal mortgage and business loans guaranteed by the federal government should be canceled immediately on any new financing of homes and businesses located in known high risk areas.
   Effects:
   1. Less construction or reconstruction after and before a storm, flood, or earthquake.
   2. Value of existing properties in both affected and unaffected coastal and/or flood areas will fall due to resale effects, new qualifications, and lack of mortgage or institutional mortgage insurance.
   3. Tax base will fall in high risk areas

3) Government Services Administration
   A directive and policy to no longer fund projects, services, capital purchases, leases or contracts that encourage the building, reconstruction, leasing or releasing of U.S. Government office space in high risk areas should be immediately imposed.
   Effects: This will require the gradual shift of government offices, courts, warehouses, etc. and employees away from high risk areas and reduce other civilian development and users to create new space in high risk areas. A transfer of wealth and urban growth would occur in safer areas.

4) The Justice Department should no longer build federal prison facilities, detention centers or federal courts in high risk areas and should have emergency contingency plans to move operations and inmates in the event of an emergency.

5) The Department of Transportation should no longer construct, reconstruct, or encourage any funding, co-funding, grants, loans or matching funds for new highways, mass transit projects, bridges, ferry services or programs that encourage improved access to the public and private development projects in high risk areas. Limiting service roads, curb-culs, and on/off ramps in flood area would accomplish less development.

6) The Department of Health and Human Services should reevaluate any and all programs involving health facilities, schools, school programs, welfare programs, etc. which reward or encourage recipients to continue to live or be employed in high risk areas. Perhaps consider zones of benefits based on location risk factors with areas of no new funding to high risk areas.

7) Department of Defense and U.S. Army Corps of Engineers should develop realistic cost benefit analyses of all "flood protection" projects in regard to their long-term impact of encouraging urban growth in high risk areas. "Flood protection programs," design, construction and lack of adequate maintenance all act in concert to encourage development in high risk areas which results in actually putting the public and improved properties in harm's way.

Katrina is one (1) storm which has offered an important opportunity to reevaluate the federal government's past, present and future policies in regard to urban development in high risk areas. The local political environment often favors capital investment and programs for local areas in spite of high risks. The long-term cost/benefit analysis in terms of the health, welfare and safety of the public and their investment of tax dollars is often dangerous and causes more destruction and losses than otherwise would have occurred. The Federal government should not continue to indirectly encourage development in these high risk areas.

5. Conclusions and Recommendation

Louisiana's new housing aid plan was just announced, offering up to $150,000 to homeowners whose insurance doesn't cover their losses with the condition to raise the house 3 ft. We believe that this type of requirement does not solve the problem in the long run. The significant cost of reinforcing the levees for another category three hurricane along with the cost of rebuilding in high risk areas does not seem as cost effective as encouraging permanent relocation of the evacuees at their inland evacuation areas with federal assistance.

National specific agency/program recommendations to the U.S. federal government in regard to reducing risk and financial exposure to building in floodplains, coastal areas and earthquake prone areas should be immediately changed.

By presidential executive order, congressional directive or individual agency policy implementation, the U.S. government should immediately put into effect policies that no longer encourage the development or redevelopment of urban growth in “high risk” areas. Figure 20 includes specific recommendations by U.S. Departments and private enterprises that should be followed to develop land and projects.

Private enterprises should continue to be allowed to develop lands in high risk areas, subject to local and state government approval but, however without the encouragement of federal programs, either directly or indirectly through capital improvement programs, loan, grants, loan guarantees, etc.

(See Figure 20 for specific program/department recommendations)

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