IPET
Consequence Assessment: Losses Analysis – Report 2

Co-leads

David Moser, Ph.D., Chief Economist, USACE
Patrick Canning, Ph.D., Senior Economist, USDA

March 2006

Overview

Objective

- To the extent practical, develop a full assessment of all loss consequences resulting from hurricane Katrina and estimates of loss consequences from several “what-if” events
- To develop economic losses and fatalities for range of water surface elevations by drainage sub-basin

Status Overview

- Human Health & Safety (HHS)
  - To address the consequences of flooding and hurricane damage and future risks following reconstruction from a HHS perspective

Two Tracks

1) HHS impacts on N.O. residents from Katrina
   - Descriptive account of actual and potential HHS impacts
     - Susceptible subgroups, onset & duration, effects on others
     - Compile hard data on fatalities
     - summarize external studies on morbidity

Status Overview

- Human Health & Safety (HHS) (cont.)

2) Potential mortality risks of post-Katrina scenarios
   - Scenario based flooding simulations using LIFESim
     - Probabilistic mortality assessment due to breaches & overtopping; Warning and evacuation module; routinely links to current data sources—USGS topographic data with IPET LIDAR controls, Census TIGER data, HAZUS-MH database

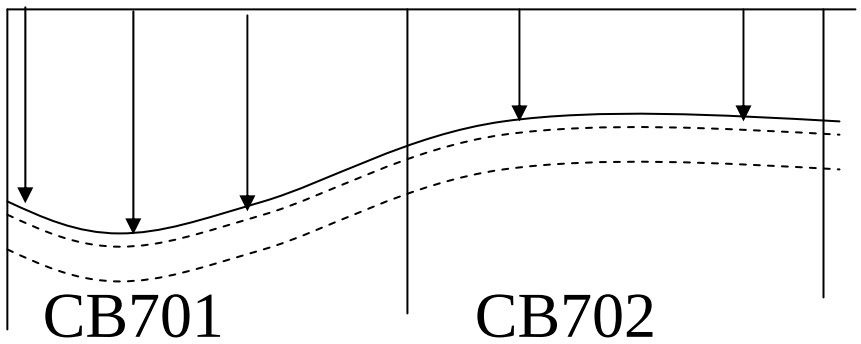
– Recent Accomplishments:
   - Established a modeling framework with recalibrated escape/rescue module drawn from Katrina experience
   - Identified input data needs in coordination with appropriate IPET personnel
   - Compiled external ‘hard data’ sources and important strategic information sharing alliances, such as with LSU Hurricane center

Status Overview

- Human Health & Safety (HHS) (cont.)
  - Remaining Efforts:
    - Calibration of LIFESim from flood routing hydrograph data
    - Finalize GIS data layers for post-Katrina demographics
    - Coordinate with the risk and reliability team on the dimensions of a depth-duration-velocity/mortality curve from simultaneous flooding

Status Overview

- Direct Economic Consequences
  - Develop WSE-property damage relationships by polder sub-basin
    - Residential
    - Non-residential
    - Vehicles



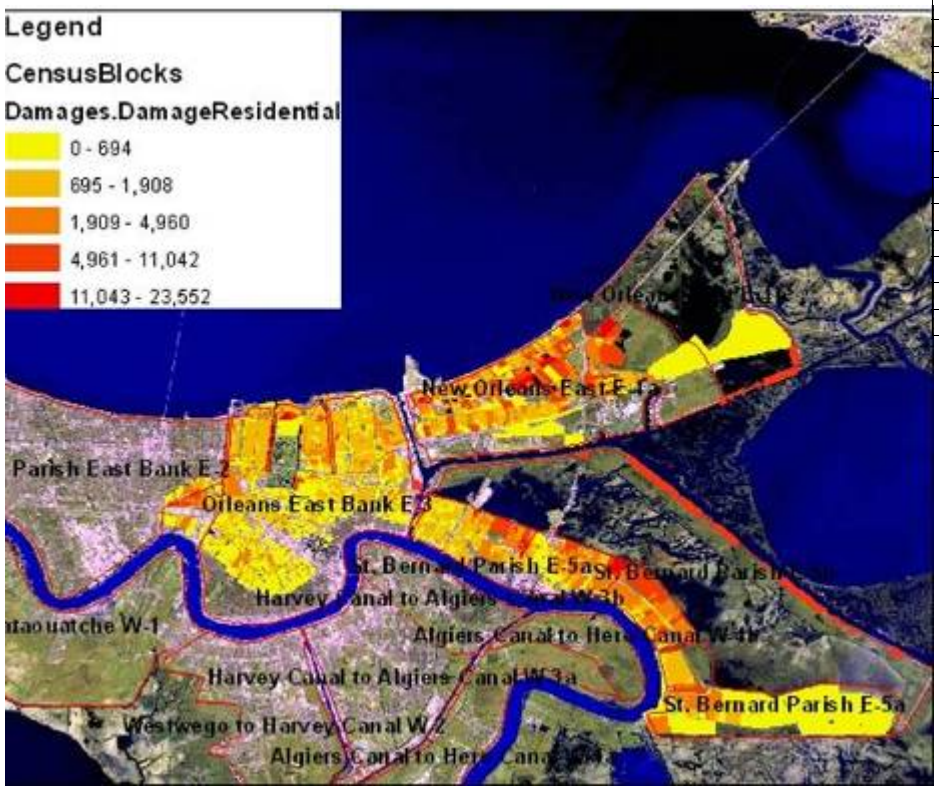
WSE1

Depth	% Damage
-1	0
0	10
1	15
2	25
3	40
4	50
5	65
6	70
7	85

					Depth			Damage		
Census Block	# Single Family	Mean Value ('000)	Total Value	WSE	Min	Mean	Max	Min	Mean	Max
CB701	40	120	4800	WSE1	1.5	3	5	960	1920	3120
CB702	60	135	8100	WSE1	1	1	2	1215	1215	2025

For illustrative purposes only

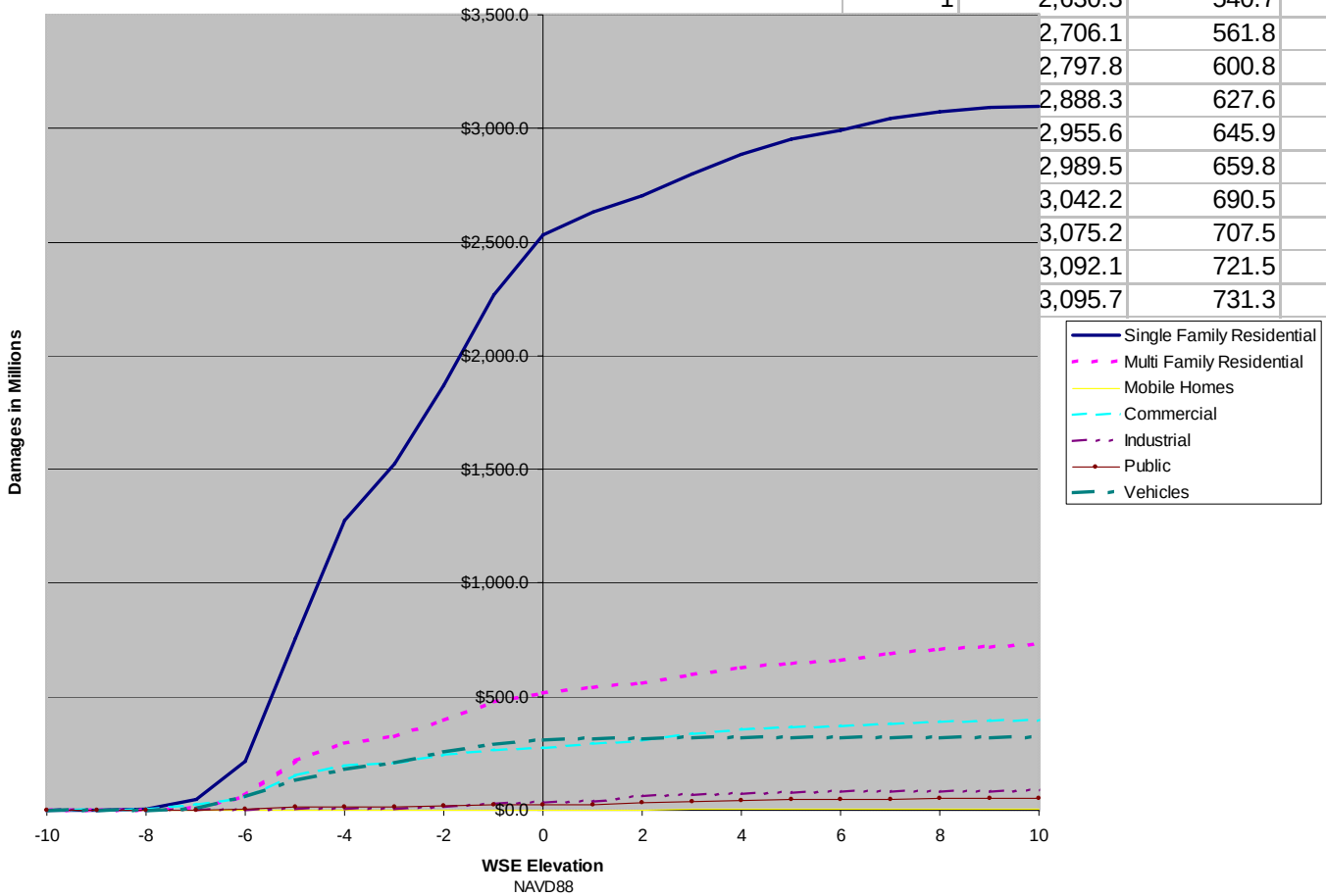
Preliminary Estimate of Number and Damage (in millions of dollars) by Major Categories by Parish and Zip Code—Katrina flooding



Parish	Zip Code	Residential Damage	Number Housing Units	Non-residential Damage	Number Non-residential	Vehicle Damage	Number Vehicles
Jefferson	70001	$84.9	1,200	$7.8	100	$22.0	1,900
Jefferson	70005	$130.6	1,700	$7.4	200	$73.8	6,200
Jefferson	70121	$30.1	1,100	$7.6	100	$22.1	2,400
Parish Total		**$245.6**	**4,000**	**$22.8**	**400**	**$118.0**	**10,400**
Orleans	70112	$34.5	600	$296.3	600	$57.3	4,300
Orleans	70113	$68.7	2,100	$62.5	400	$99.4	9,300
Orleans	70115	$234.0	4,700	$47.0	800	$249.3	19,500
Orleans	70116	$119.8	3,200	$20.6	400	$100.2	8,000
Orleans	70117	$958.7	13,600	$61.6	700	$326.9	22,700
Orleans	70118	$384.1	7,200	$61.2	600	$260.0	19,300
Orleans	70119	$728.3	13,800	$197.7	1,600	$478.1	31,600
Orleans	70122	$1,349.5	16,400	$93.7	1,000	$487.1	32,800
Orleans	70124	$1,006.7	10,600	$56.2	500	$267.7	18,100
Orleans	70125	$419.2	6,600	$98.5	900	$313.2	20,200
Orleans	70126	$1,147.3	12,000	$226.0	1,100	$444.0	29,400
Orleans	70127	$858.8	8,000	$319.1	800	$305.1	20,000
Orleans	70128	$778.3	6,500	$113.5	500	$220.1	14,300
Orleans	70129	$294.0	2,600	$129.5	300	$101.3	6,500
Orleans	70130	<$0.1	<50	$0.4	100	$0.3	200
Parish Total		**$8,381.9**	**108,000**	**$1,783.9**	**10,300**	**$3,709.9**	**256,000**
Plaquemines	70041	$47.9	1,400	$11.1	100	$29.9	2,400
Plaquemines	70083	$6.5	200	$2.1	<50	$7.1	700
Plaquemines	70091	$1.1	100	$1.1	<50	$1.0	100
Parish Total		**$55.5**	**1,700**	**$14.3**	**100**	**$38.0**	**3,200**
St. Bernard	70032	$272.9	3,600	$67.2	300	$96.3	6,300
St. Bernard	70040	$7.0	100	$0.1	<50	$1.8	100
St. Bernard	70043	$1,077.0	11,200	$139.8	800	$240.2	16,400
St. Bernard	70075	$421.5	3,300	$21.2	100	$69.9	4,600
St. Bernard	70085	$111.0	2,100	$12.3	100	$36.7	2,500
St. Bernard	70092	$378.7	4,000	$15.6	100	$70.4	4,700
Parish Total		**$2,268.1**	**24,300**	**$256.3**	**1,300**	**$515.3**	**34,500**
Grand Total		**$10,951.1**	**138,000**	**$2,077.3**	**12,100**	**$4,381.2**	**304,100**

New Orleans East: Preliminary Elevation- Flood Damage

Water Elevation	Single Family Residential	Multi Family Residential	Mobile Homes	Commercial	Industrial	Public	Vehicles
-10	0.8	0.0	0.0	0.0	0.0	0.0	0.0
-9	0.8	0.0	0.0	1.1	0.0	0.0	0.1
-8	2.6	0.5	0.0	6.8	0.0	0.0	1.1
-7	47.1	8.2	0.0	23.7	0.3	0.4	10.3
-6	218.1	60.9	0.0	58.2	0.9	5.9	60.1
-5	758.7	219.7	0.3	152.7	2.8	12.3	135.7
-4	1,277.1	298.8	0.5	194.7	4.9	15.3	180.8
-3	1,522.8	327.8	0.5	204.4	6.7	16.1	210.2
-2	1,871.3	396.2	0.7	243.9	13.6	19.3	257.5
-1	2,268.1	477.5	1.1	263.7	28.2	21.7	294.3
0	2,532.8	516.8	1.5	274.2	33.3	23.7	312.4
1	2,630.3	540.7	1.6	291.7	40.3	25.1	316.2
	2,706.1	561.8	2.0	309.0	61.0	34.2	317.6
	2,797.8	600.8	3.3	333.6	68.1	36.6	319.0
	2,888.3	627.6	3.9	355.1	72.4	42.8	320.2
	2,955.6	645.9	4.6	362.0	77.9	45.6	320.4
	2,989.5	659.8	4.6	368.2	79.2	46.2	320.4
	3,042.2	690.5	4.6	379.8	80.6	48.9	320.5
	3,075.2	707.5	4.6	389.7	81.6	51.7	320.5
	3,092.1	721.5	4.6	391.9	83.4	52.7	320.5
	3,095.7	731.3	4.6	395.1	85.1	53.8	320.5

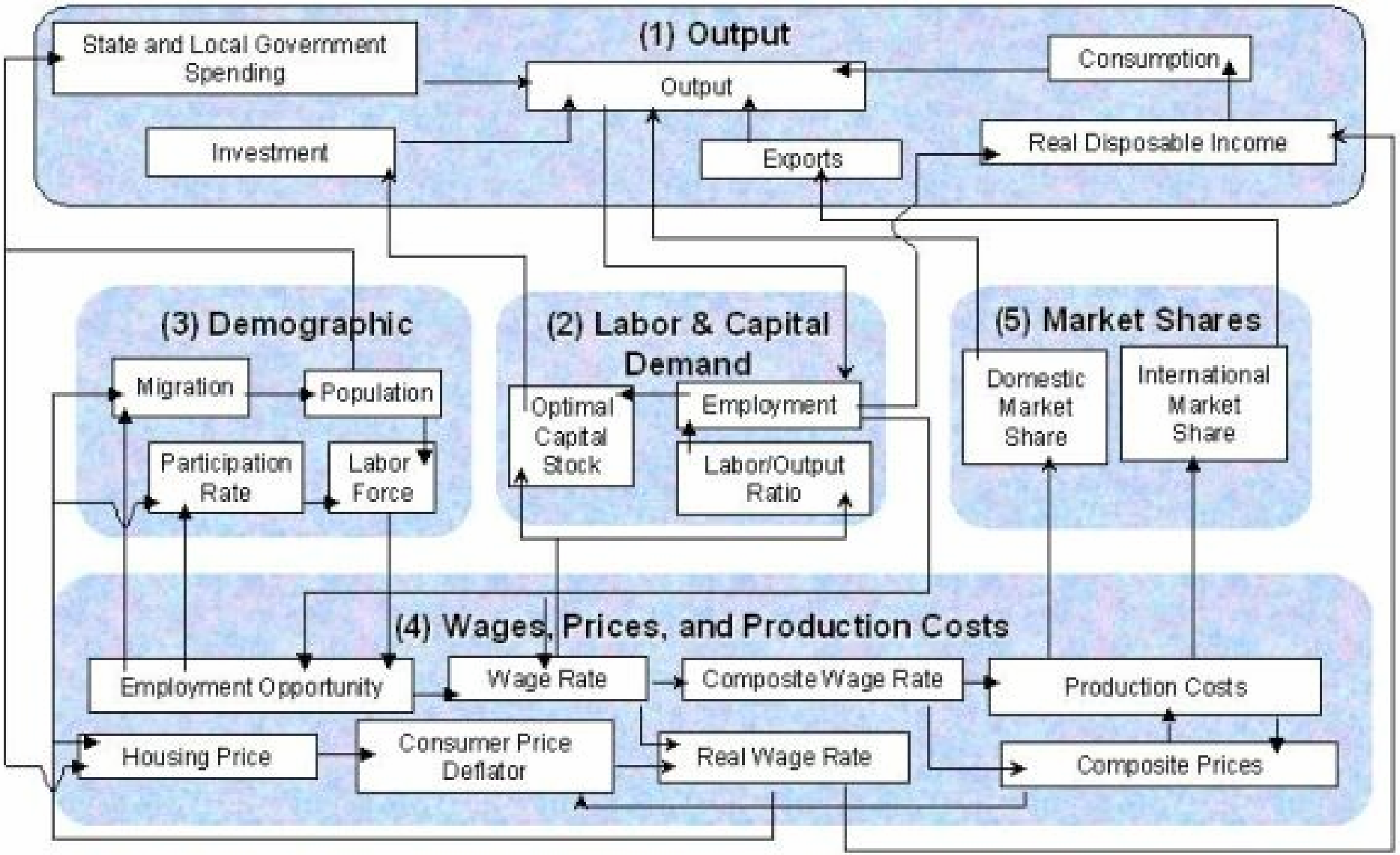


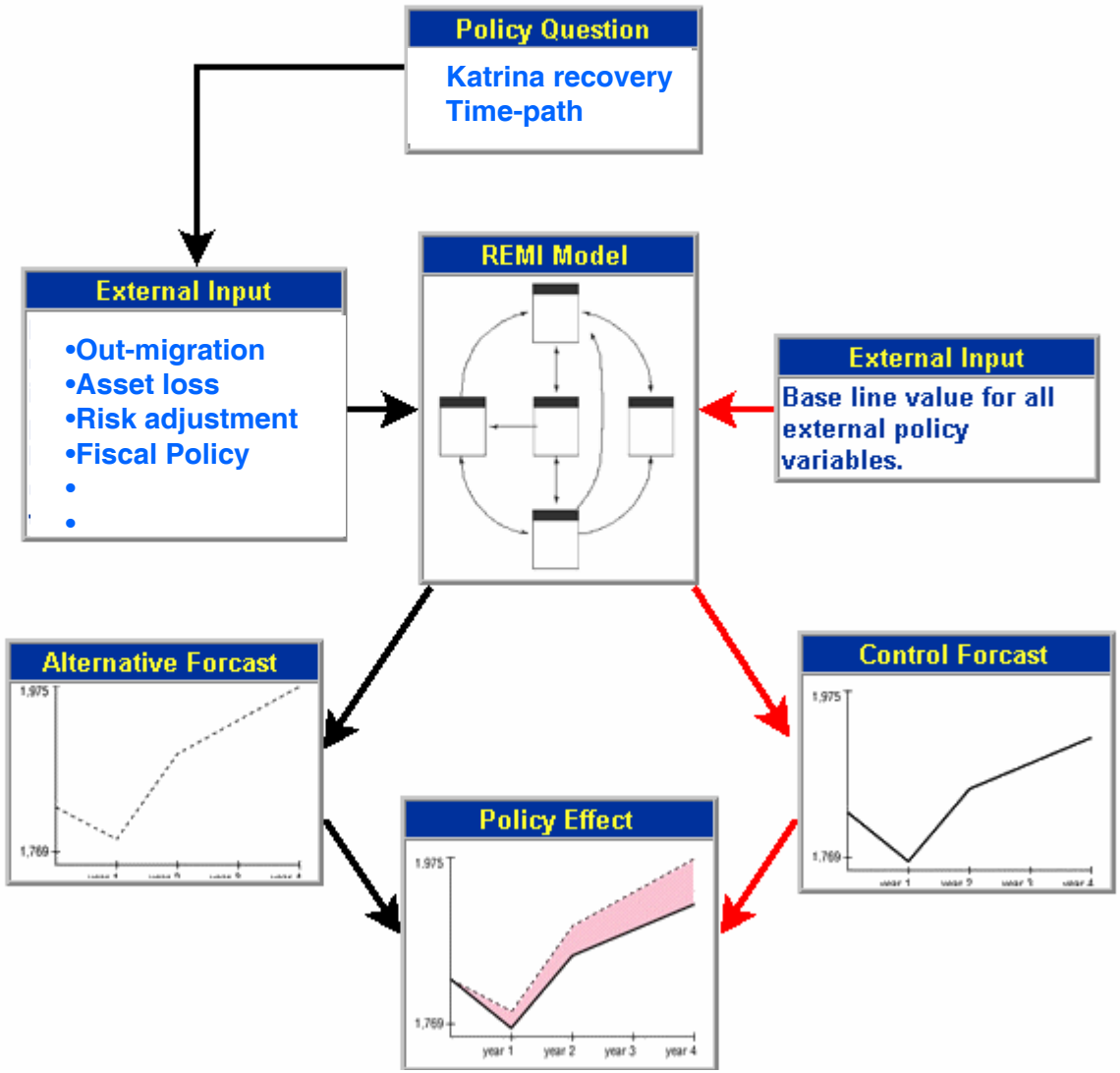
Status Overview

- Direct Economic Consequences (cont.)
  - Remaining Efforts
    - Update baseline data to 2005
    - Compile estimates of wind damage
    - Expand analysis to full 5-parish geography
    - Cross-check results and validate to other external data sources

Status Overview

- Indirect Economic Consequences
  - Describe the salient market forces that are influencing the redirection of current and future expenditures from pre-Katrina levels
  - Analysis will trace local/regional/national impacts by combining:
    - a recently calibrated multi-regional economic model (REMI)
    - Geo-referenced time-series data from Quarterly Census of Employment and Wages for Louisiana


(1) Output
State and Local Government Spending
Output
Consumption
Investment
Exports
Real Disposable Income
(3) Demographic
Migration
Population
Participation Rate
Labor Force
(2) Labor & Capital Demand
Optimal Capital Stock
Employment
Labor/Output Ratio
(5) Market Shares
Domestic Market Share
International Market Share
(4) Wages, Prices, and Production Costs
Employment Opportunity
Wage Rate
Composite Wage Rate
Production Costs
Housing Price
Consumer Price Deflator
Real Wage Rate
Composite Prices


Policy Question
Katrina recovery
Time-path
External Input
•Out-migration
•Asset loss
•Risk adjustment
•Fiscal Policy
REMI Model
External Input
Base line value for all external policy variables.
Alternative Forcast
1,975
1,769
Control Forcast
1,975
1,769
Policy Effect
1,975
1,769
year 1
year 2
year 3
year 4

Policy Variables Available for Simulation

Category	Elements Directly Affected
Consumer Spending	Within State Final Demand
Investment Spending	
Government Spending	
Industry Demand	Within State
Industry Output	Intermediate Demand
Dividends, Interest, Rent	Disposible Income
Residence Adjustment	
Transfer Payments	
Factor Productivity	Factor Demands, profits
Industry Employment	Prices, Employment
Birth Rates	
Survival Rates	
Labor Force Participation rates	
Retired Migrant Rates	
Economic Migrants	Regional Workforce
Amenity Attractiveness	
Production Costs	Production Costs
Labor Costs	
Wage rates	
Occupational Supply	Wage rates
Business Taxes & Credits	Production Costs
Fuel Costs	
Housing Prices	Consumer Price
Consumer Prices	Deflator
Regional Purchase Shares	Self Supply
Export Share	

Source: Treyz, Rickman, and Shao; IRSR (14:3)

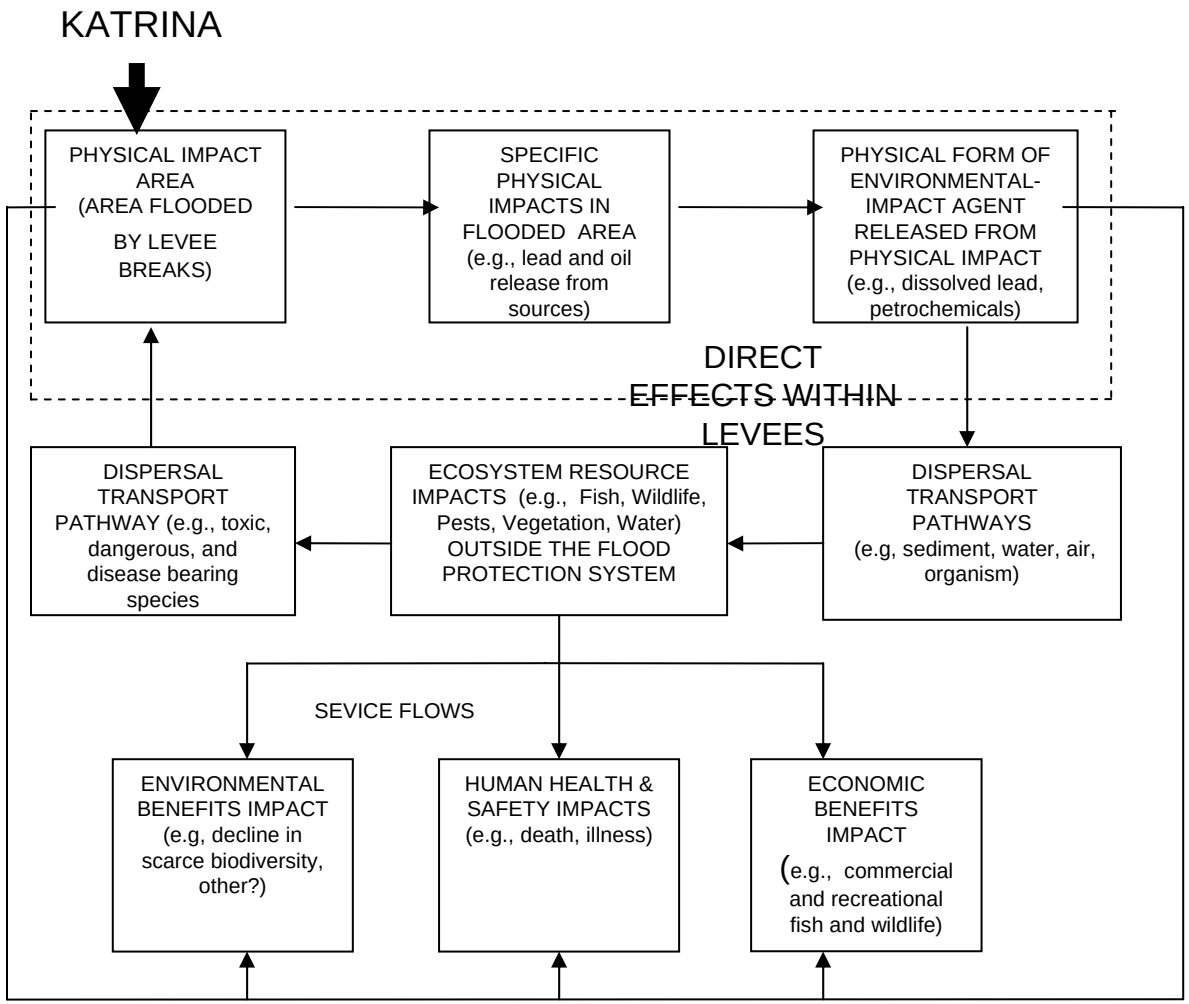
Status Overview

- Indirect Economic Consequences (Cont.)
  - Describe the costs to waterborne navigation
    - Damages to the waterway system
    - Cost of service losses due to obstructions and dredging
  - Remaining Efforts
    - Finalize scenario experiments for multiregional impact model
    - Conduct sensitivity analysis on model results
    - Develop appropriate output reports and initiate peer review
    - Carry out similar activities for waterborne navigation study

Status Overview

- Environmental Consequences
  - Direct, intermediate and long-term ecological resource degradation and benefit loss stemming from events associated with Katrina
    - Examine inner ecosystem (inside flood protection) and outer ecosystem
    - Examine water and soil quality, salt water intrusion, pest and toxic dust dispersal, barriers to natural species movements

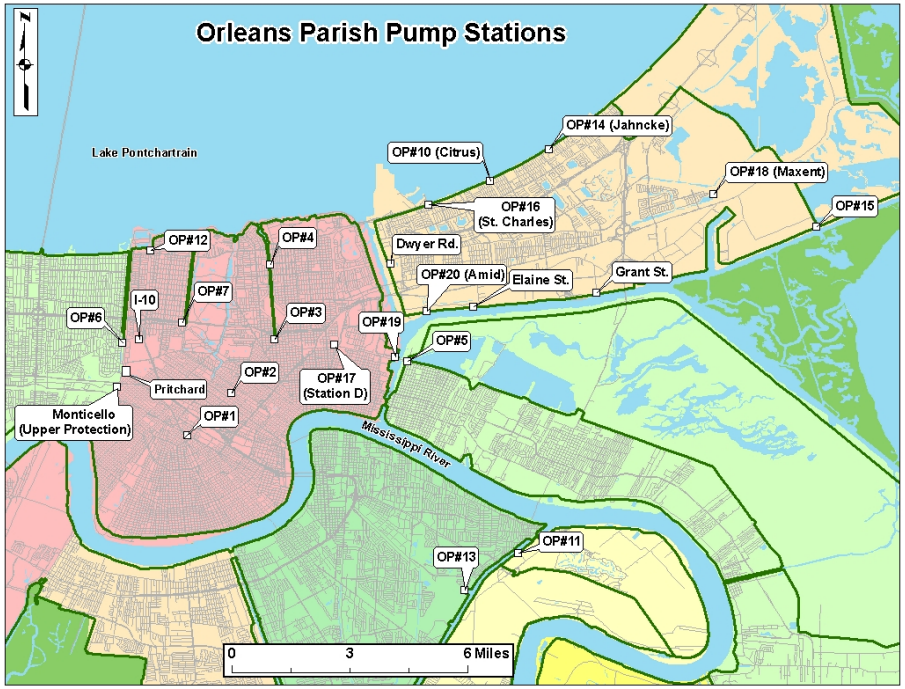
Conceptual model of the ecosystem area directly impacted by flooding and the area externally impacted outside the flood-protection system by indirect impacts

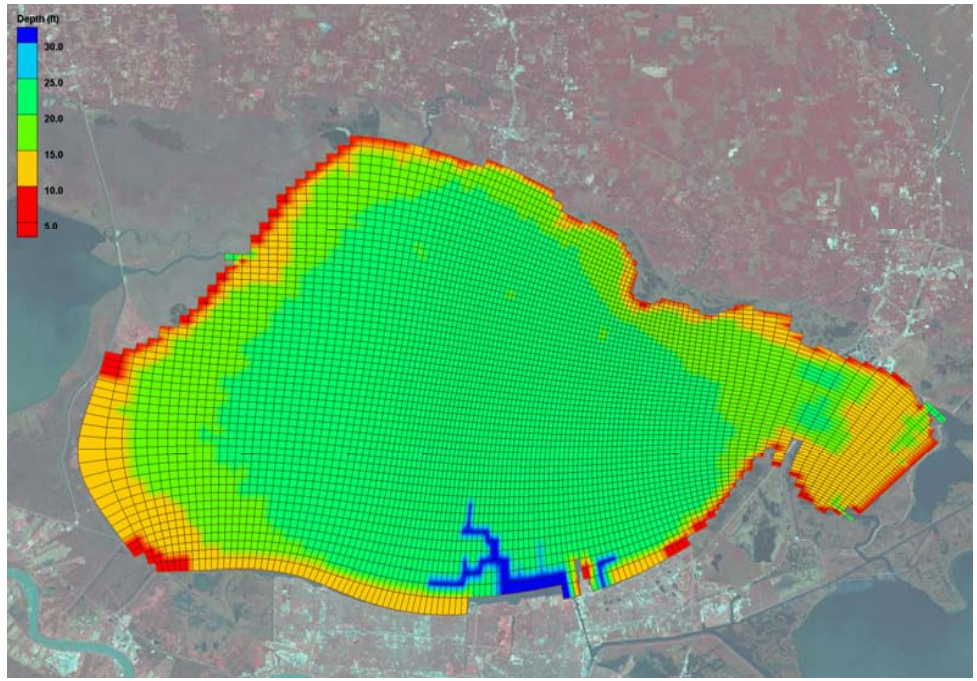


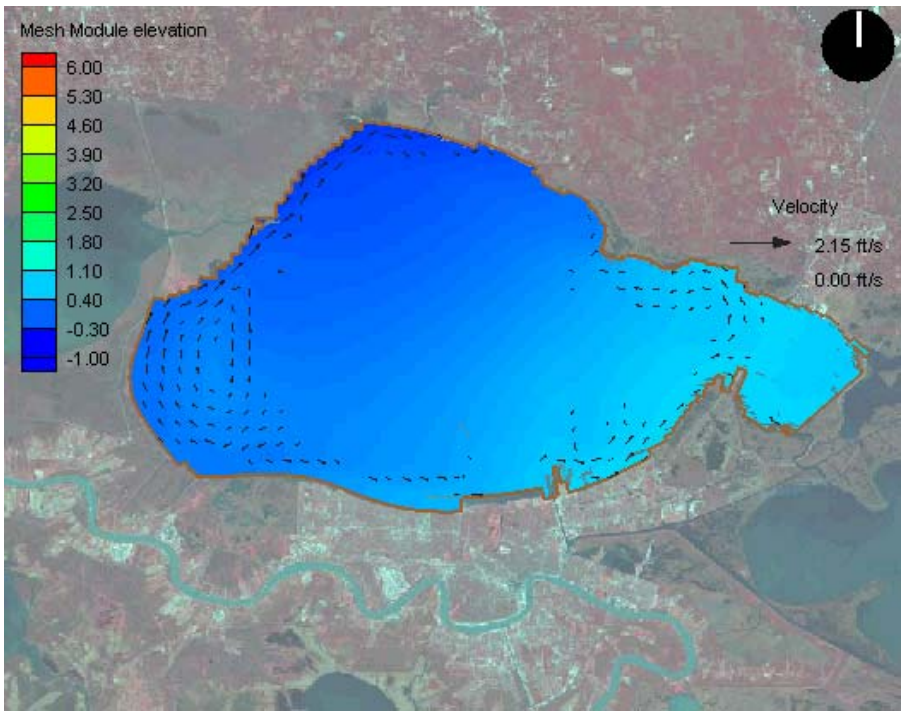
Status Overview

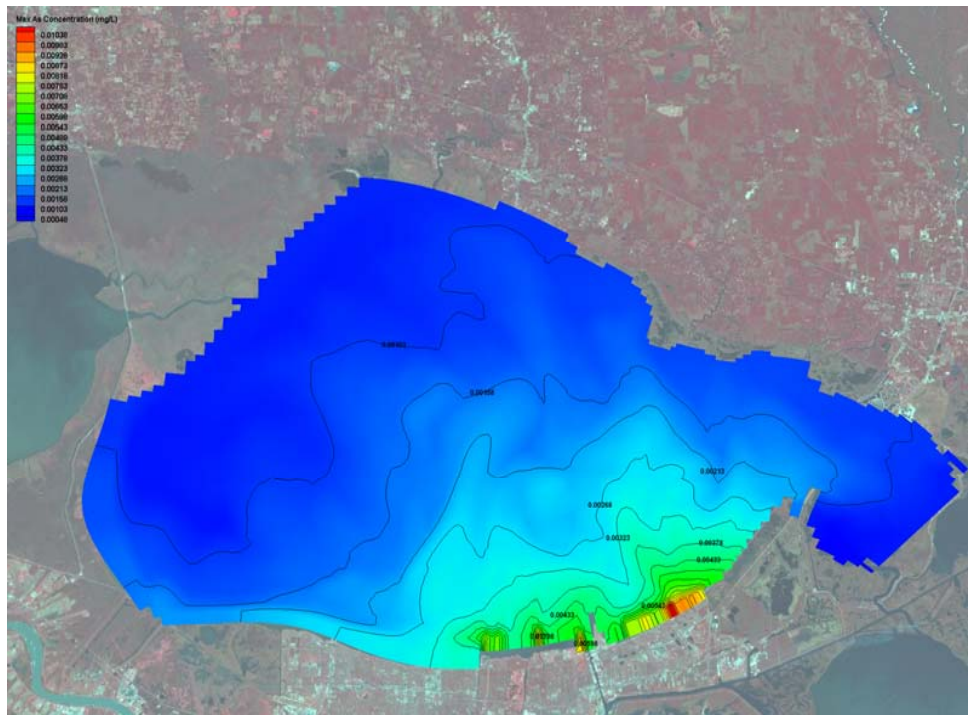
Environmental Consequences (cont.)

- Interim Results
  - Outer ecosystem
    - No indication of offshore fish or shrimp population impacts
    - MS Sound and offshore bacterial measures not exceed EPA standards; PCB's, DDT's, PAC's in fish tissue normal
    - MS, LA, and FDA issued safe seafood announcements (quantitative data yet to be found)
    - Little information on wildlife impacts
    - Damages to Lake oyster beds
    - Tagged Sturgeon in area not detected
    - Contaminant movement model of Pontchartrain show preliminary indications of arsenic transport, but quickly dispersed and diluted—further tests are forthcoming


Orleans Parish Pump Stations
Lake Pontchartrain
OP#14 (Jahncke)
OP#10 (Citrus)
OP#18 (Maxent)
OP#16 (St. Charles)
OP#15
OP#12
OP#4
Dwyer Rd.
OP#20 (Amid)
Elaine St.
Grant St.
I-10
OP#7
OP#6
OP#3
OP#19
OP#5
OP#2
OP#17 (Station D)
Pritchard
Monticello (Upper Protection)
OP#1
Mississippi River
OP#11
OP#13
0
3
6 Miles


Depth (ft)
30.0
25.0
20.0
15.0
10.0
5.0


Mesh Module elevation
6.00
5.30
4.60
3.90
3.20
2.50
1.80
1.10
0.40
-0.30
-1.00
Velocity
2.15 ft/s
0.00 ft/s


Max As Concentration (mg/L)

Status Overview

Environmental Consequences (cont.)

- Interim Results
  - Inner ecosystem
    - Contains important wetlands and wildlife
    - Only fecal coliform data have been supplied
      - Measures routinely exceed EPA and LADEQ standards
    - Some metal concentrations above standards
      - Not unlike typical storm levels
      - Data being used for contaminants transport fate model
    - Sampling of Violet Marsh to evaluate distribution of sewage pumped into the Marsh from Florida Ave. plant and oil spill from a Paris Rd. oil company
      - Yet to be analyzed
    - Salinity changes in vicinity of pumping stations
      - Indicate disturbances to species compositions
      - Being monitored for impact on bald cypress (bird nesting)

Status Overview

- Social, Cultural, and Historic Consequences
  - Example of Descriptive Impact Indicators

Geographic District in City of NO	Gentilliy*
2000 US Census Count	
Population	52,235
White	20%
African American	76%
Other	2%
Households	
Family	13,659.00
Non-Family	6,309.00
Over 5 Years Old	48,719
Percent in Same House in 1995	65.4%
Over 25 Year Old	32,990
Highest Education, Over 25:	
Less than High School	22%
High School	26%
College	24%
Households Below Poverty	23%
Pre Katrina 2005 Estimate	
Population	51,000
White	21%
African American	78%
Other	2%
Households	
Family	13,000.00
Non-Family	6,000.00
Over 5 Years Old	45,000
Percent in Same House in 1995	70.9%
Over 25 Year Old	31,000
Highest Education, Over 25:	
Less than High School	24%
High School	27%
College	26%
Households Below Poverty	23%

Geographic District in City of NO	Gentilliy*
Post Katrina Re-Occupation Estimate June 2006**	
Population	1,500
White	30%
African American	20%
Other	15%
Households	
Family	800.00
Non-Family	700.00
Over 5 Years Old	800
Percent in Same House in 1995	20.0%
Over 25 Year Old	1,100
Highest Education, Over 25:	
Less than High School	30%
High School	10%
College	23%
Households Below Poverty	30%
Post Katrina Estimate Post June 2006	
Population	
White	**
African American	**
Other	**
Households	
Family	
Non-Family	
Over 5 Years Old	
Percent in Same House in 1995	**
Over 25 Year Old	
Highest Education, Over 25:	**
Less than High School	**
High School	**
College	**
Households Below Poverty	**

Notes:*Includes Census Tracts:17.02, 17.03, 17.06, 24.01, 24.01, 25.02, 25.02, 25.04, 33.01, 33.02, 33.03, 3.04, 33.05, 33.06, 33.07, 33.08. **Scenario Based, at best. Some Observational Data