Impact of natural hazards on coastal systems in Louisiana

Wen-Ching Chuang, Ph.D.
Tarsha Eason, Ph.D.
Ahjond Garmestani, Ph.D., J.D.
Office of Research and Development
US Environmental Protection Agency

Introduction

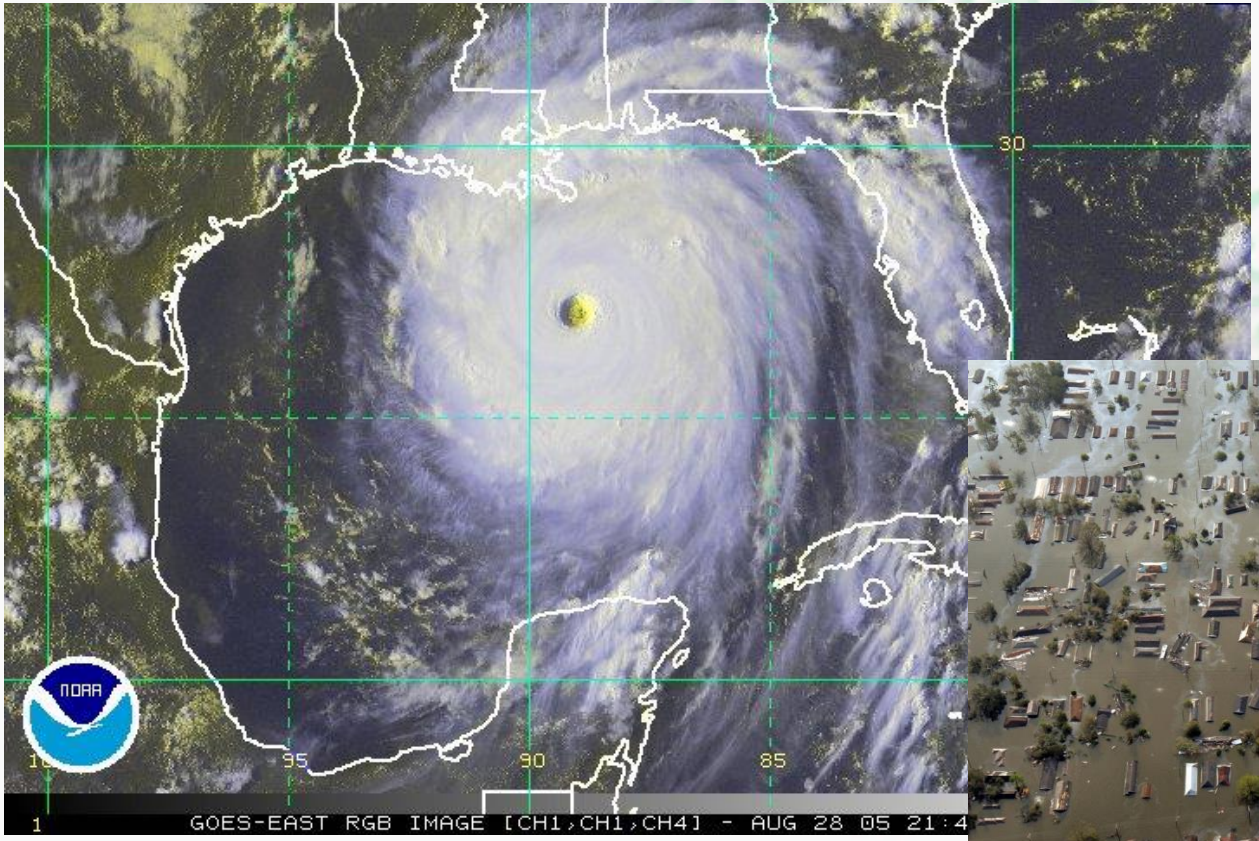


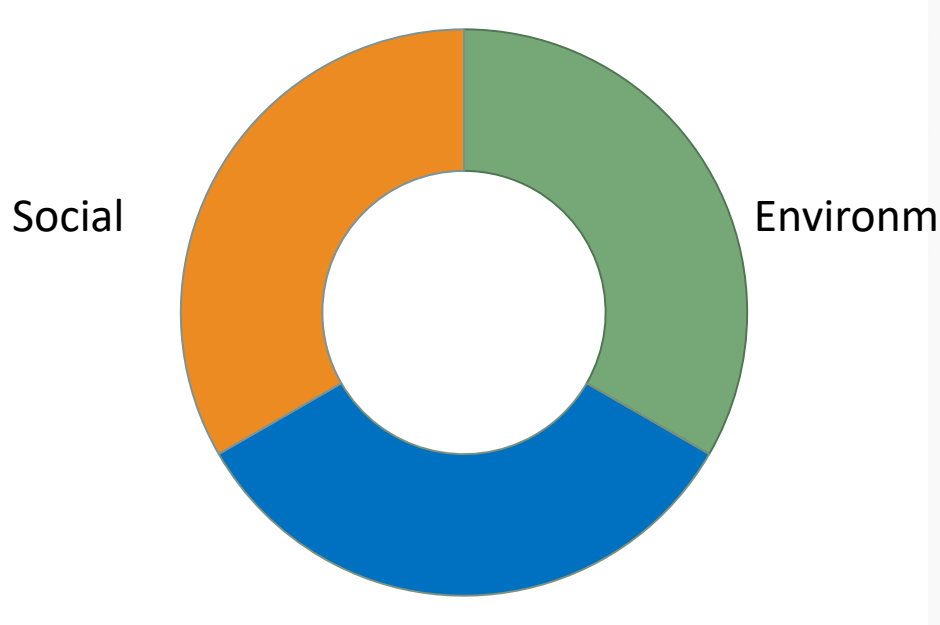
Image source: AP

Background

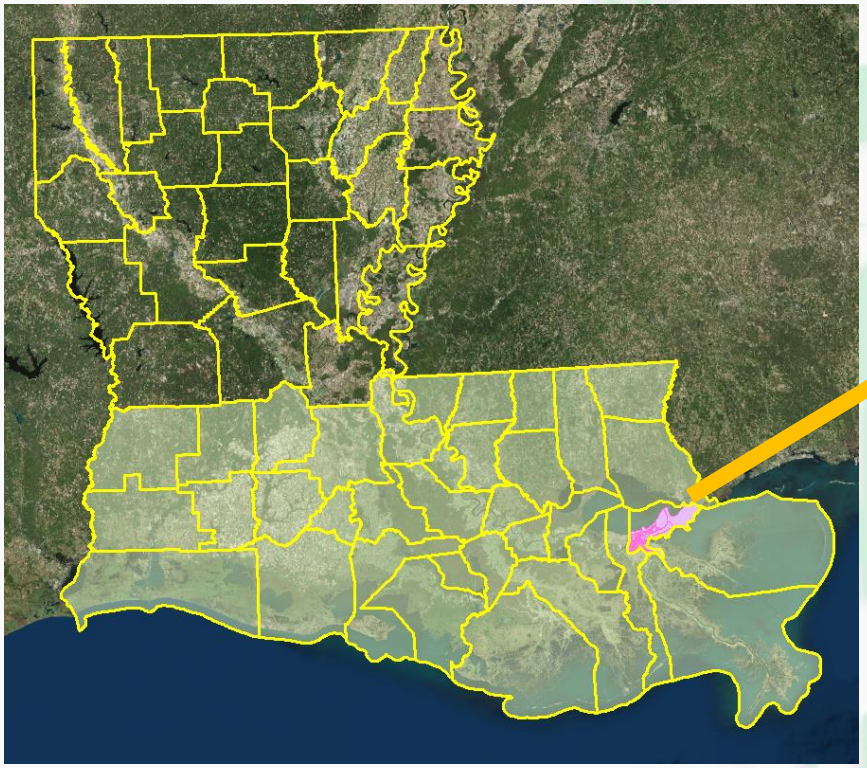
- Disaster resilience research
  - Vulnerability vs. resilience
  - Definitions & frameworks
  - Gaps & limitation

Research goals

- Examine the spatial changes of social, economic, and environmental conditions before and after Hurricane Katrina.



Study Area



Louisiana vs. southern Louisiana

New Orleans Parish

Flooded/ Damaged Areas

- Flood-damaged areas in New Orleans by 09/02/2005

Method

- Data
  - US Census 2000, ACS 2009, ACS 2014
  - NOAA Coastal Change Analysis Program
  - USGS North American Breeding Bird Survey

Social

- Race/Ethnicity
- Vacant units
- % renter occupancy
- % owner occupancy
- Poverty

Environment

- Birdy diversity
- % Wet land
- % Vegetation
- % High intensity development

Economic

- Median home value
- Median household income

Analysis & Results

- % of land-use in southern Louisiana (% of total area)

Land Use, Year, (%)	2001	2005 (pre-Katrina)	2010 (post-Katrina)
Developed, High Intensity	0.31	0.37	0.45
Developed, Medium Intensity	0.58	0.61	0.66
Developed, Low Intensity	3.25	3.24	3.27
Developed, Open Space	0.60	0.66	0.70
Cultivated Crops	12.23	12.36	12.24
Pasture/Hay	5.86	5.46	5.26
Grassland/Herbaceous	1.85	1.92	1.31
Deciduous Forest	0.86	0.83	0.79
Evergreen Forest	6.06	5.70	5.22
Mixed Forest	1.19	1.12	0.99
Scrub/Shrub	4.11	4.87	5.98
Palustrine Forested Wetland	16.77	16.56	16.09
Palustrine Scrub/Shrub Wetland	1.30	1.27	1.87
Palustrine Emergent Wetland	6.07	5.95	5.96
Estuarine Scrub/Shrub Wetland	0.04	0.03	0.03
Estuarine Emergent Wetland	9.23	9.16	8.72
Unconsolidated Shore	0.49	0.50	0.49
Bare Land	0.15	0.14	0.28
Open Water	26.48	26.65	27.01
Palustrine Aquatic Bed	0.18	0.18	0.24
Estuarine Aquatic Bed	0.28	0.28	0.31

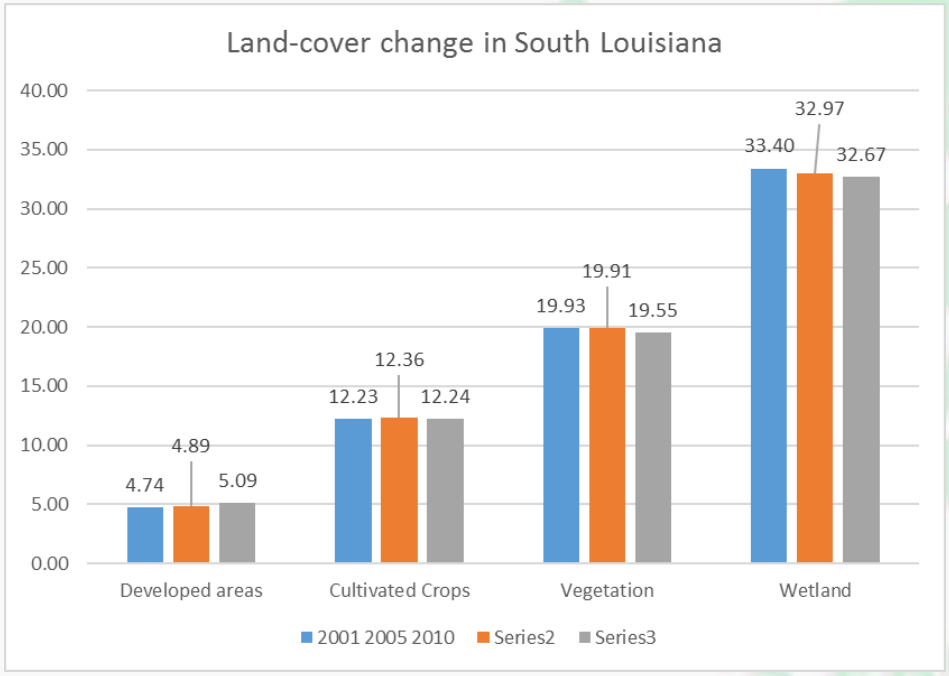
Urbanization

Vegetation

wetland

Analysis & Results

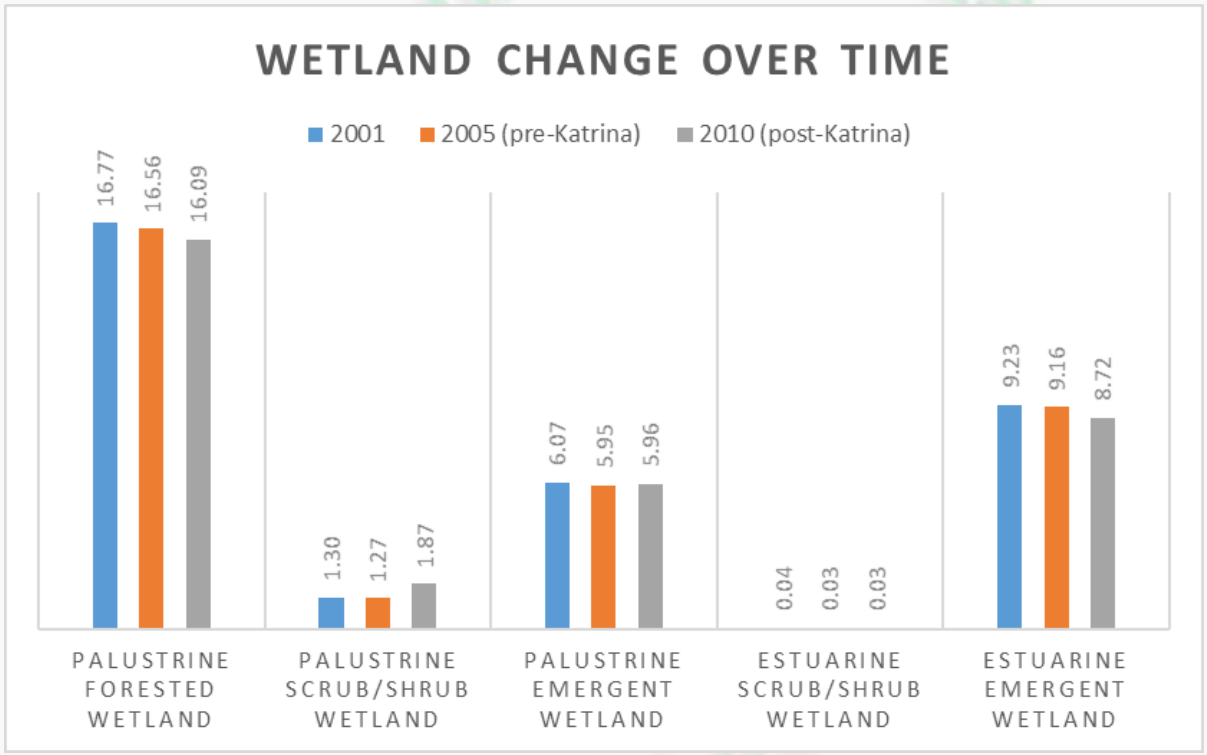
- % of land area by land use type



Land use type, Year (%)	2001	2005	2010
Developed areas	4.74	4.89	5.09
Cultivated Crops	12.23	12.36	12.24
Vegetation	19.93	19.91	19.55
Wetland	33.40	32.97	32.67

Analysis & Results

- % of wetland area over time



Analysis & Results

- Land change before and after Hurricane Katrina
  - New Orleans Parish

Land cover change	**area (Km2)**	**% change of the total area**
Estuarine Emergent Wetland to Water	8.13	0.90
Palustrine Emergent Wetland to Water	1.52	0.17
High Intensity Developed to Low Intensity Developed	0.85	0.09
Medium Intensity Developed to Low Intensity Developed	0.66	0.07
Low Intensity Developed to High Intensity Developed	0.32	0.04

Analysis & Results

- Land change before and after Hurricane Katrina
  - Southern Louisiana

Land cover change	Area (Km2)	% Change of total land area
Estuarine Emergent Wetland to Water	429.04	0.56
Evergreen Forest to Grassland	183.93	0.24
Palustrine Emergent Wetland to Water	96.44	0.13
Scrub/Shrub to Grassland	58.03	0.08
Evergreen Forest to Scrub/Shrub	55.67	0.07

Analysis & Results

- Land change between 2001 and 2010
  - New Orleans Parish

Land cover change	area (Km2)	% change of the total area
Estuarine Emergent Wetland to Water	13.30	1.47
Low Intensity Developed to Medium Intensity Developed	3.66	0.40
Palustrine Emergent Wetland to Water	3.54	0.39
Medium Intensity Developed to High Intensity Developed	2.93	0.32
Low Intensity Developed to High Intensity Developed	2.29	0.25

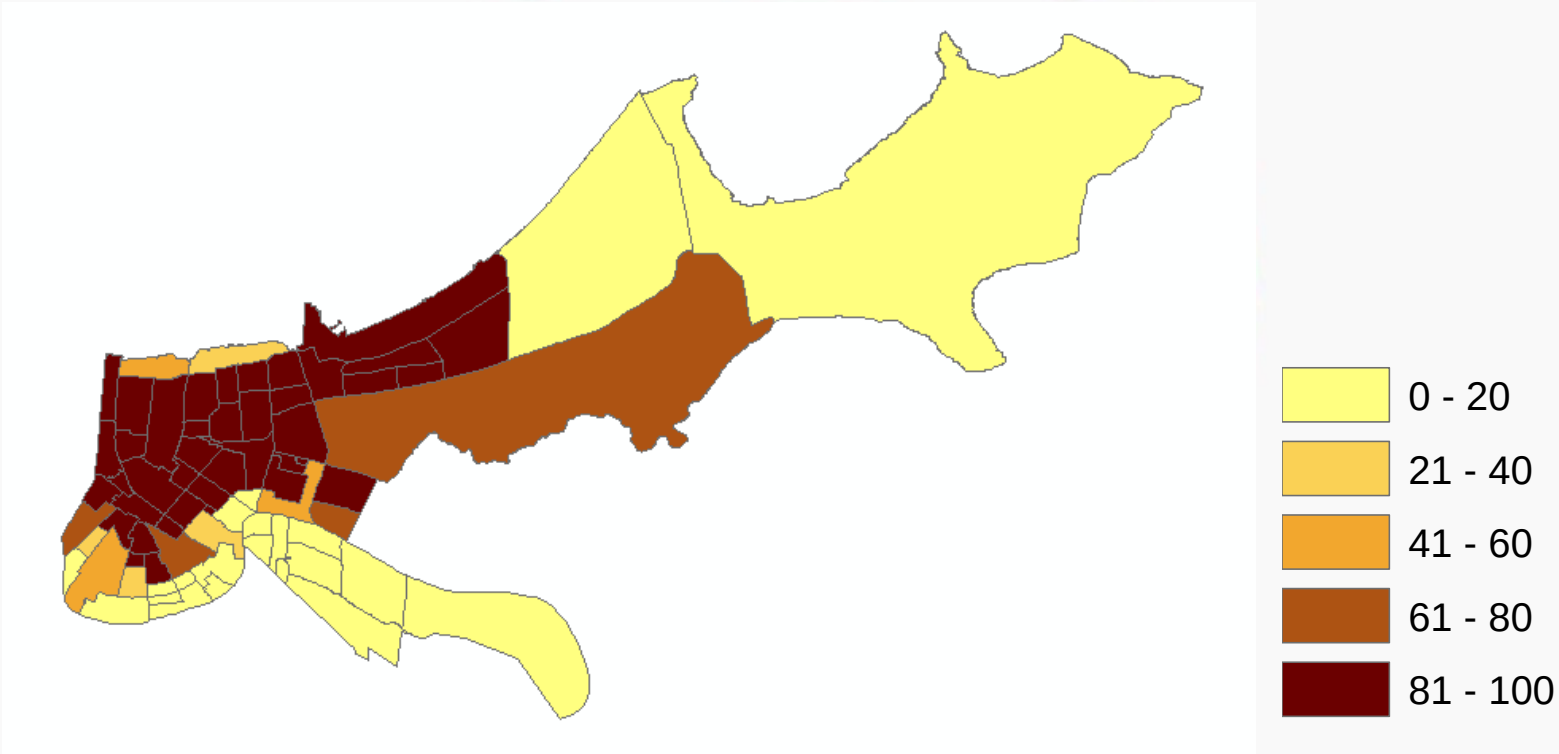
Analysis & Results

- Land change between 2001 and 2010
  - Southern Louisiana

Land cover change	Area (Km2)	% Change of total land area
Evergreen Forest to Scrub/Shrub	1321.79	1.73
Scrub/Shrub to Evergreen Forest	698.34	0.91
Grassland to Scrub/Shrub	537.50	0.70
Estuarine Emergent Wetland to Water	427.09	0.56
Grassland to Evergreen Forest	222.89	0.29

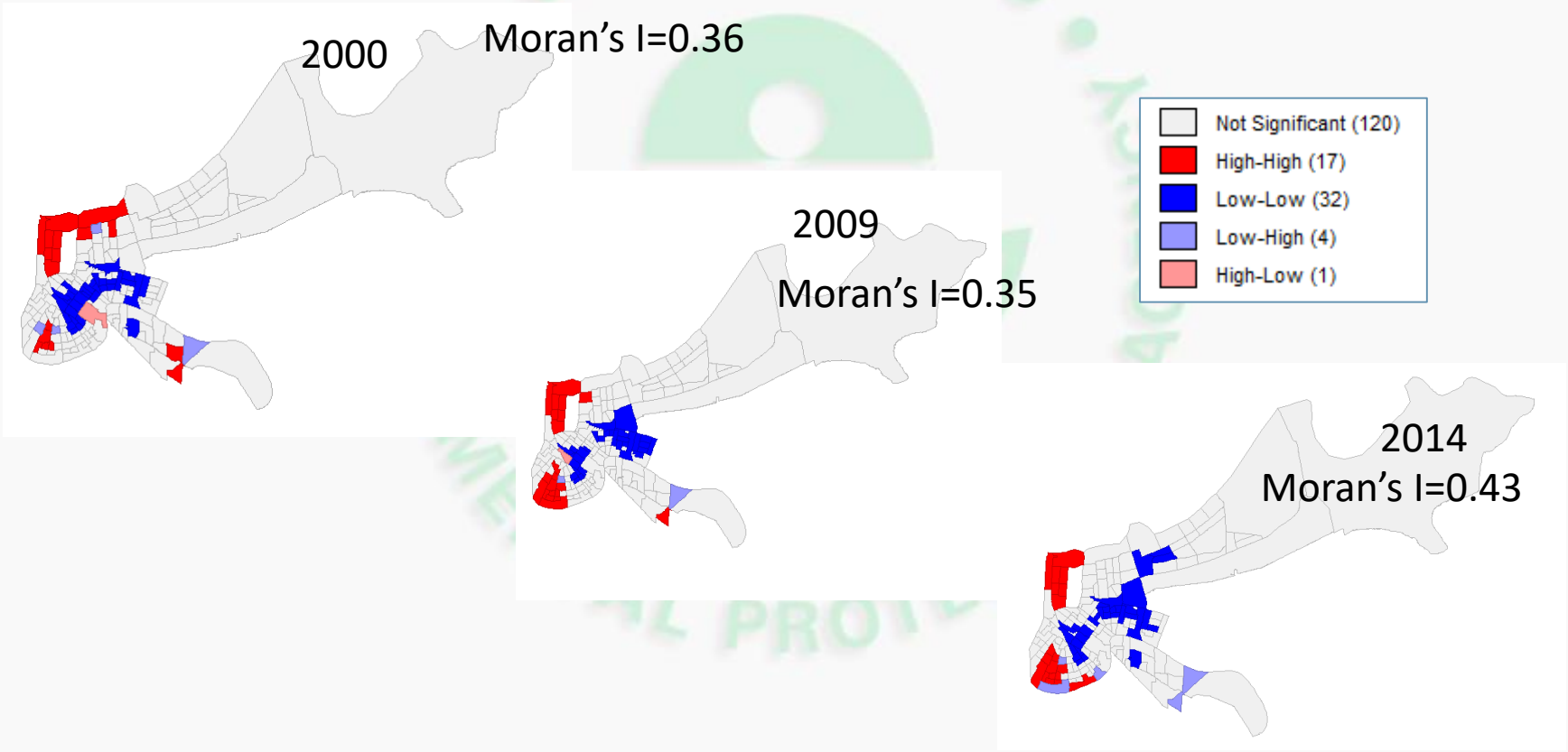
Analysis & Results

- Percent in population lived in damaged area in 2000



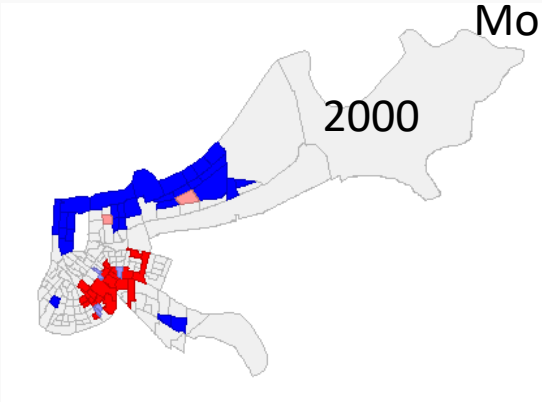
Analysis & Results

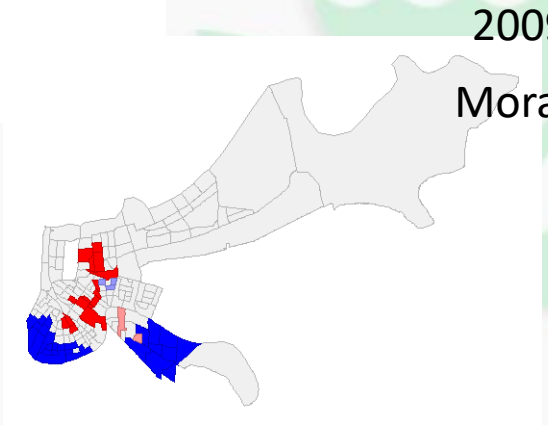
- Cluster analysis of income

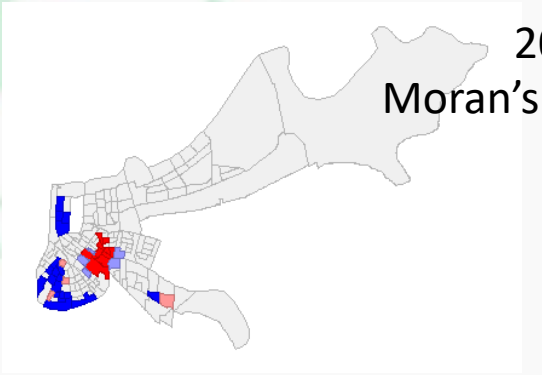


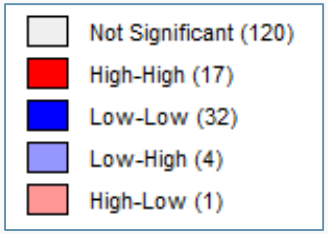
Analysis & Results

- Cluster analysis of vacancy rates









Conclusion

- Shannon index of bird diversity has been decreasing since 2000.
- Different scales and locations experienced distinct impacts.
  - Cross-scale consideration
- Not all population groups and local communities were equally impacted by natural hazards or benefit from reorganization.
  - Transformation
- Policy implication

Thank you & QA

The views expressed in this presentation are those of the authors and do not necessarily represent the views or the policies of the U.S. Environmental Protection Agency.