ASSESSING TEMPORAL AND SPATIAL VARIABILITY IN COMMUNITY AND PARISH LEVEL RESPONSES TO OIL SPILLS AND OTHER EVENTS IN COASTAL LOUISIANA

Bureau of Ocean Energy Management
Information Transfer Meeting
August 24, 2017

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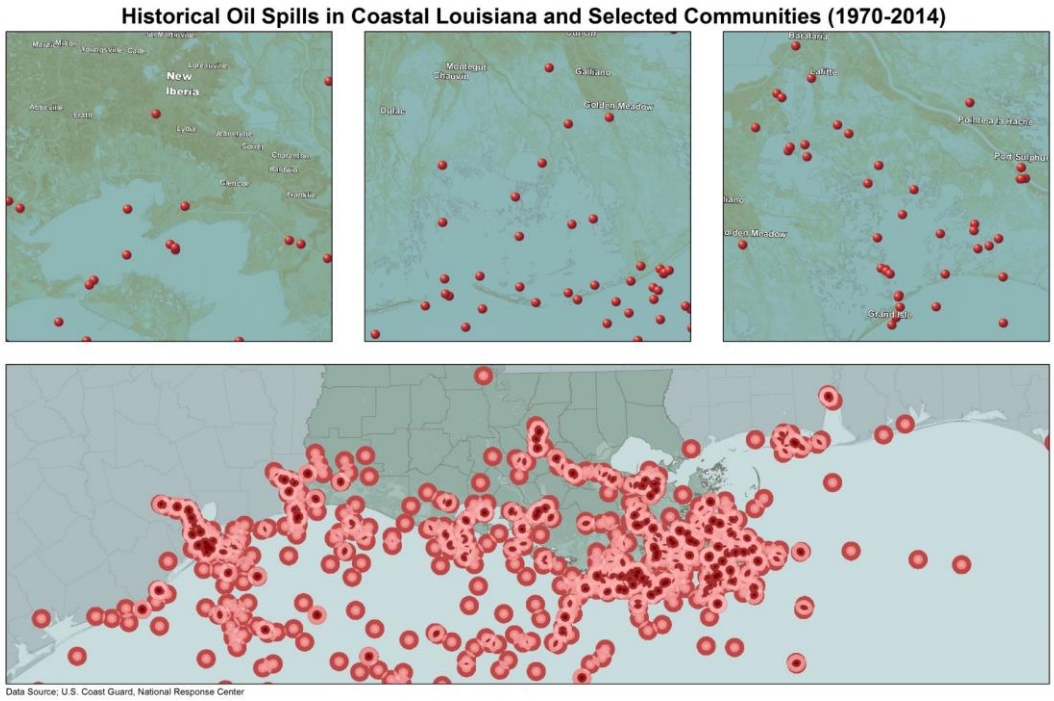
Research Questions

- What are the overall shifts in demographic and social conditions in coastal areas between 1950 and 2015, and what are the major historical events or transformations that have impacted coastal communities during this time period?
- How do current residents of coastal communities understand the drivers of historical and contemporary demographic and social change in their towns and cities and, in particular, the role of oil and gas development?
- To what extent do people correlate demographic and social change with oil related events or, if not, other environmental or economic events at the local, regional, or national level?



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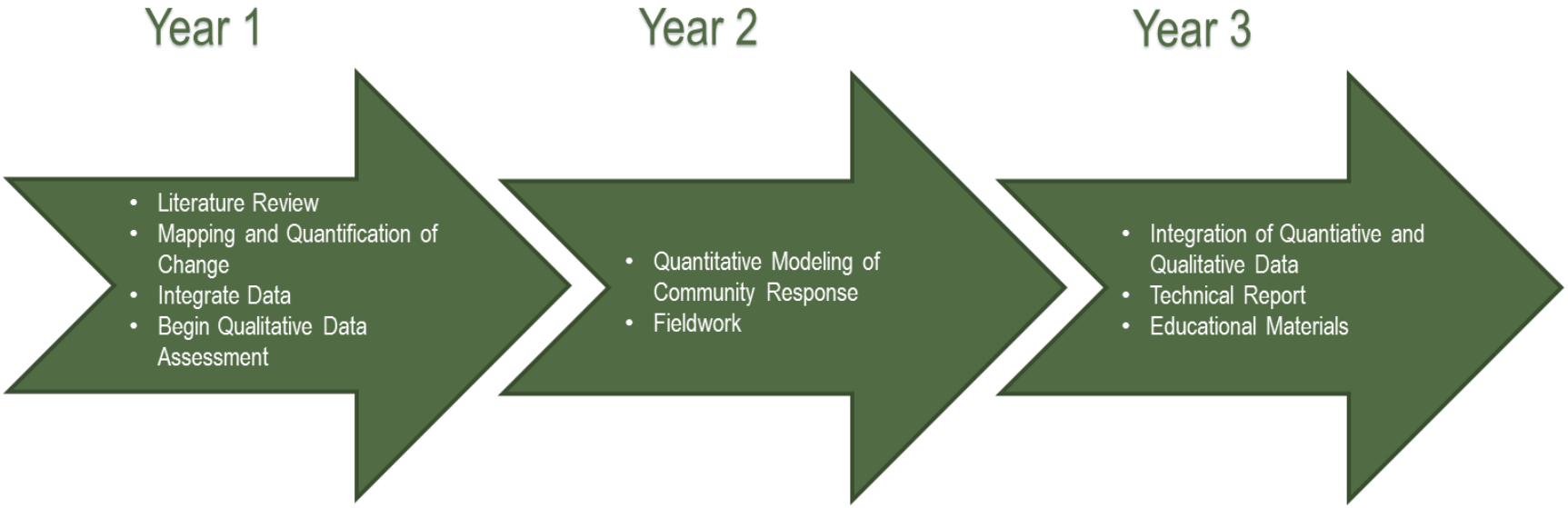
Bureau of Applied Research in Anthropology



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PRESENTATION OUTLINE

Trends in oil and gas development
1950's to 2010's

Trends in socioeconomic variables
1950's to 2010's

Trends in historical environmental change
1950's to 2010's

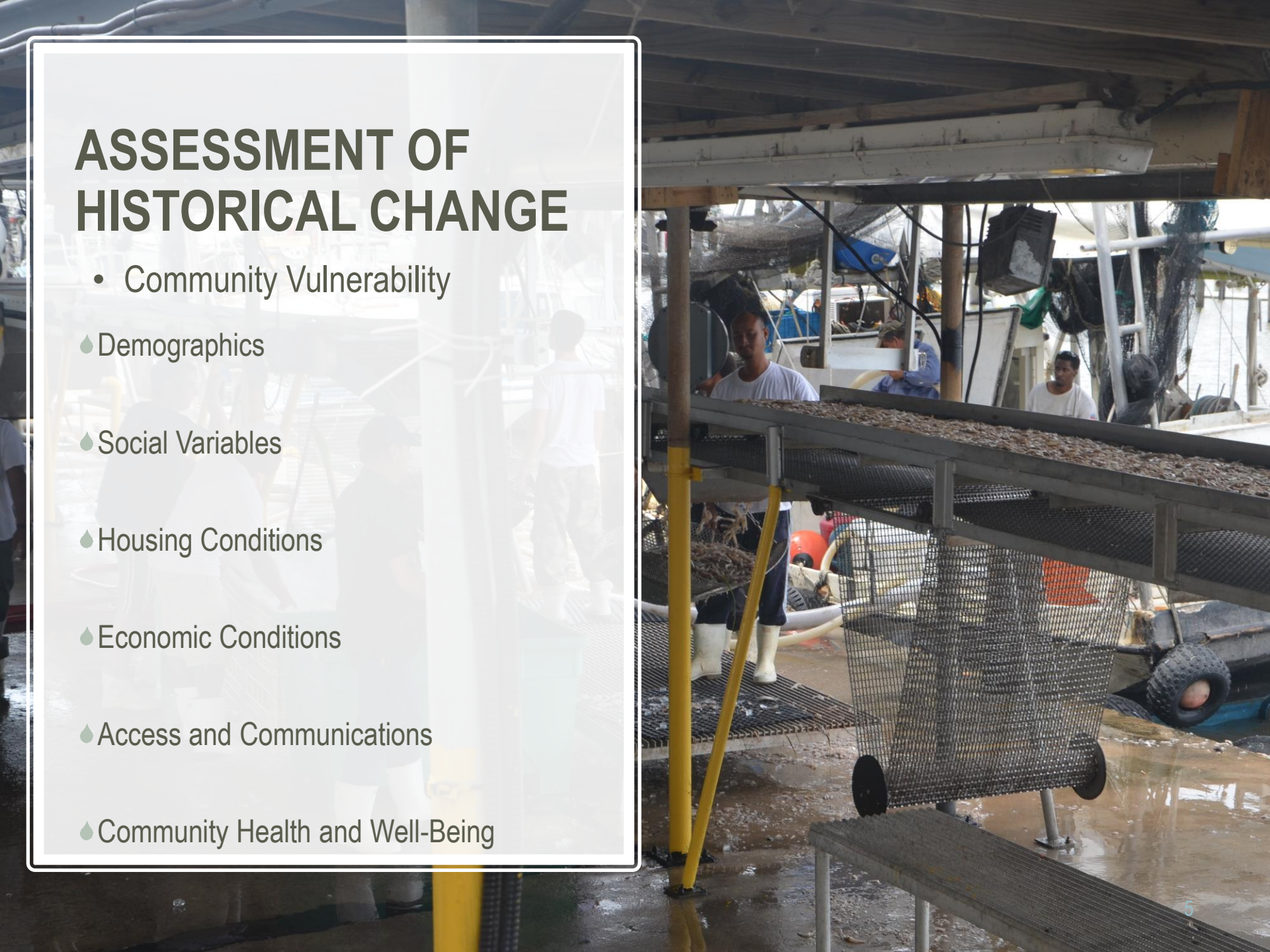
Trends in economic wellbeing
1950's to 2010's

Linkages and next phase

ASSESSMENT OF HISTORICAL CHANGE

- Community Vulnerability

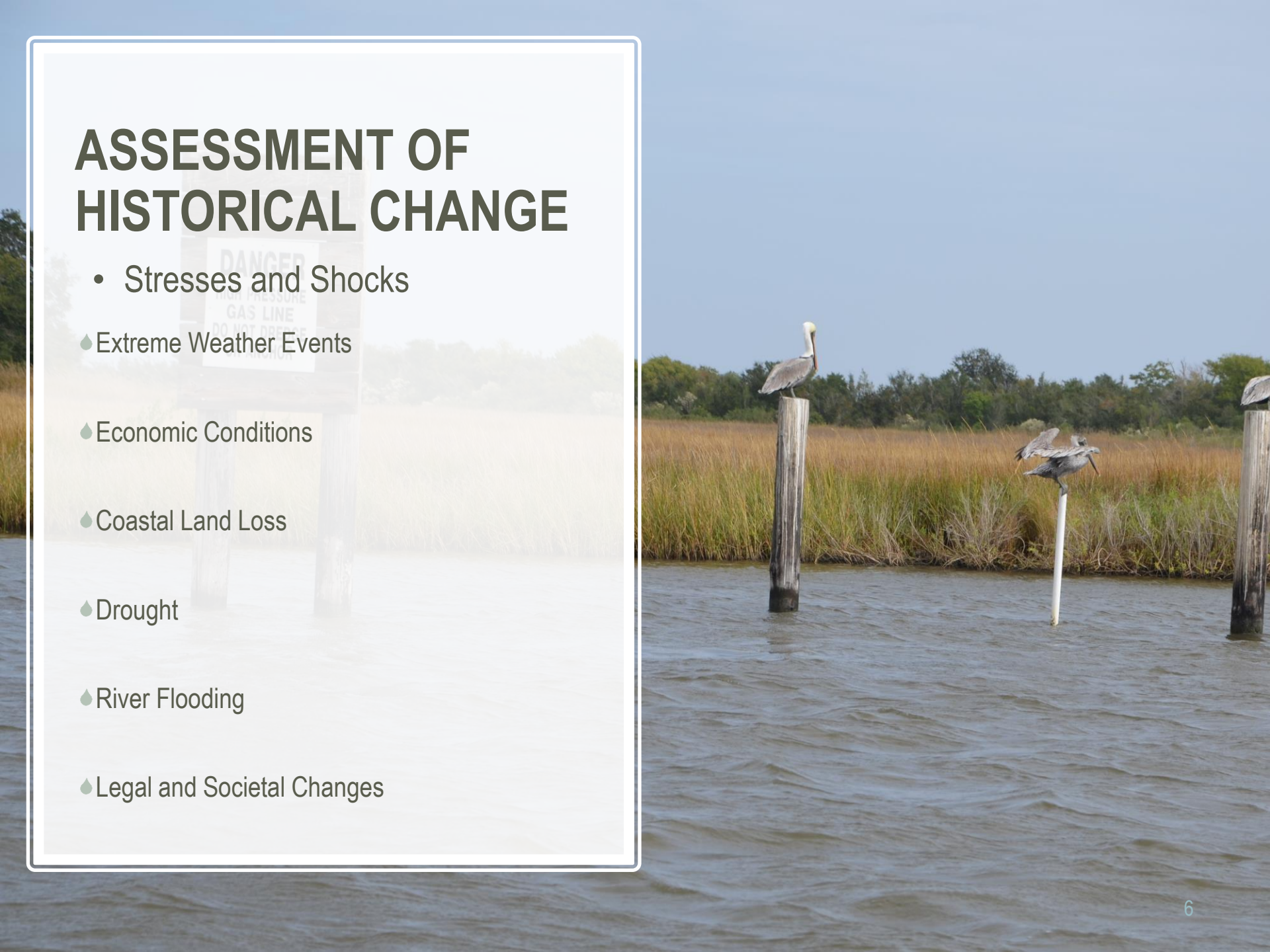
- Demographics
- Social Variables
- Housing Conditions
- Economic Conditions
- Access and Communications
- Community Health and Well-Being



ASSESSMENT OF HISTORICAL CHANGE

- Stresses and Shocks

- Extreme Weather Events
- Economic Conditions
- Coastal Land Loss
- Drought
- River Flooding
- Legal and Societal Changes



ASSESSMENT OF HISTORICAL CHANGE

- Community Responses

- Population Change
- Economic Conditions
- Housing Conditions
- Crime
- Health Impacts

PRESENTATION OUTLINE

Trends in oil and gas development 1950's to 2010's

Trends in socioeconomic variables 1950's to 2010's

Trends in historical environmental change 1950's to 2010's

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Linkages and next phase

MAPPING OIL AND GAS EXPANSION

- Facilities were identified and mapped using existing secondary data sources and permit records available from the U.S. Environmental Protection Agency (USEPA). The location of each facility was mapped using the most recent U.S. Geological Survey Digital Orthophoto Quarter Quads (DOQQs) allowing researchers to identify changes in land use in areas of oil and gas development. These geographic data layers were used to conduct a proximity-based analysis.

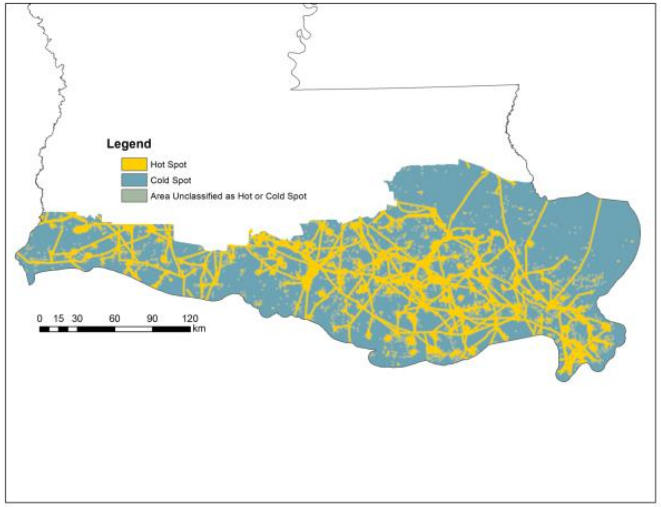
MAPPING OIL AND GAS EXPANSION

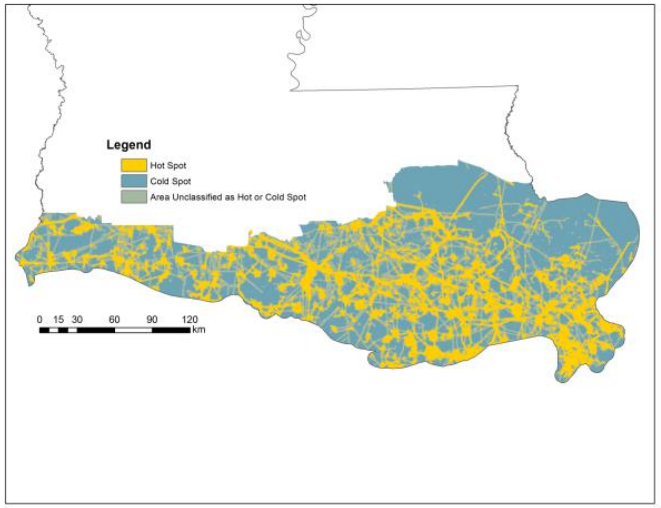
- **Facility Weighting Procedures**
  - We analyzed total statewide TRI releases over a 5-year span determined the mean frequency of release for each class of chemical for all relevant SIC Codes
  - Where the total number of releases was greater than the overall mean for a specific SIC code, we included that chemical in the data set
  - The U.S. EPA Risk-Screening Environmental Indicators (RSEI) Model provided chemical-specific hazard scores

Chemical	Total Pounds	Years	Number of Facilities	Average Annual Release per Facility
Hydrogen cyanide	9,713,228	5	19	102,244.51
n-Hexane	3,397,440	5	19	35,762.53
Toluene	2,127,658	5	19	22,396.40
Xylene (mixed isomers)	1,989,240	5	19	20,939.37
Propylene	1,702,429	5	19	17,920.31
Benzene	1,163,562	5	19	12,248.02
Carbonyl sulfide	659,925	5	19	6,946.58
Ethylene	612,056	5	19	6,442.69
Methanol	480,587	5	19	5,058.81
Ethylbenzene	479,101	5	19	5,043.17
Methyl isobutyl ketone	287,934	5	19	3,030.88
Zinc compounds	246,657	5	19	2,596.39
Cyclohexane	212,990	5	19	2,242.00
Cobalt compounds	117,474	5	19	1,236.57
Carbon disulfide	108,439	5	19	1,141.46
Cumene	66,355	5	19	698.47
1,3-Butadiene	62,001	5	19	652.64
Methyl tert-butyl ether	43,929	5	19	462.41
Styrene	32,261	5	19	339.59
Manganese compounds	29,144	5	19	306.78
Acetaldehyde	26,119	5	19	274.94
Manganese	18,449	5	19	194.20
Isoprene	17,998	5	19	189.45
n-Butyl alcohol	2,700	5	19	28.42
Chromium	1,573	5	19	16.56
Chromium compounds	1,533	5	19	16.14
sec-Butyl alcohol	435	5	19	4.58
Acetonitrile	218	5	19	2.29
tert-Butyl alcohol	0	5	19	0.00
Chlorine dioxide	0	5	19	0.00
Hydrazine	0	5	19	0.00

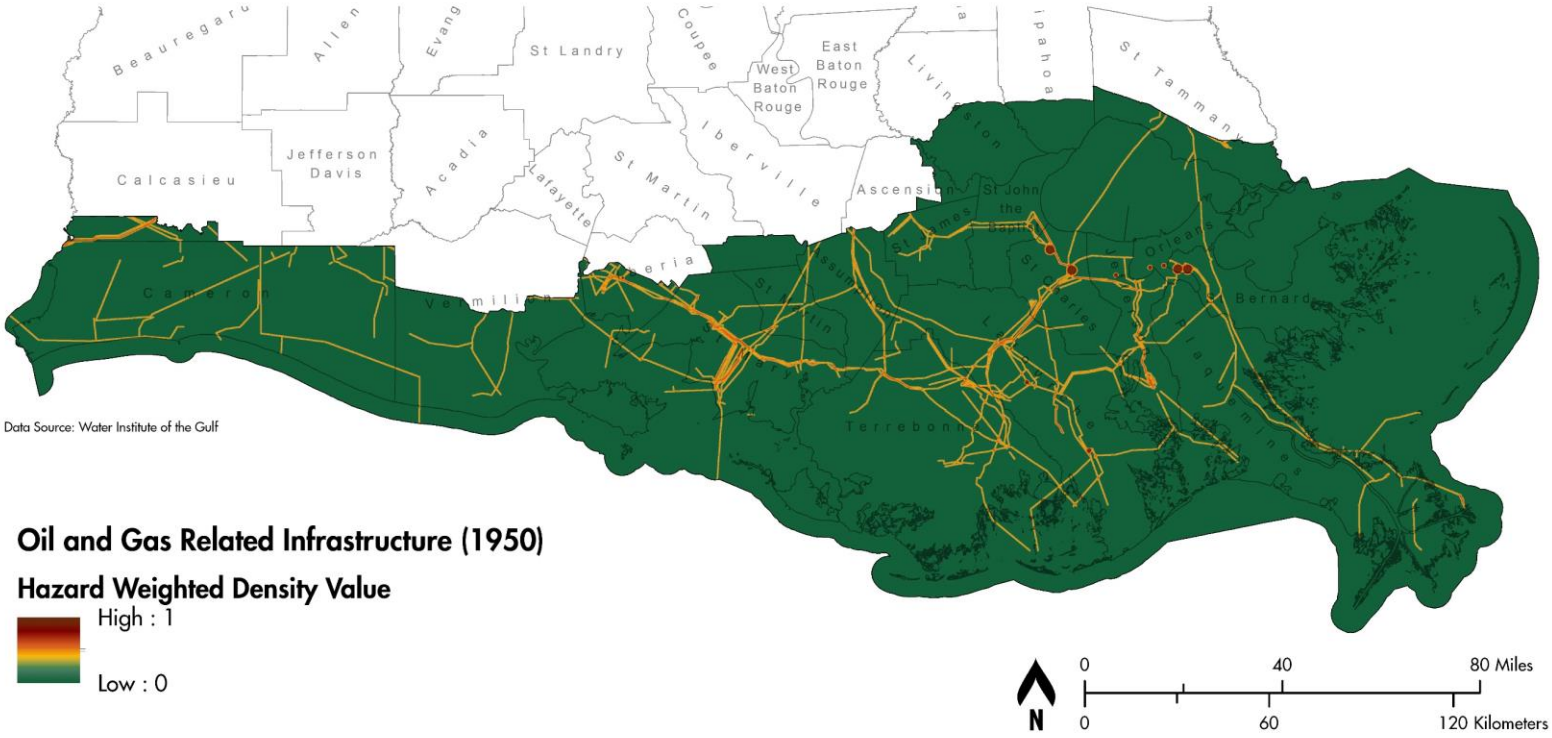
MAPPING OIL AND GAS EXPANSION

- We created **proximity-based buffers** that are dependent on the specific hazard associated with each activity.
- Worst-case release scenario and offsite consequence analysis was performed to determine the **endpoint distance of a hypothetical release**.
- U.S. Department of Transportation guidelines establish **default isolation zones** for hazardous releases that were used to create site specific buffers around facilities with fugitive release that may not be modeled in RMP*Comp.





Historical Change in Oil and Gas Related Infrastructure



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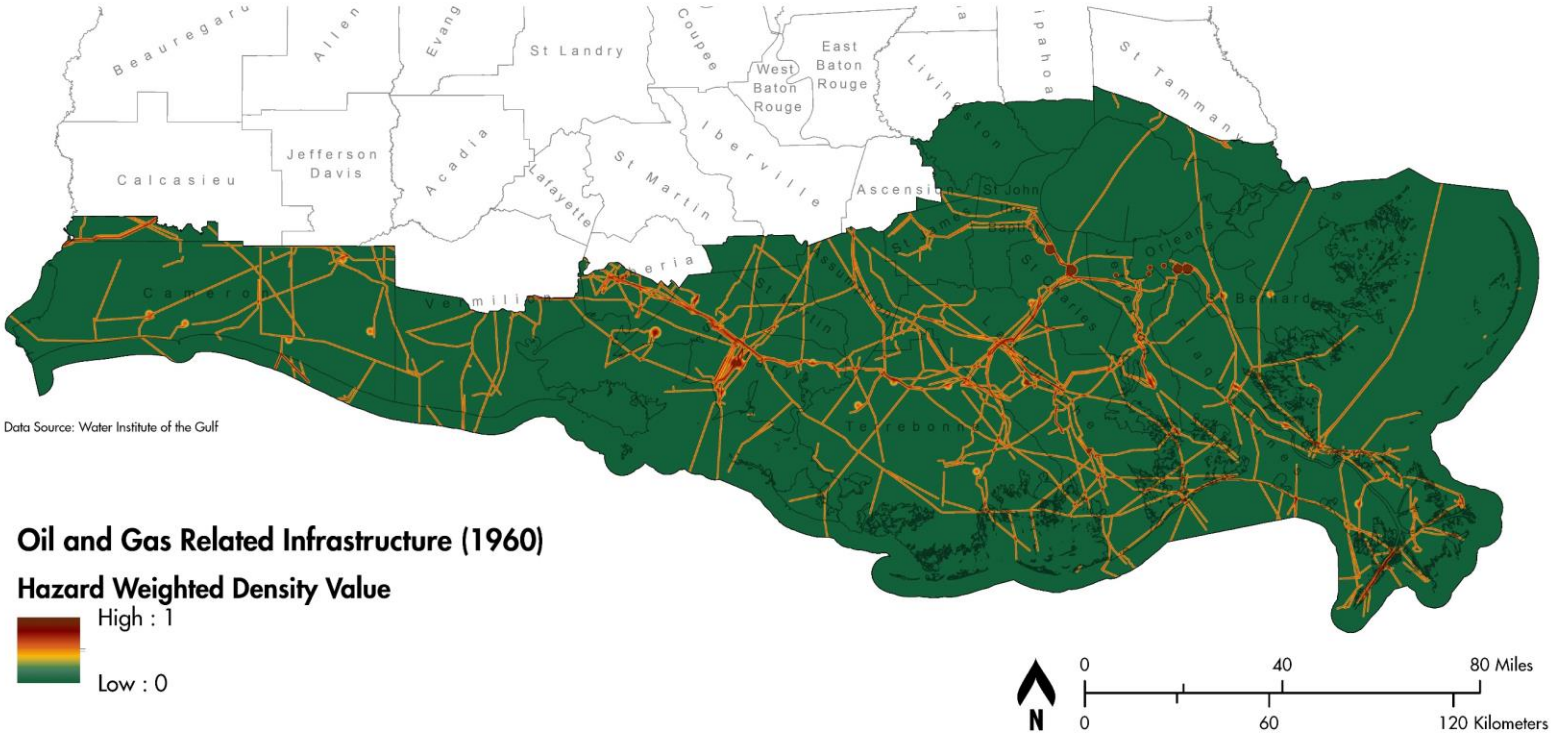

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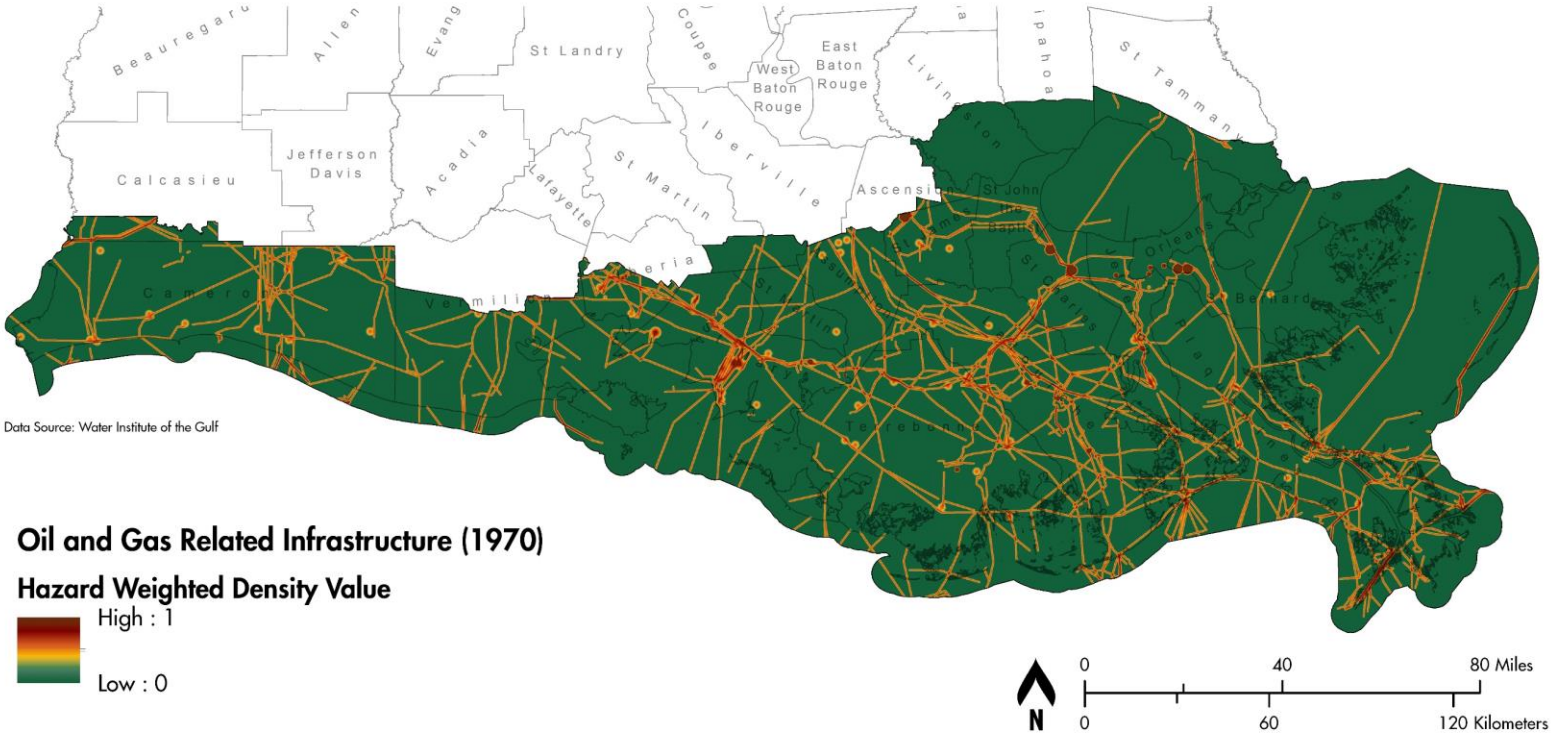

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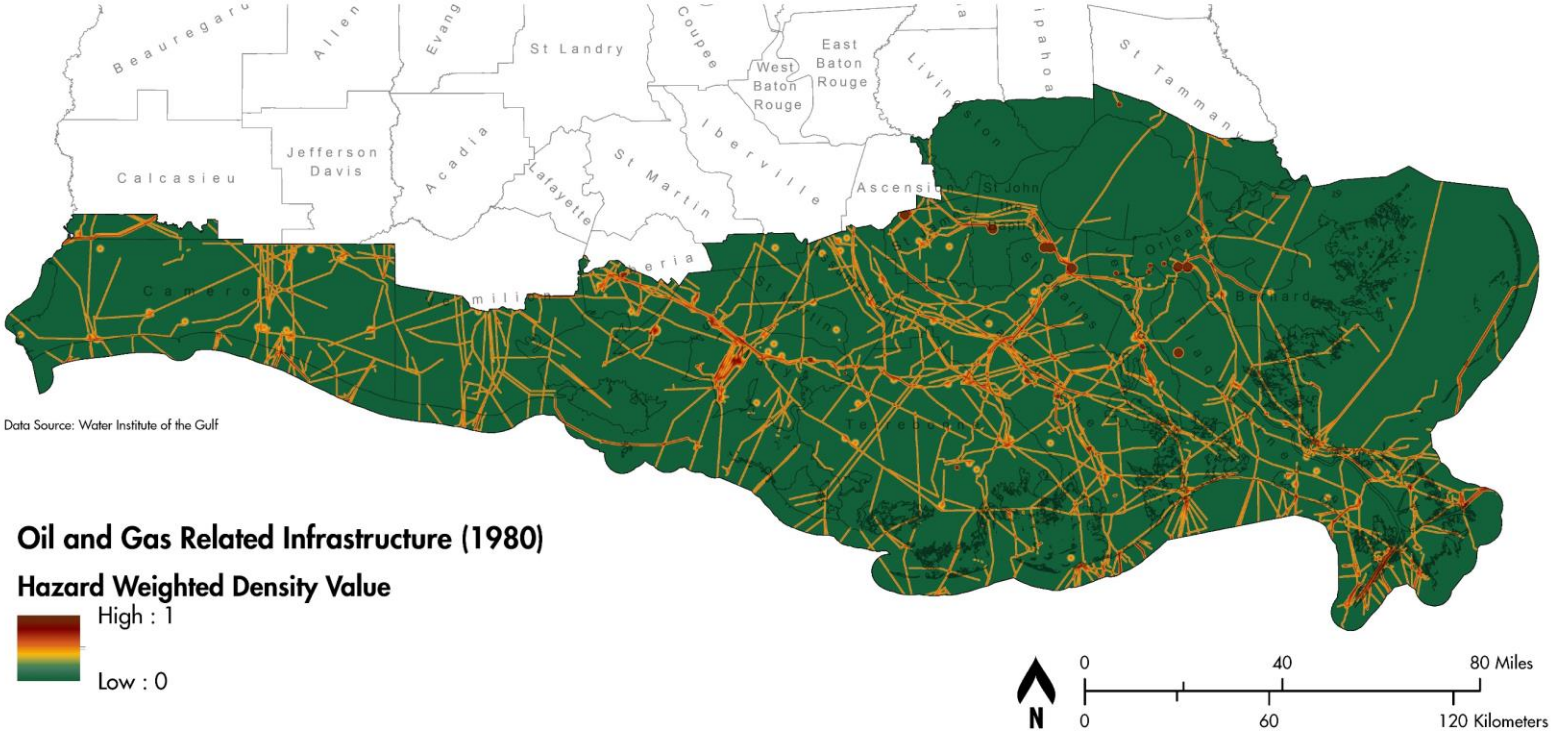

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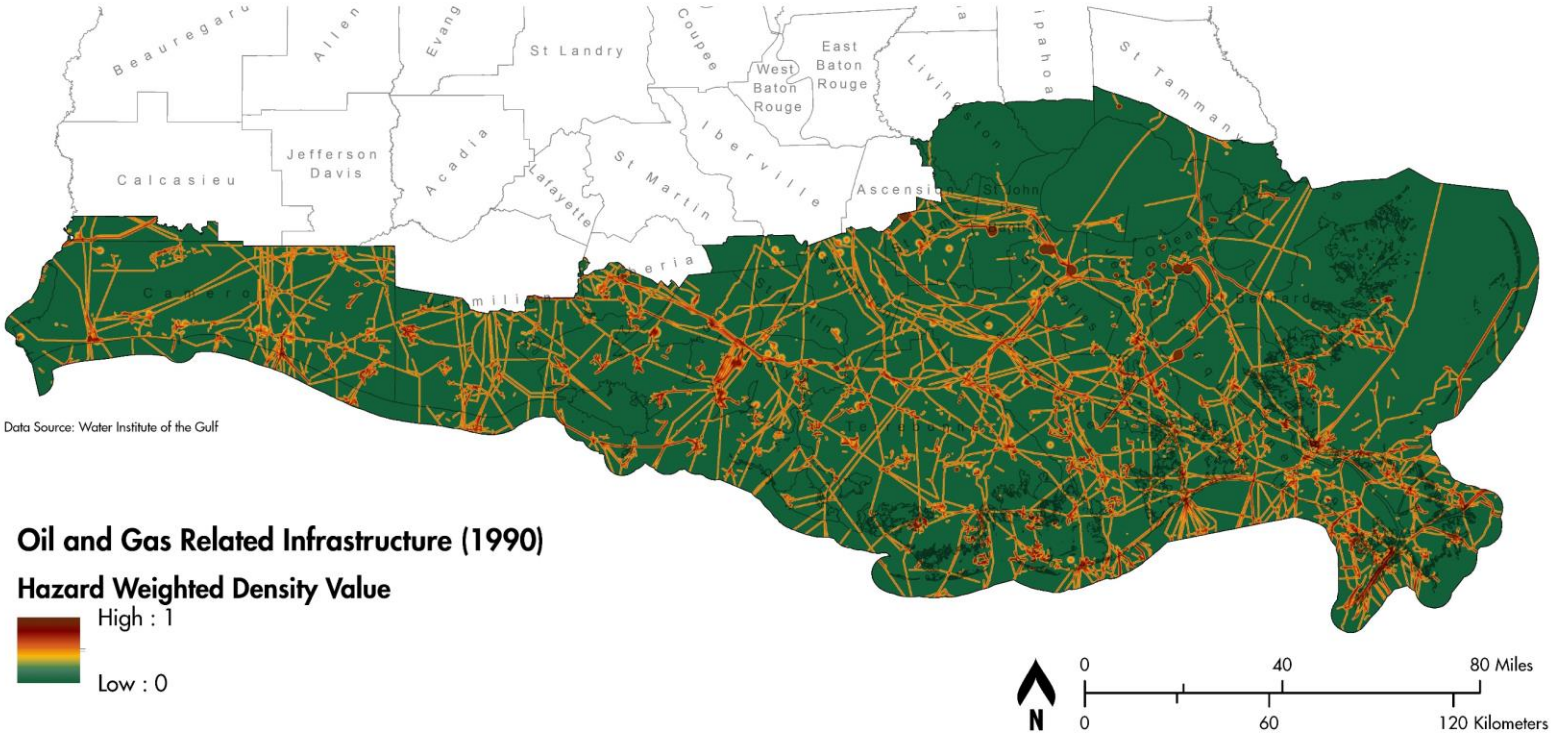

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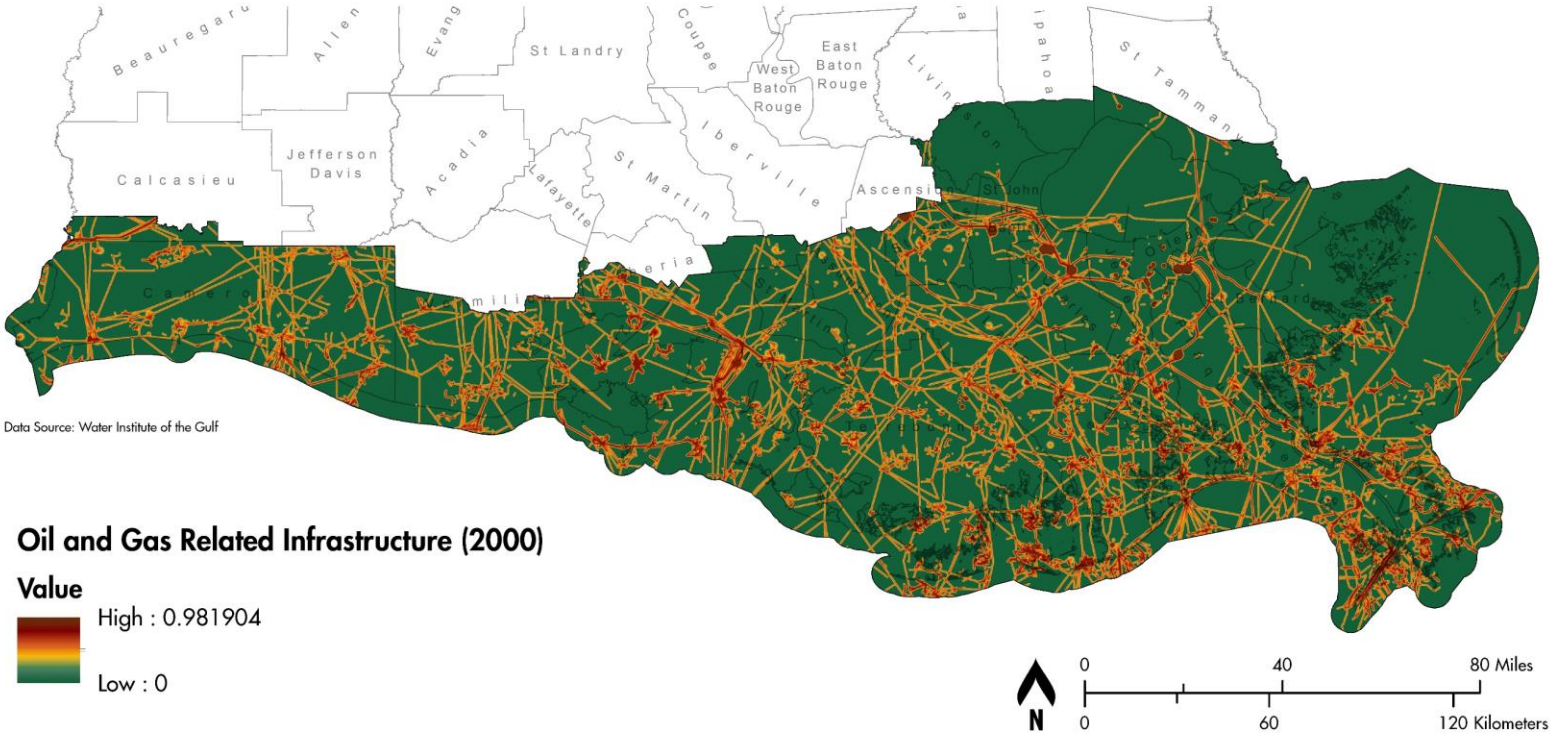

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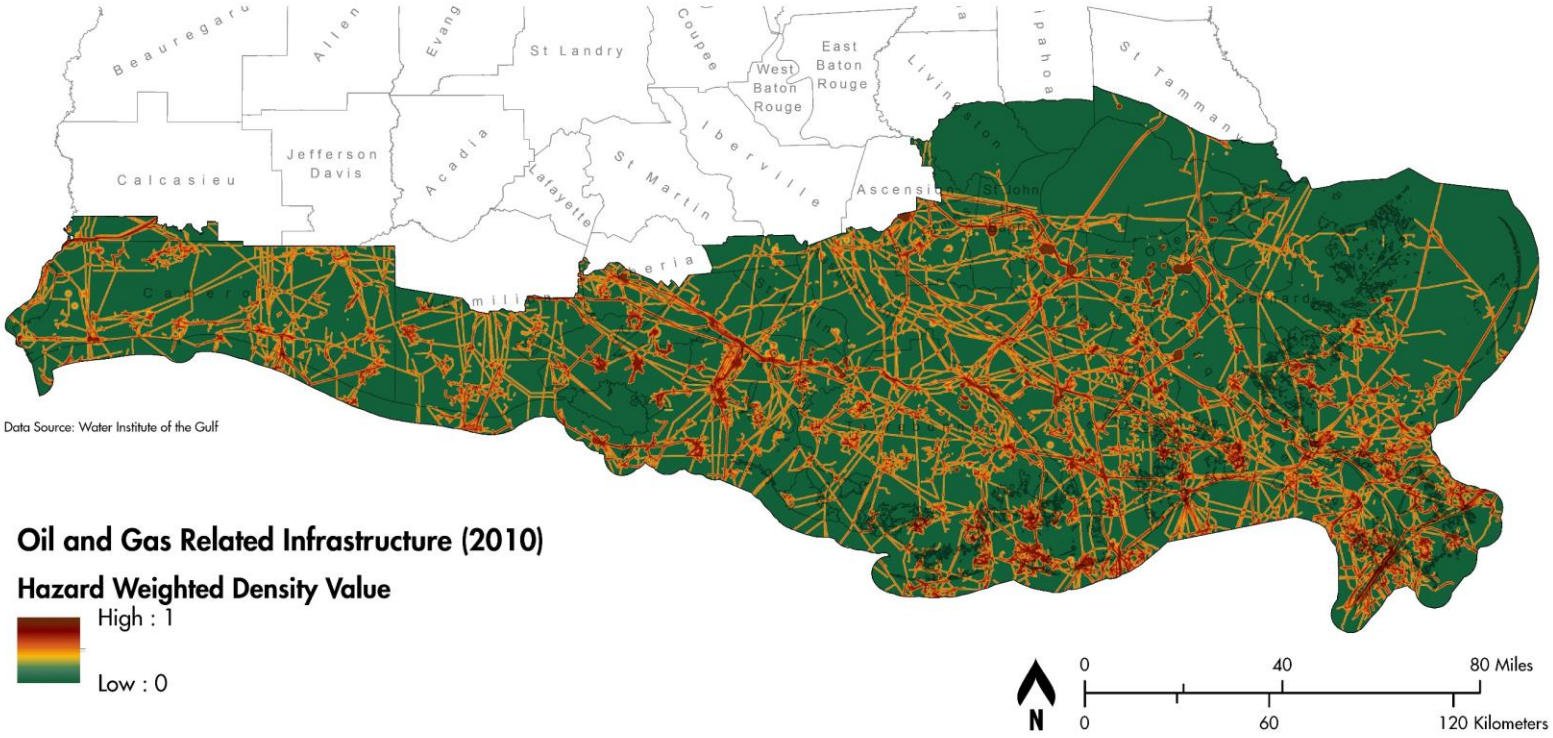
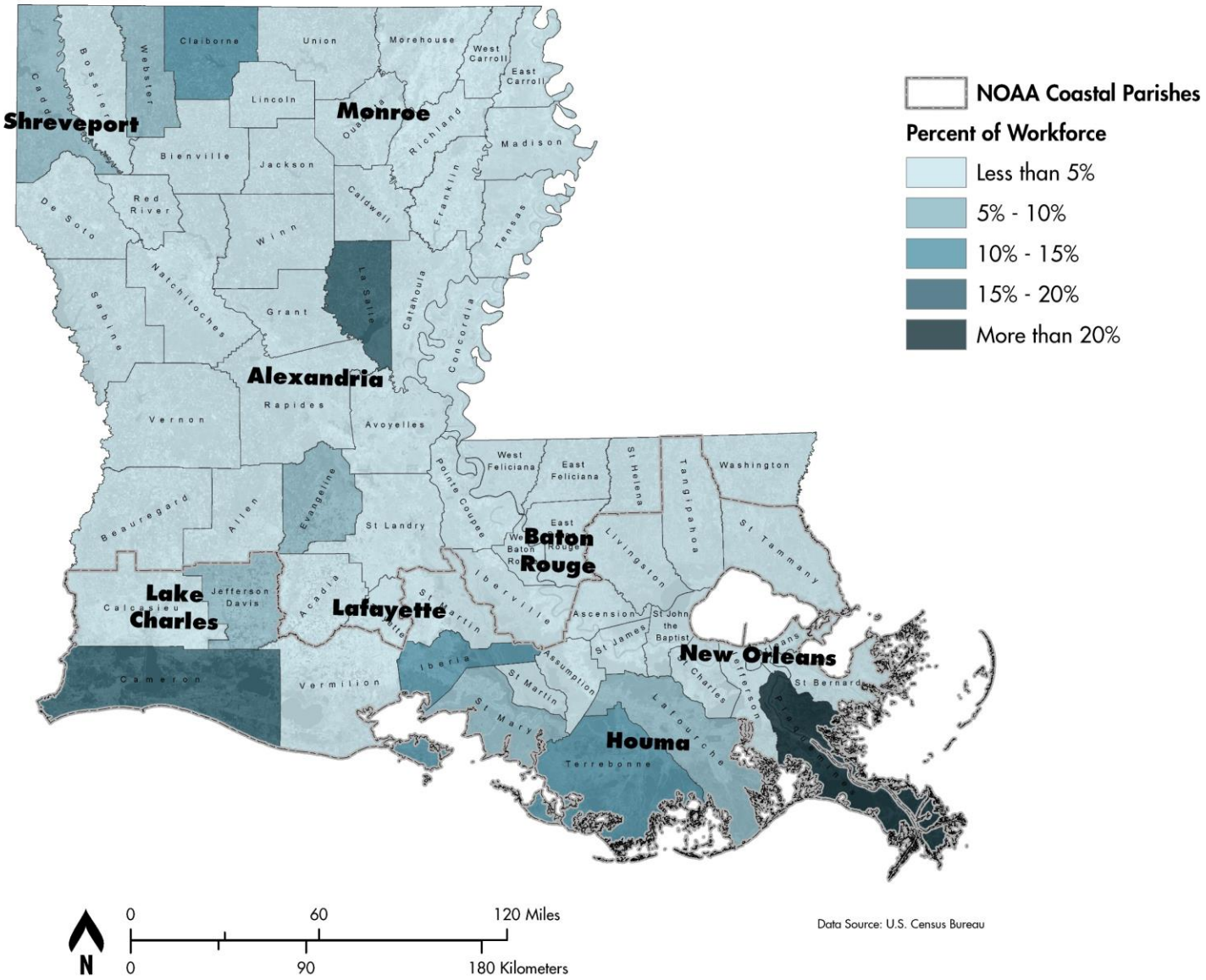
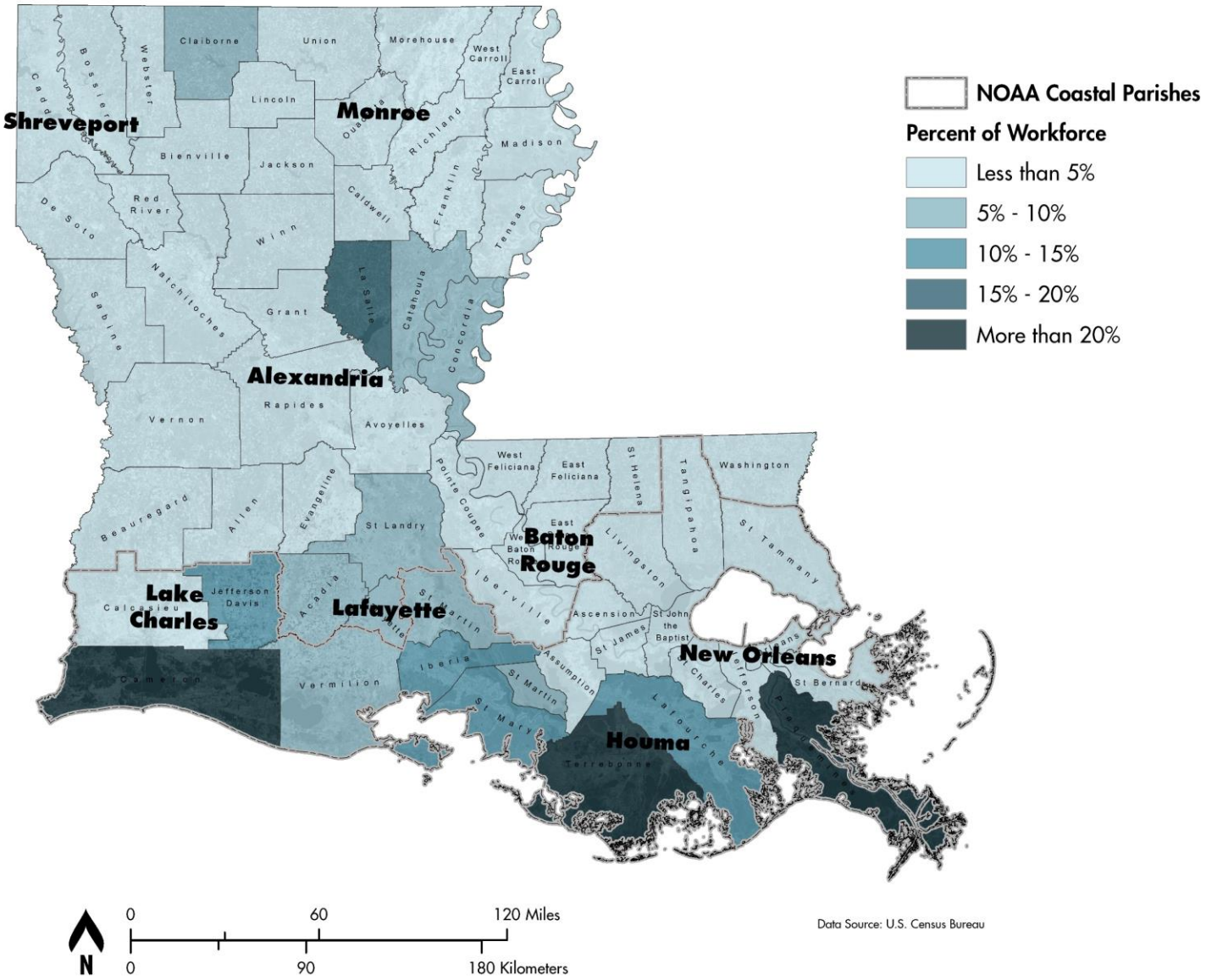


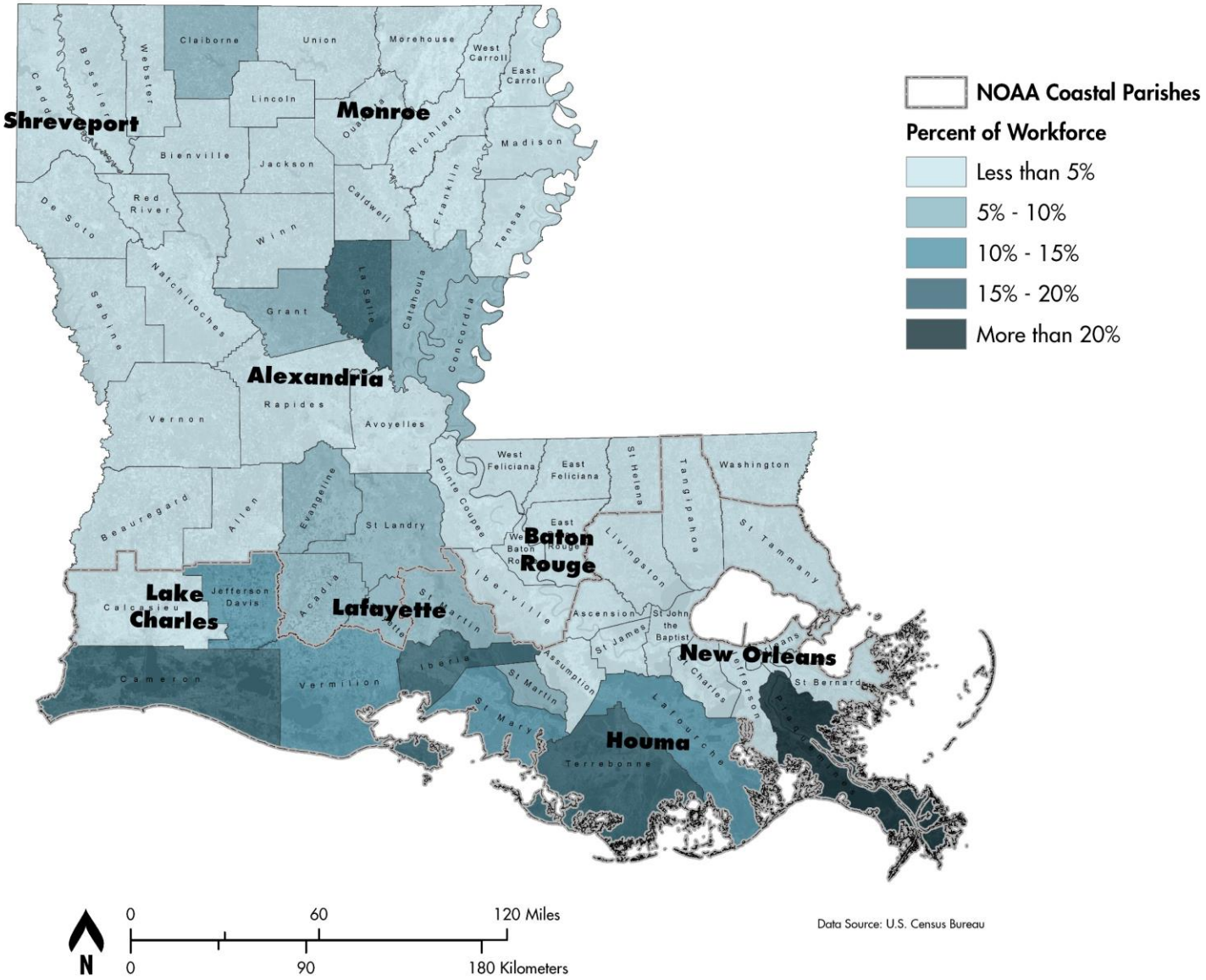
Percent of the Workforce Employed in Oil and Gas (1950)



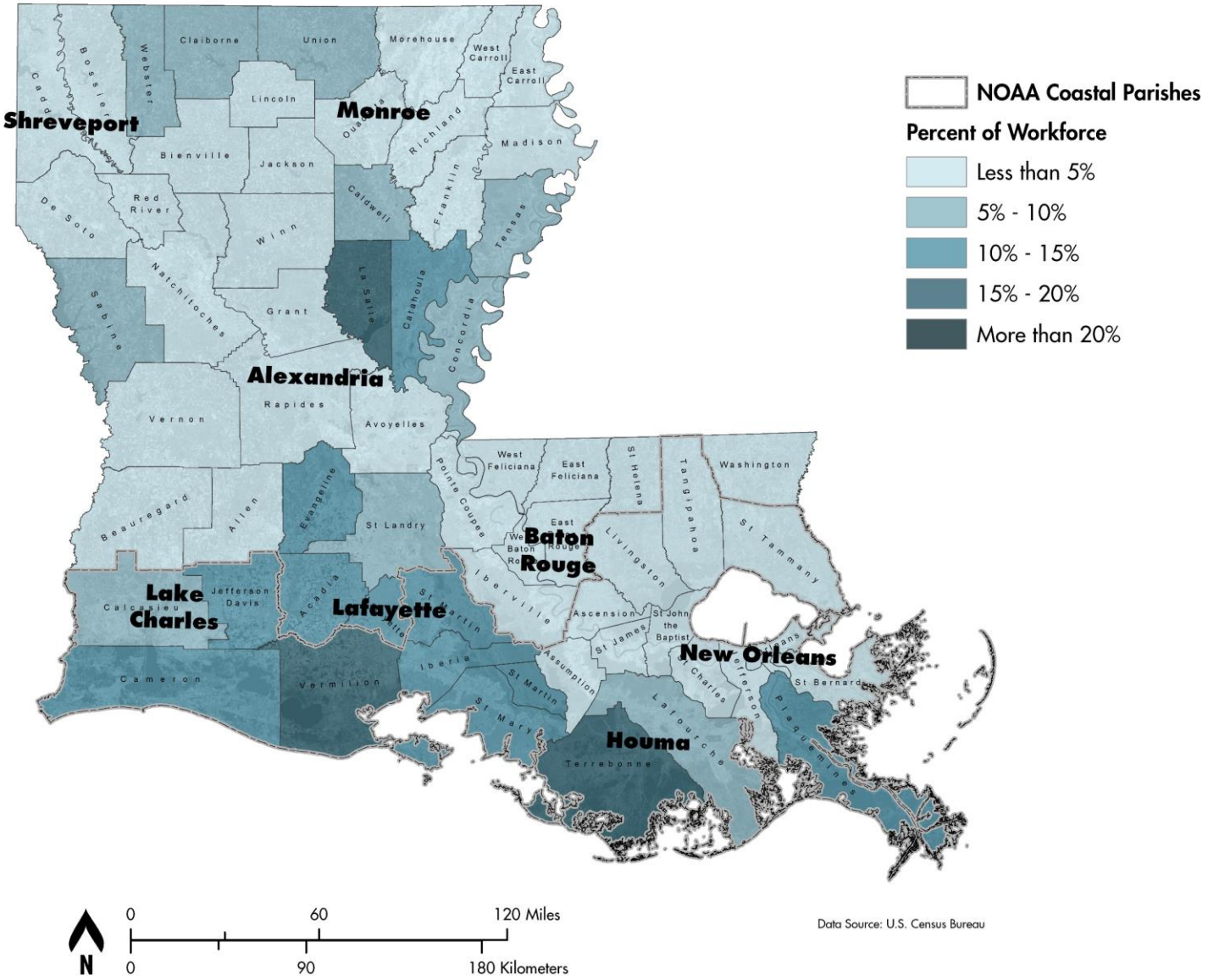
Percent of the Workforce Employed in Oil and Gas (1960)



Percent of the Workforce Employed in Oil and Gas (1970)



Percent of the Workforce Employed in Oil and Gas (1990)



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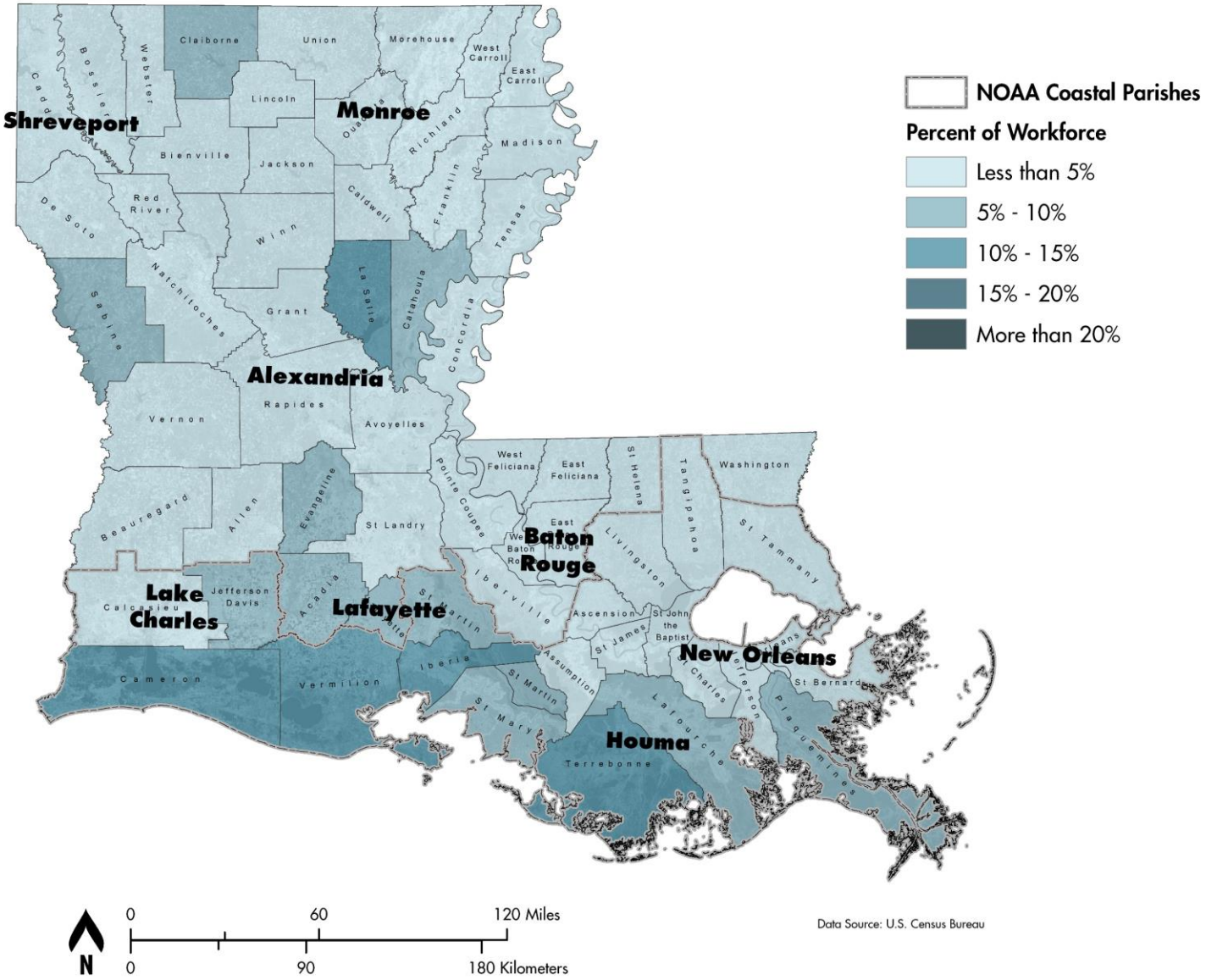

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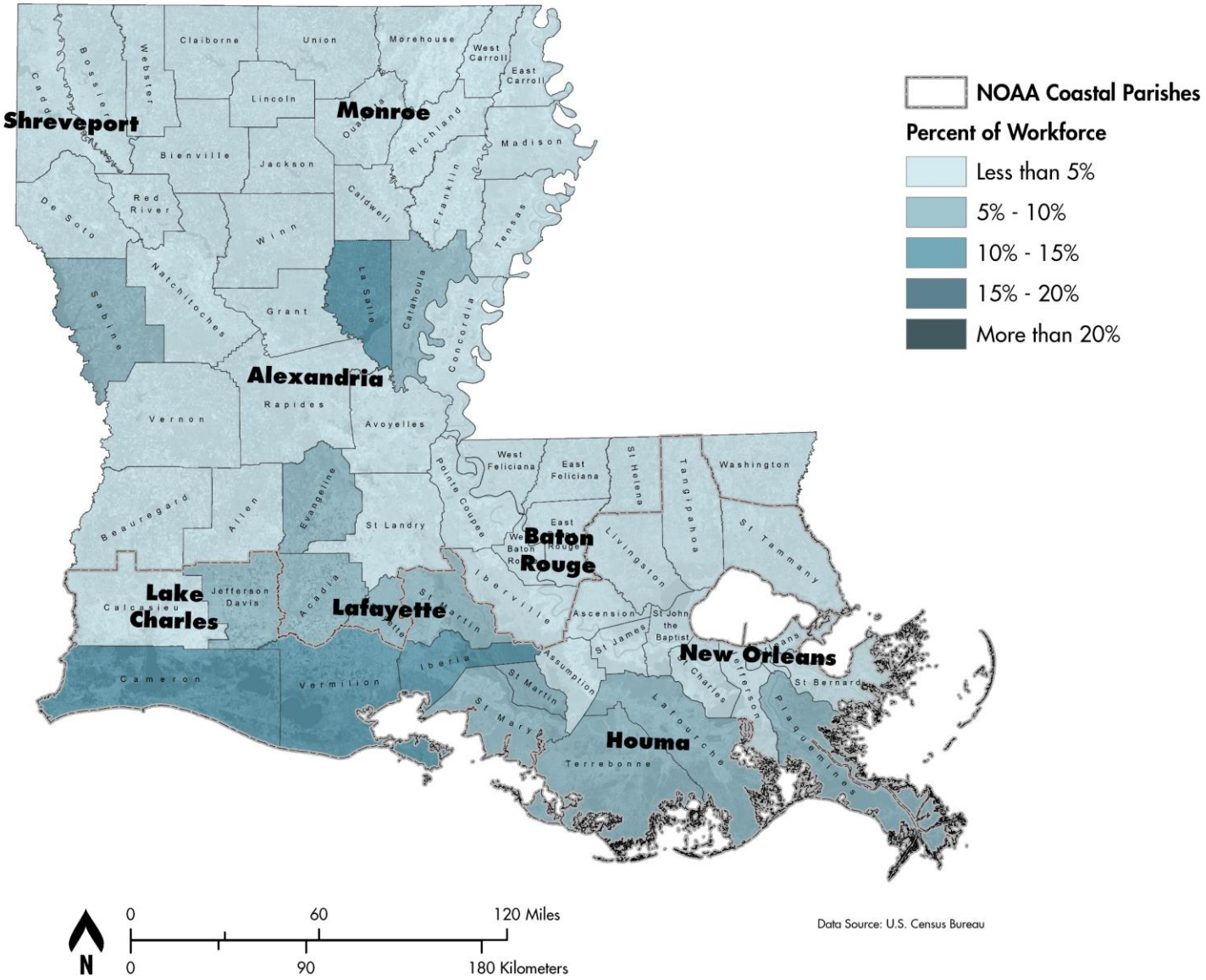
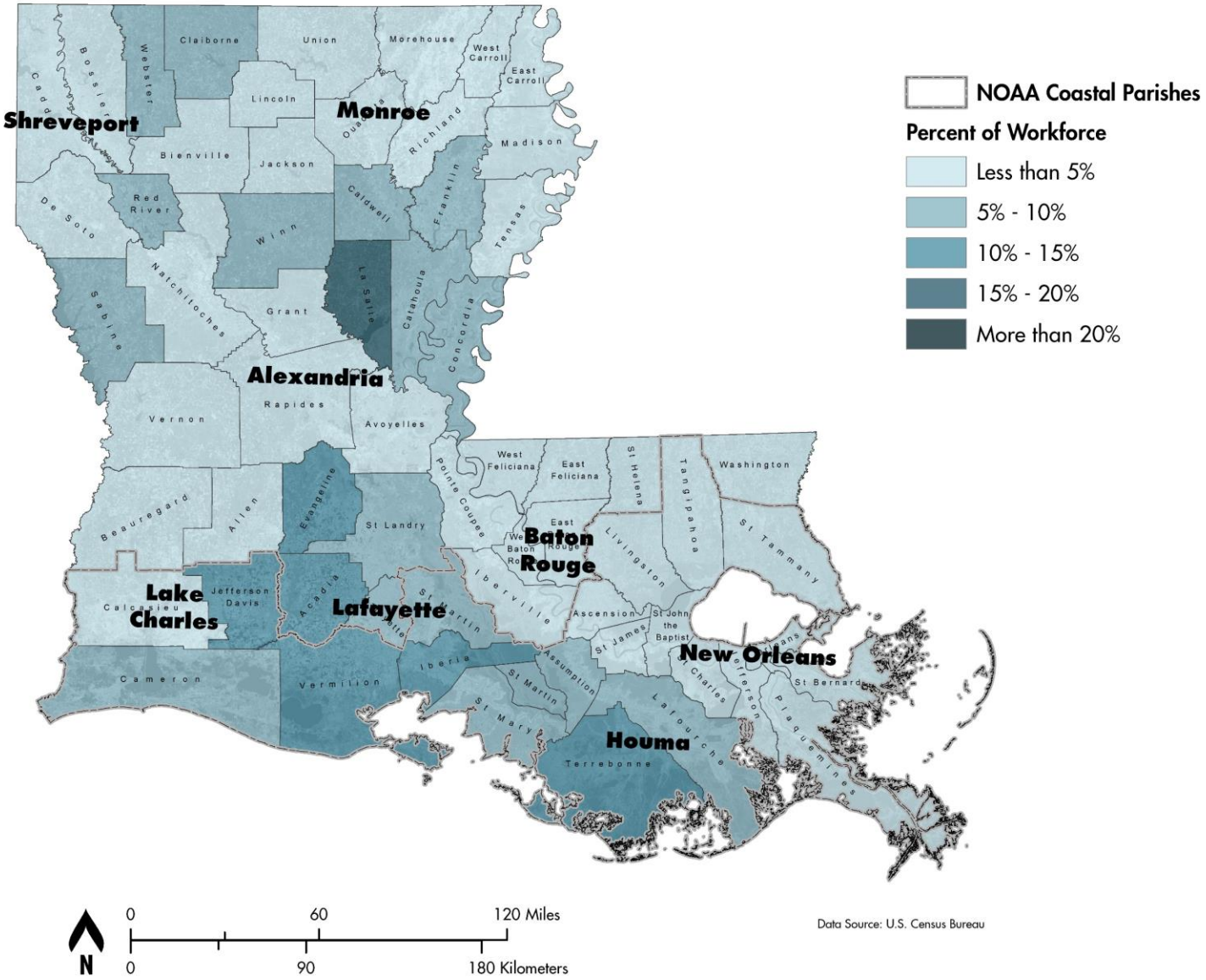


Percent of the Workforce Employed in Oil and Gas (2010)



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Linkages and next phase

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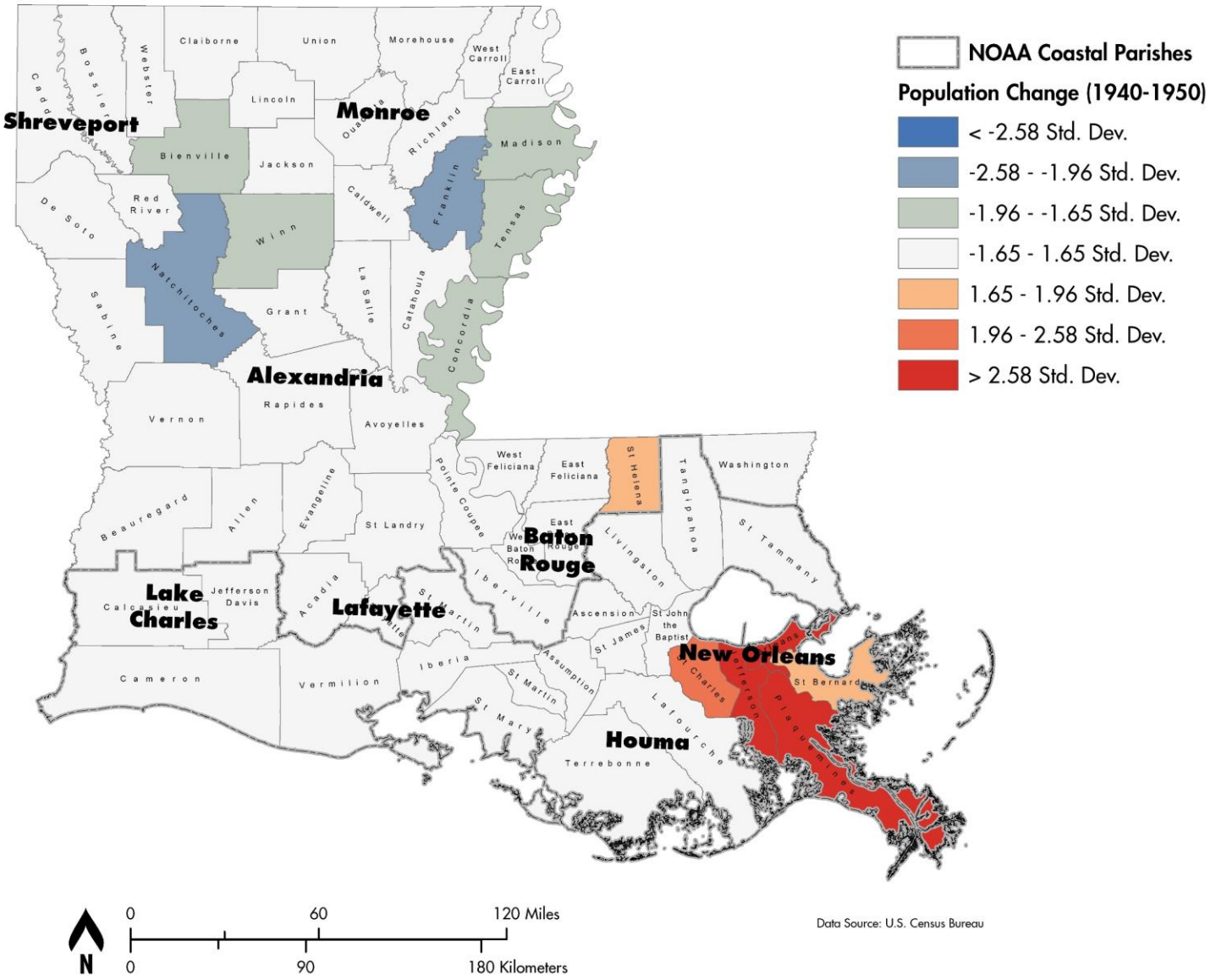

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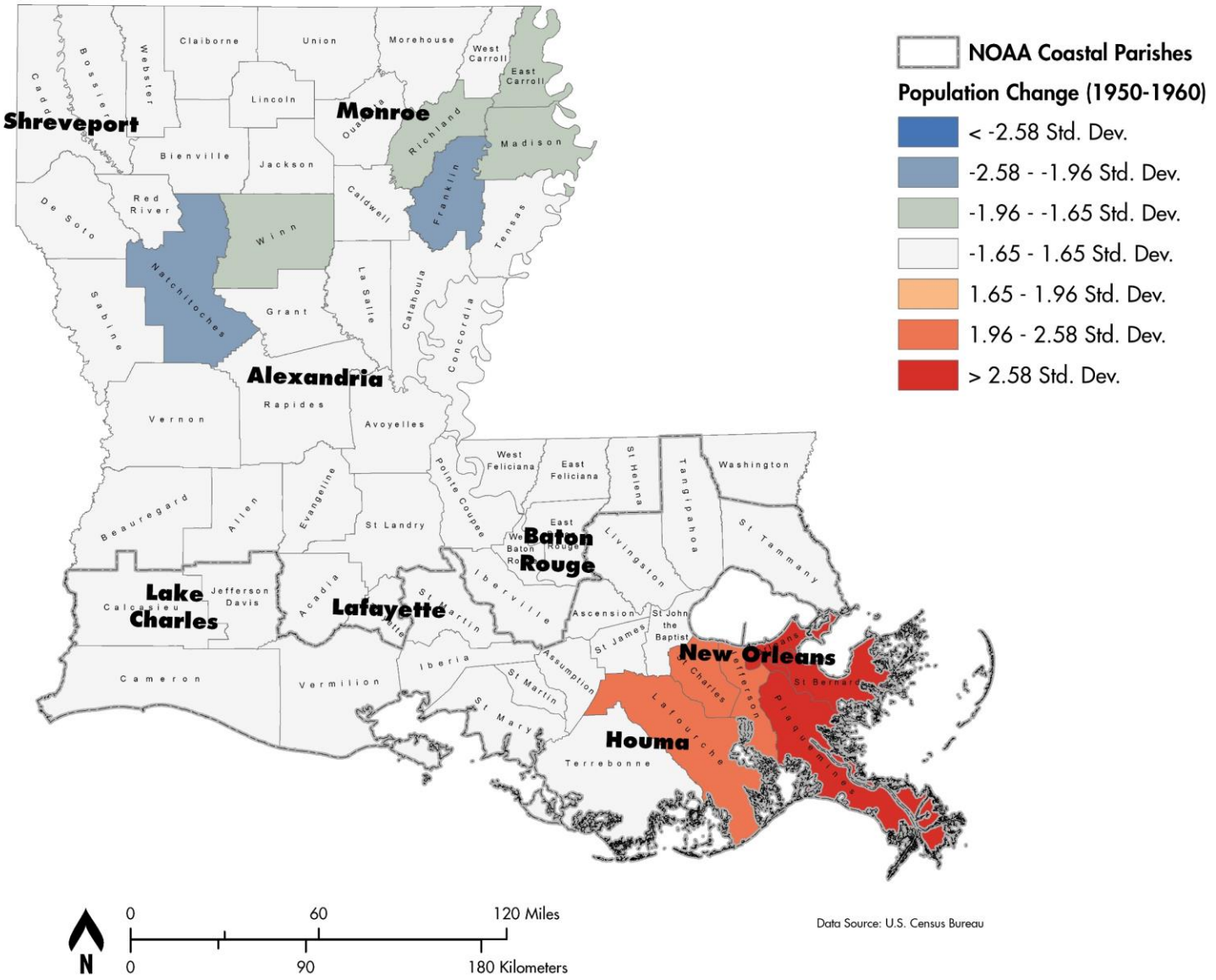

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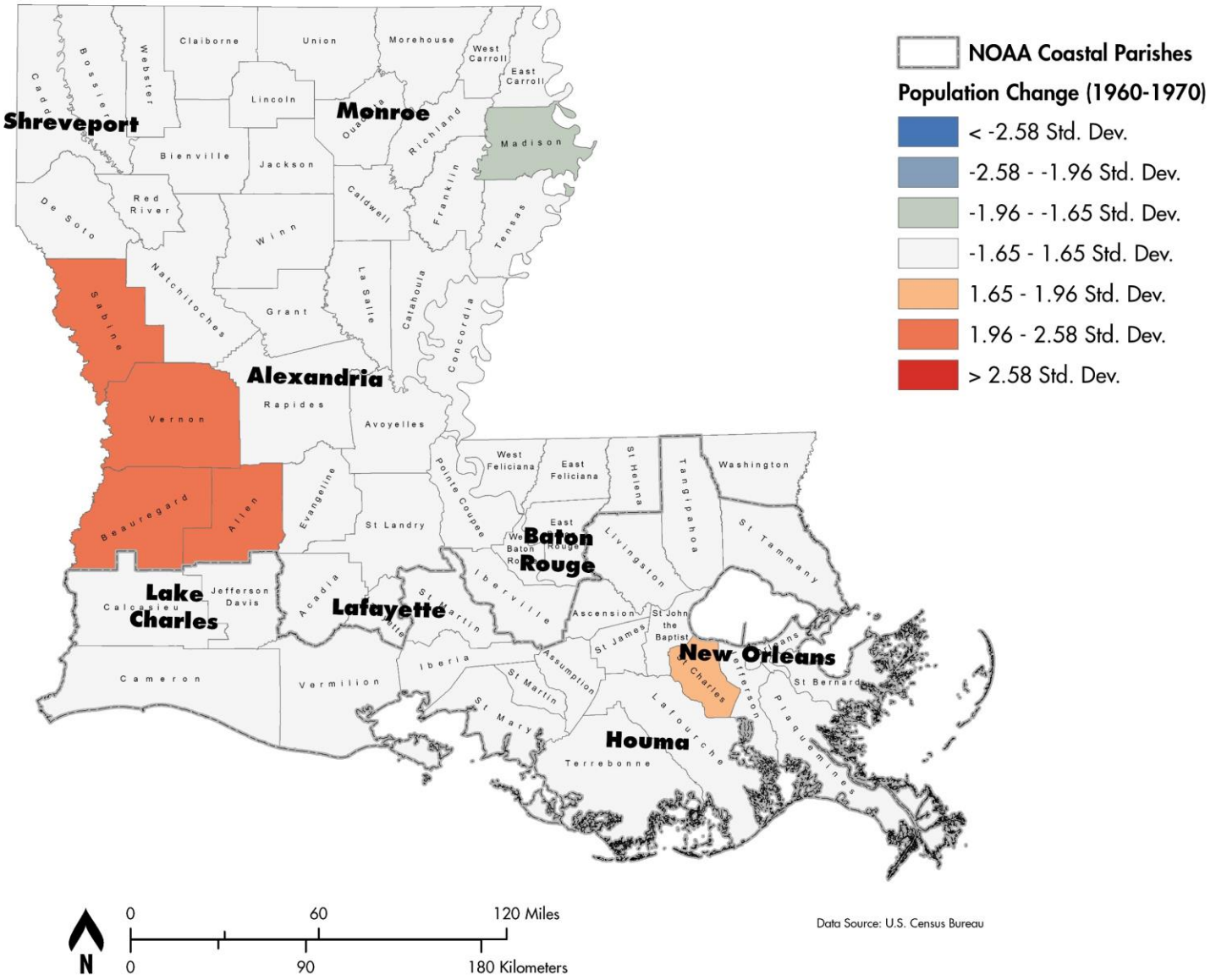

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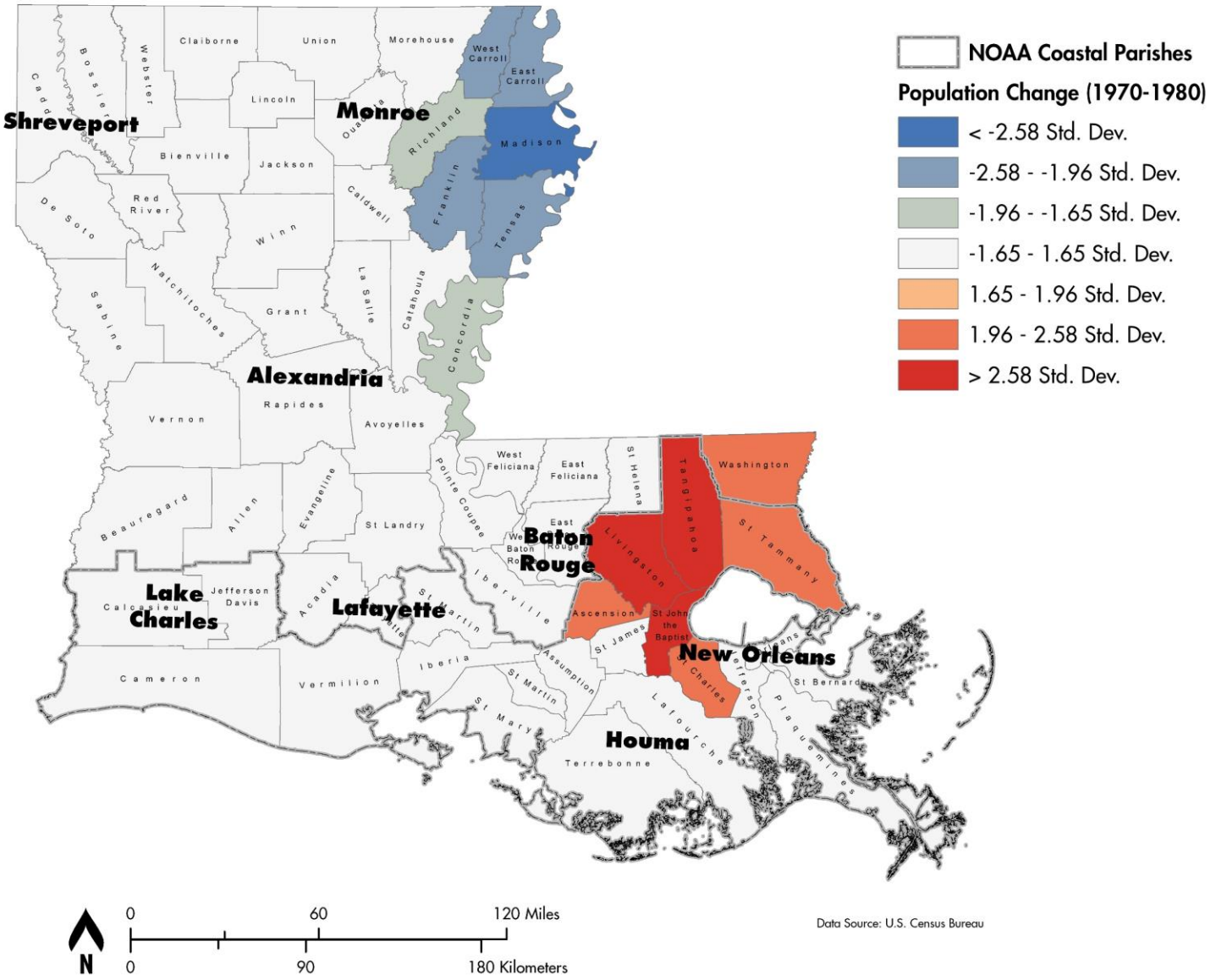

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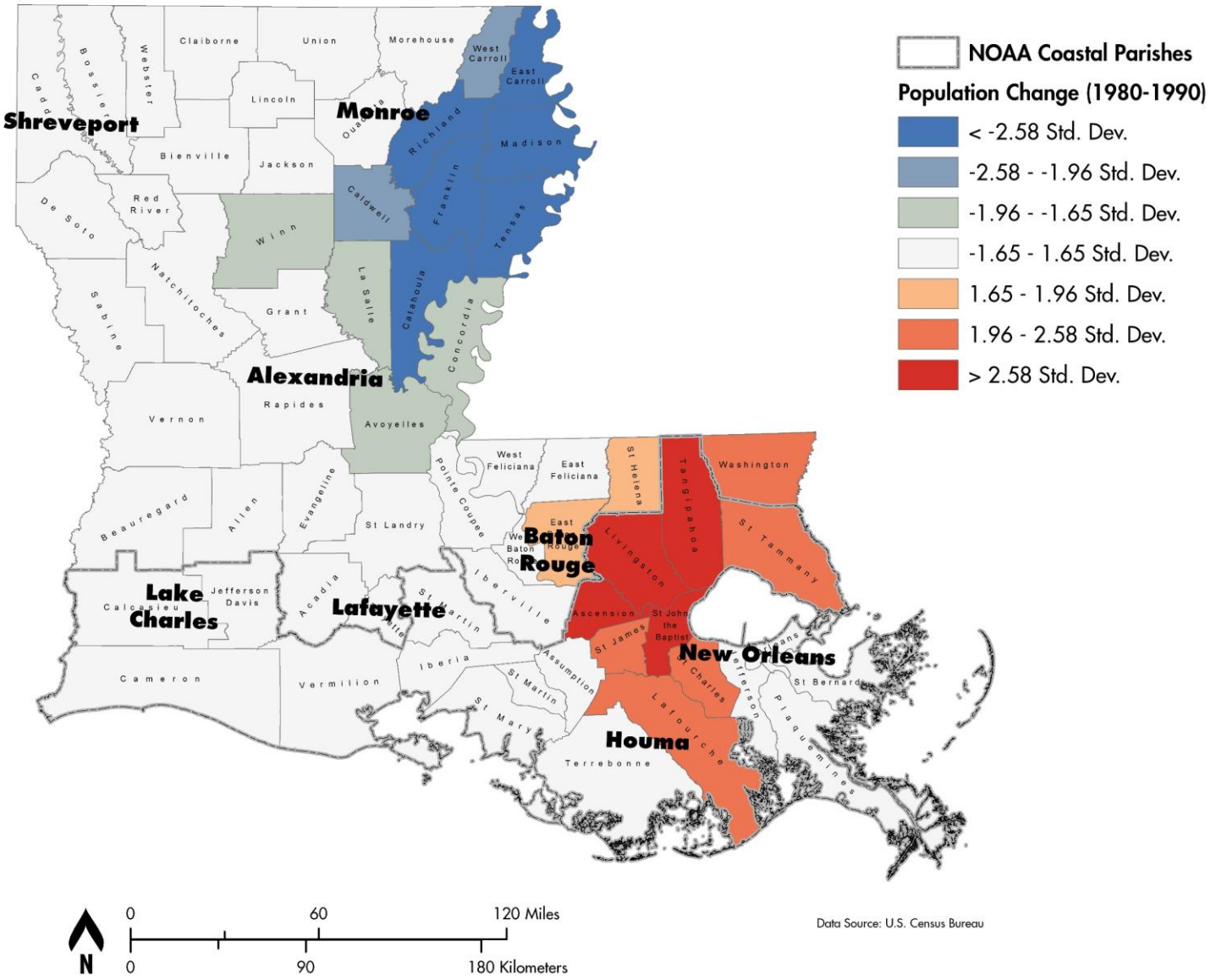

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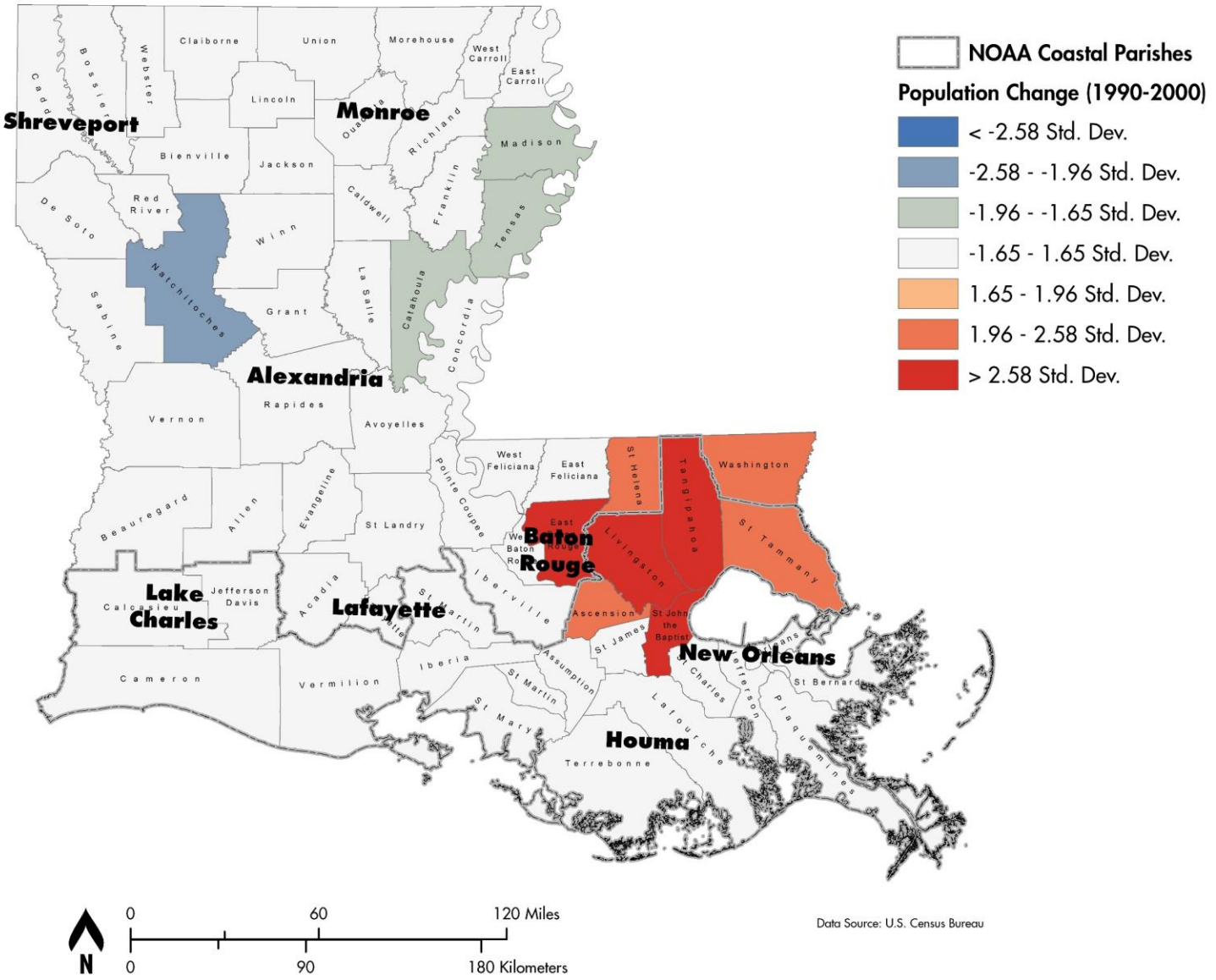

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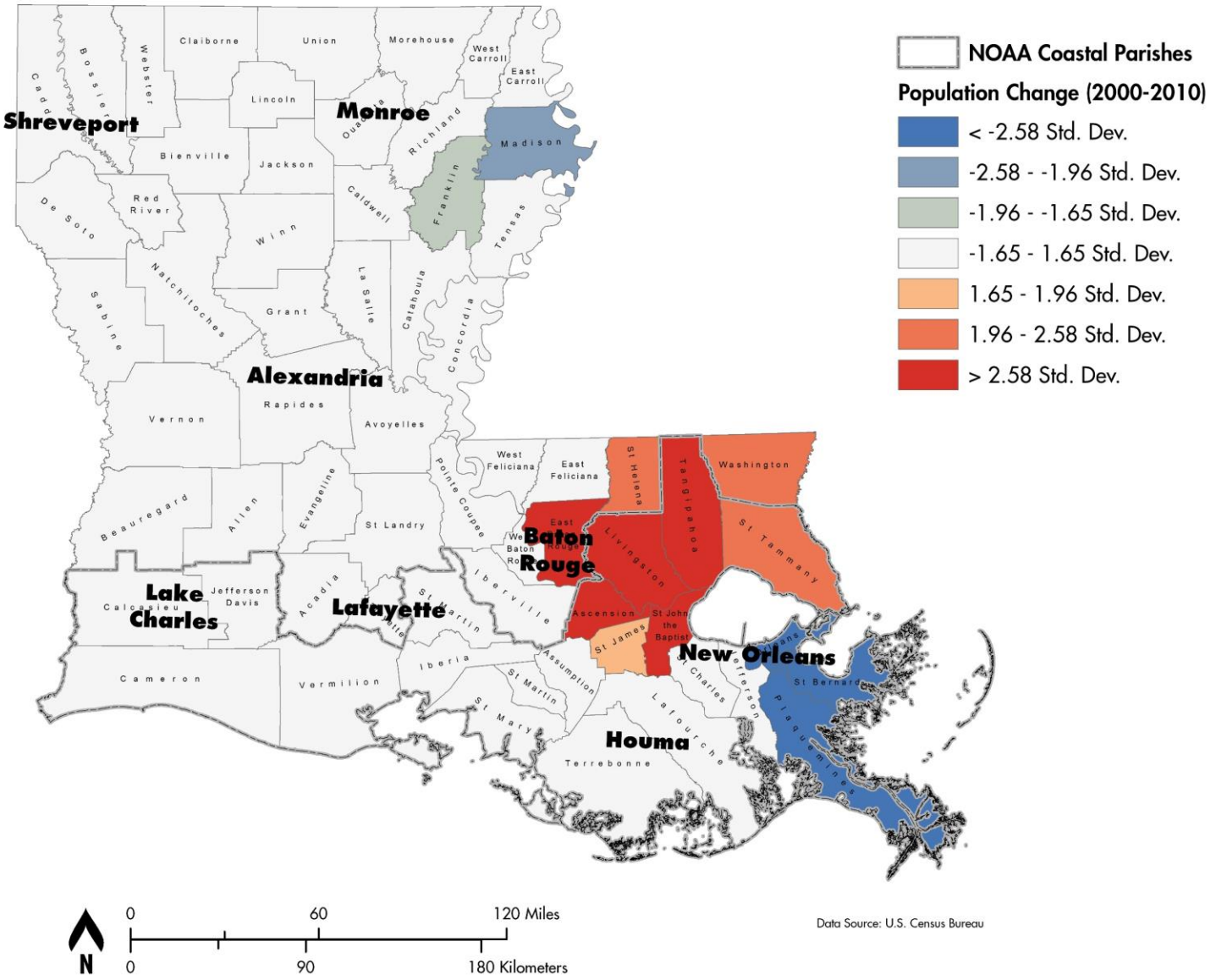
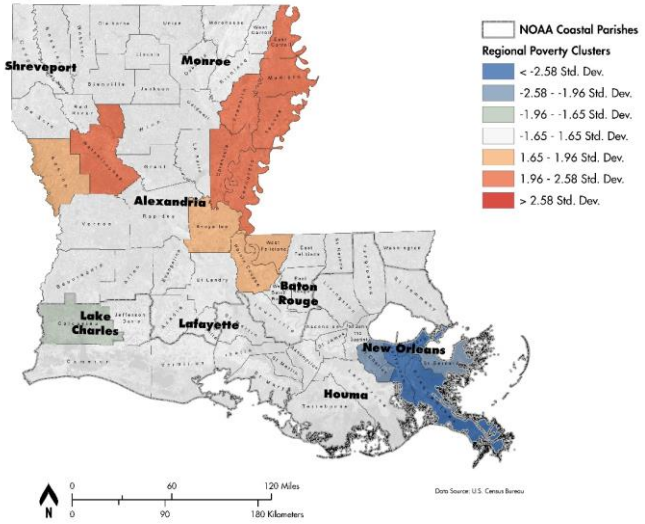
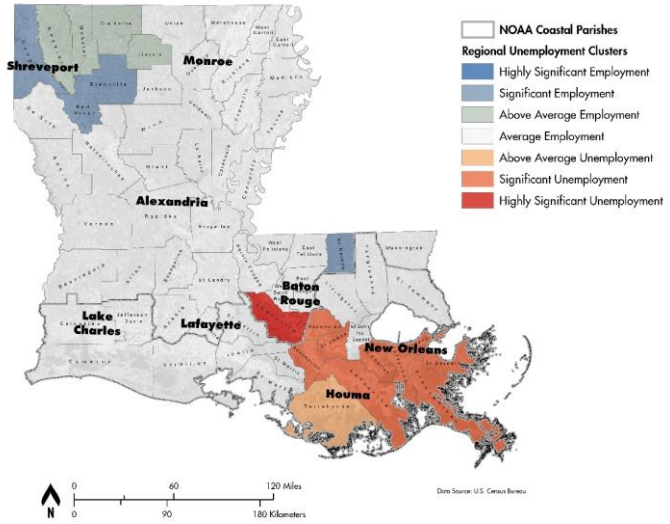


Clusters of High and Low Poverty in Louisiana Parishes (1950)



Clusters of High and Low Unemployment in Louisiana Parishes (1950)



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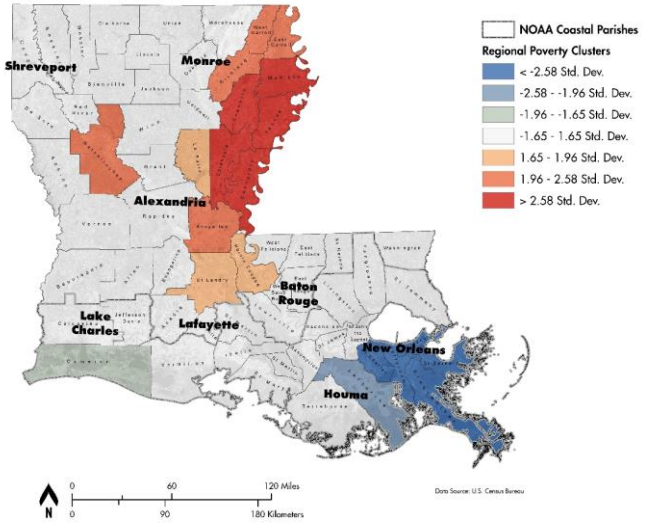

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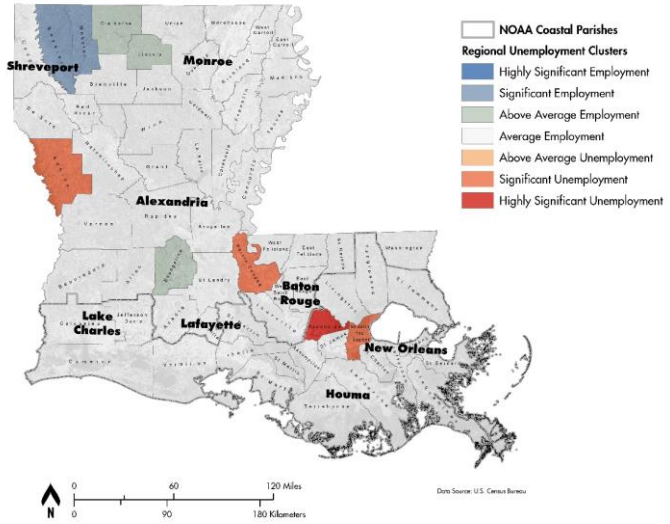
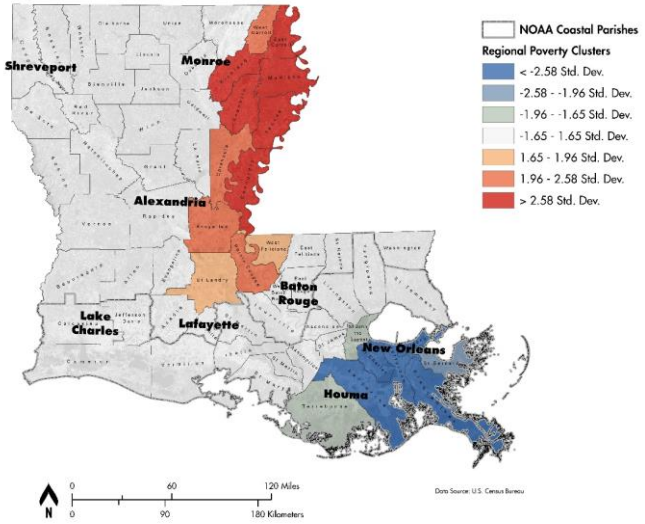


Clusters of High and Low Poverty in Louisiana Parishes (1970)



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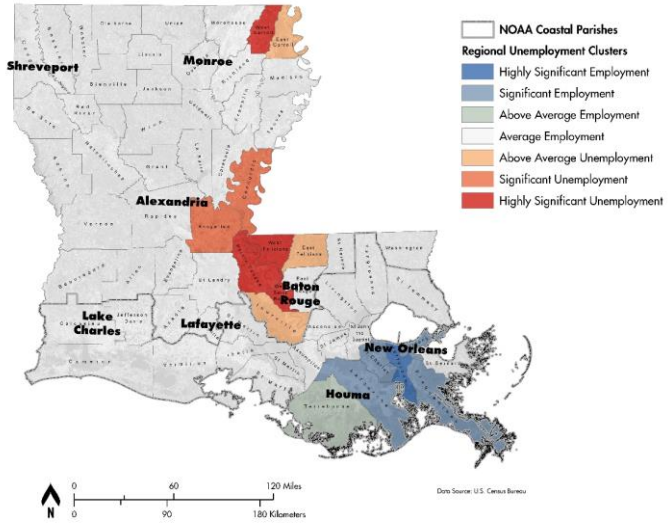
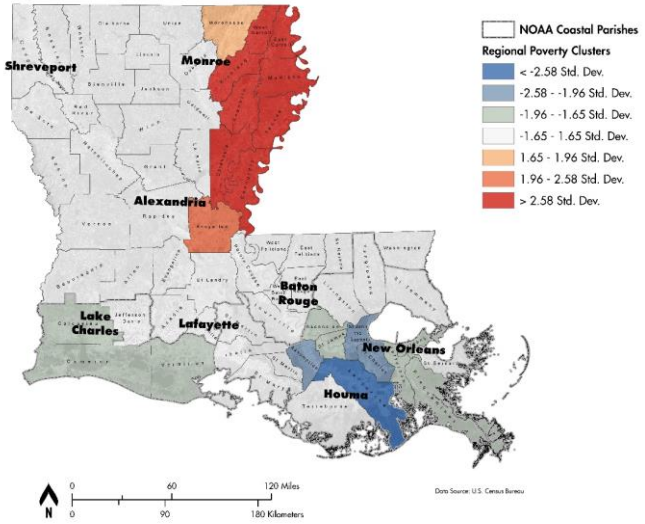
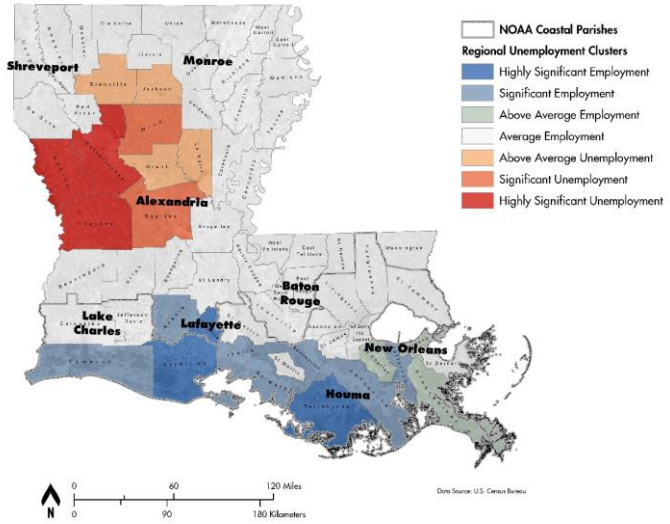


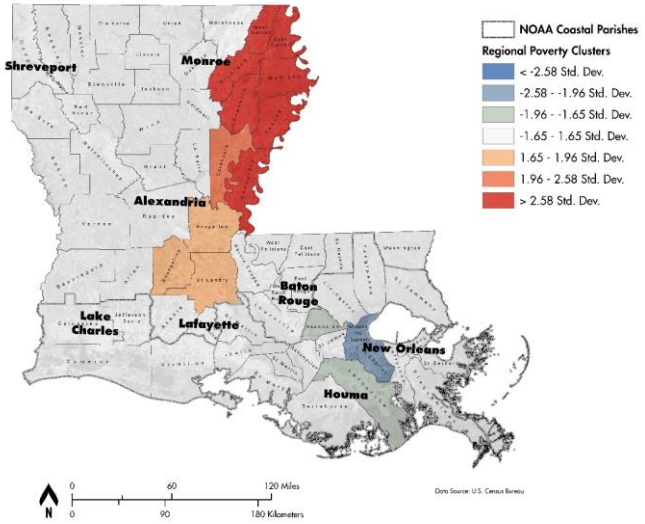
Clusters of High and Low Poverty in Louisiana Parishes (1980)



Clusters of High and Low Unemployment in Louisiana Parishes (1980)



Clusters of High and Low Poverty in Louisiana Parishes (1990)



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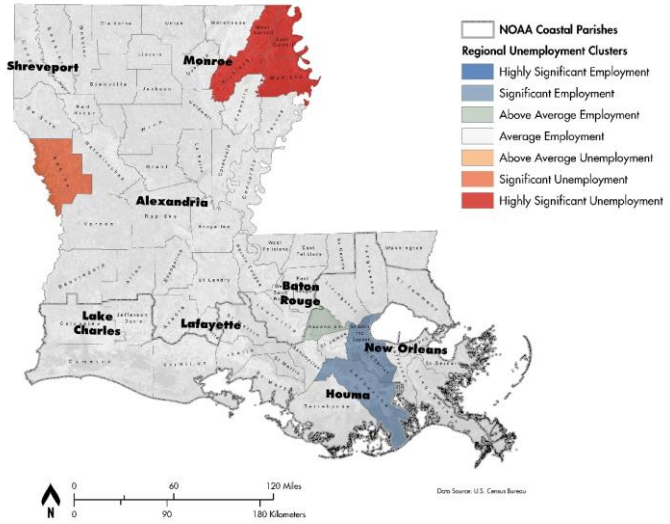

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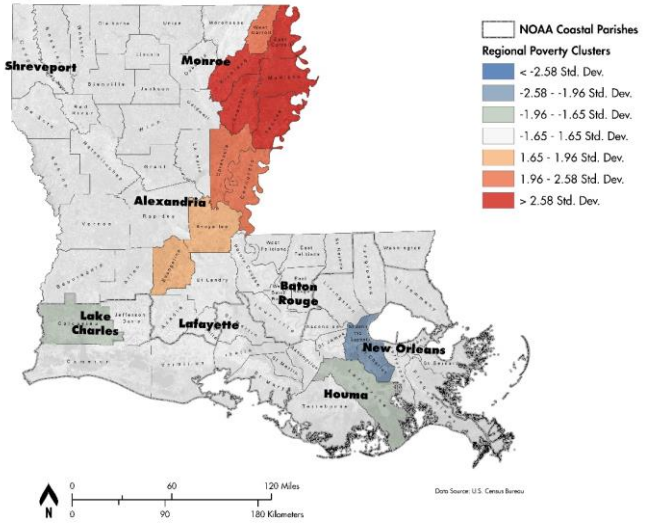

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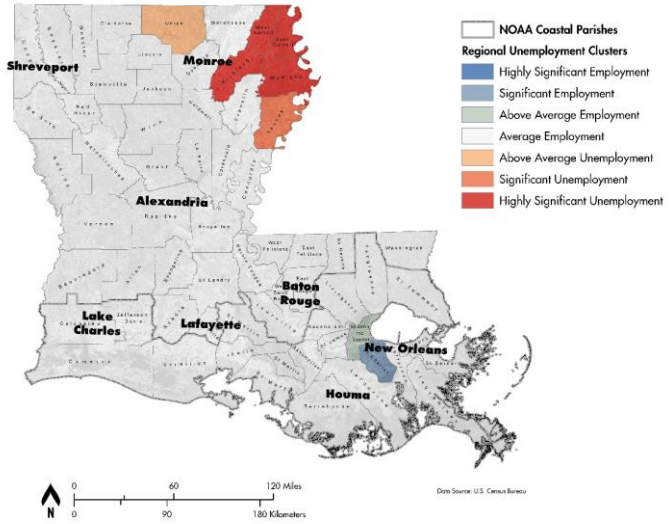
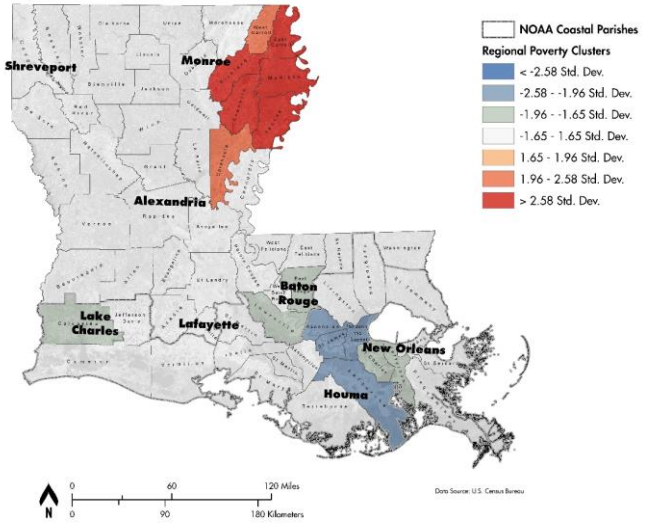
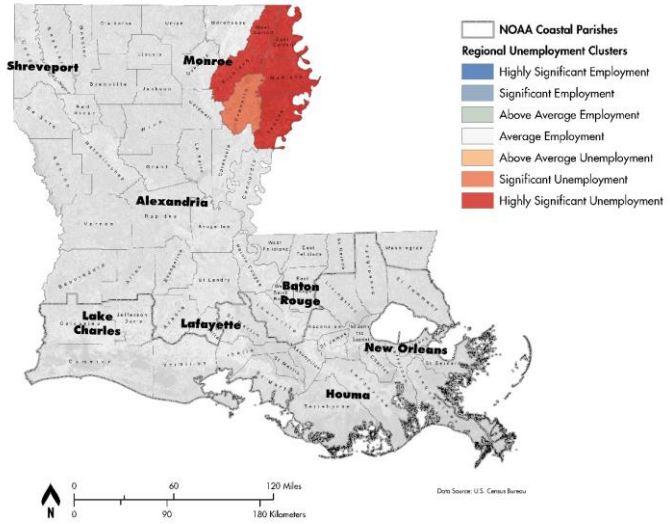


Clusters of High and Low Poverty in Louisiana Parishes (2010)



Clusters of High and Low Unemployment in Louisiana Parishes (2010)



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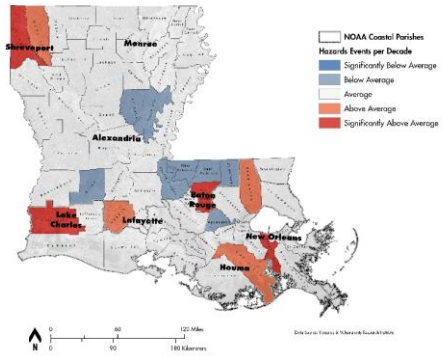
Linkages and next phase

TWO MAIN CATEGORIES OF DISTURBANCE…

- Exogenous Discrete Events or System Shocks
  - The impact of a single shock on resilience could be measured in a single decade
  - It might take a generation to learn how a region changes as a result of repeated shocks

Pendall, Foster, and Cowell (2008)

Total Hazards Events (1970-1980)



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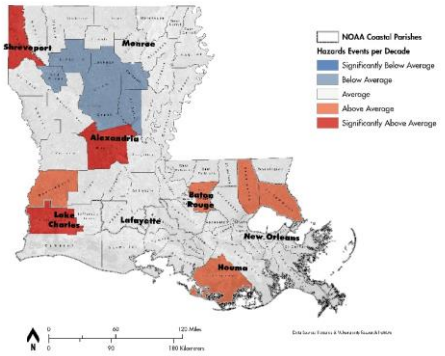
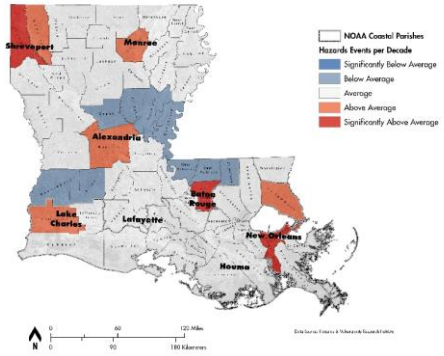
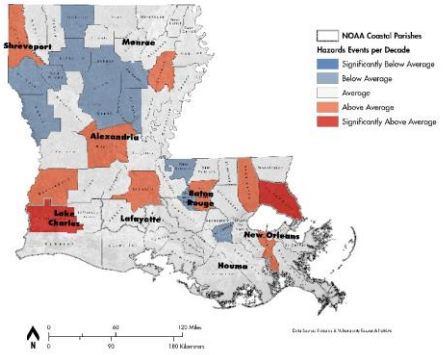


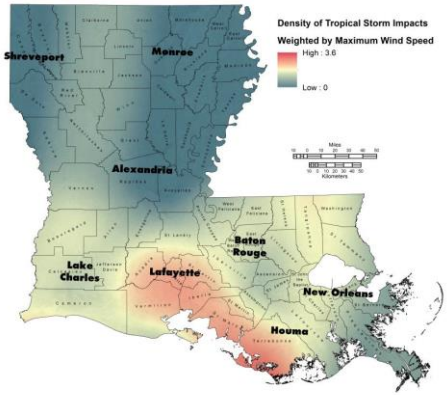
Total Hazards Events (1980-1990)



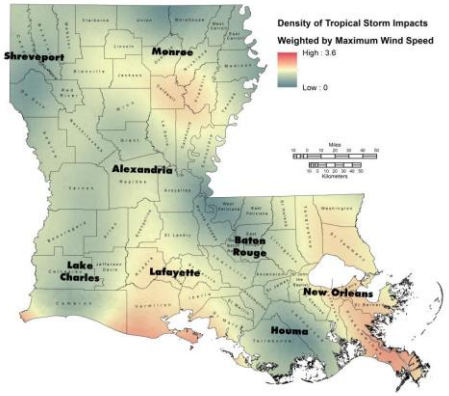
Total Hazards Events (2000-2010)



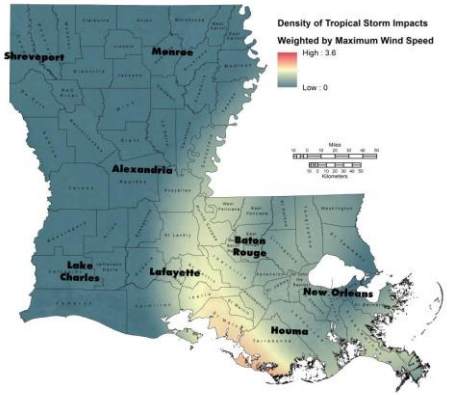
1970-1980



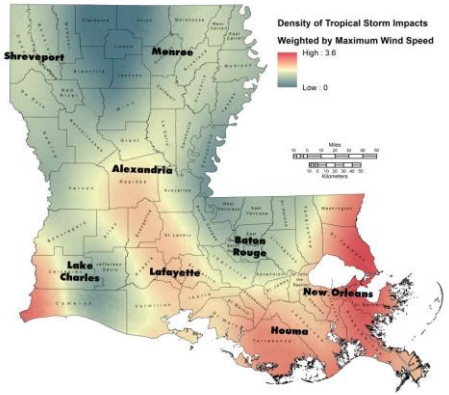
1980-1990



1990-2000

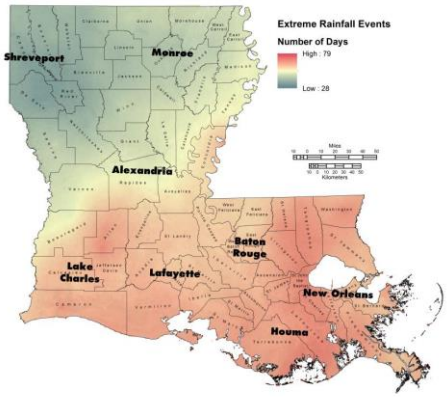


2000-2010

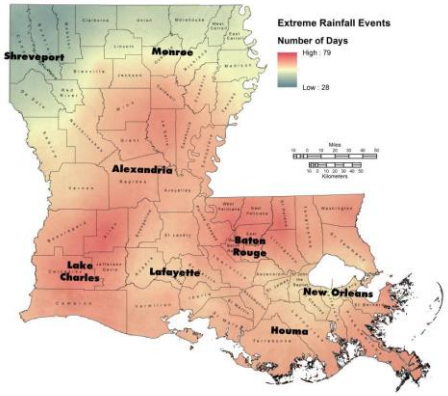


Source: Hemmerling 2017

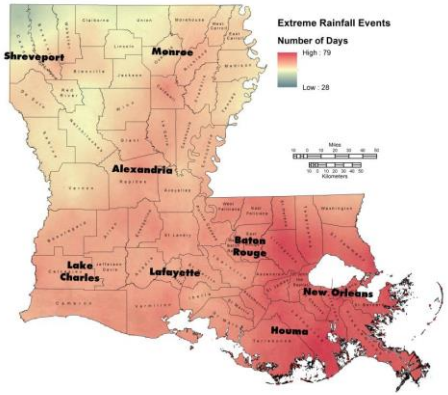
1970-1980



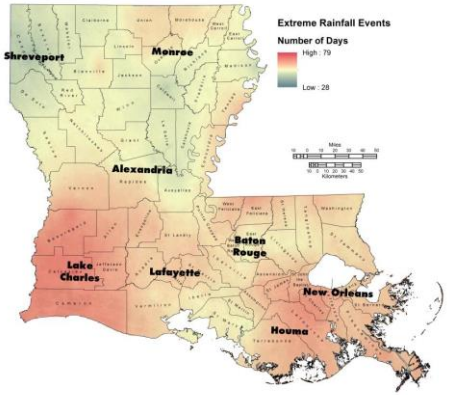
1980-1990



1990-2000



2000-2010



Source: Hemmerling 2017

PRESENTATION OUTLINE

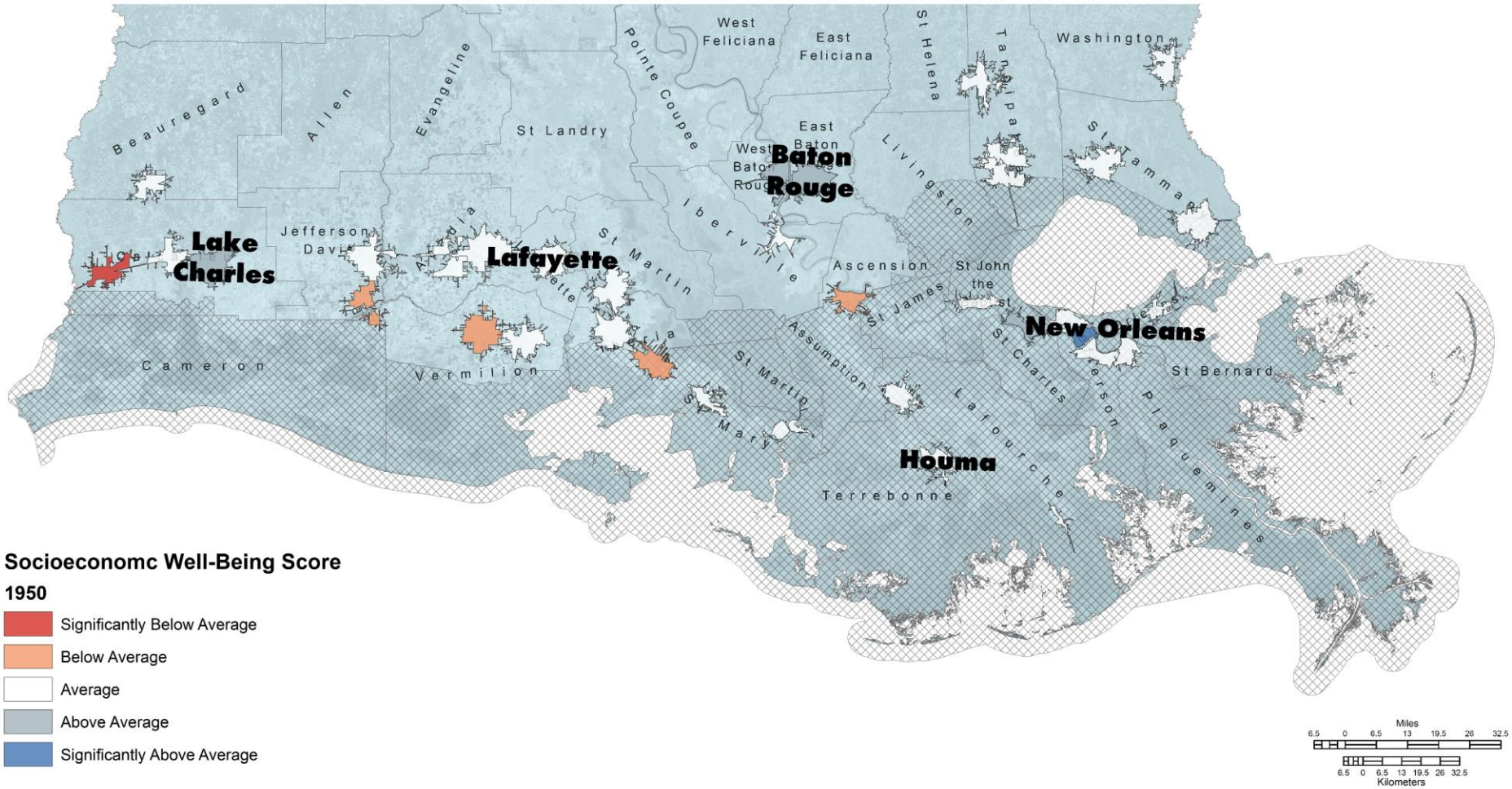
Trends in oil and gas development
1950's to 2010's

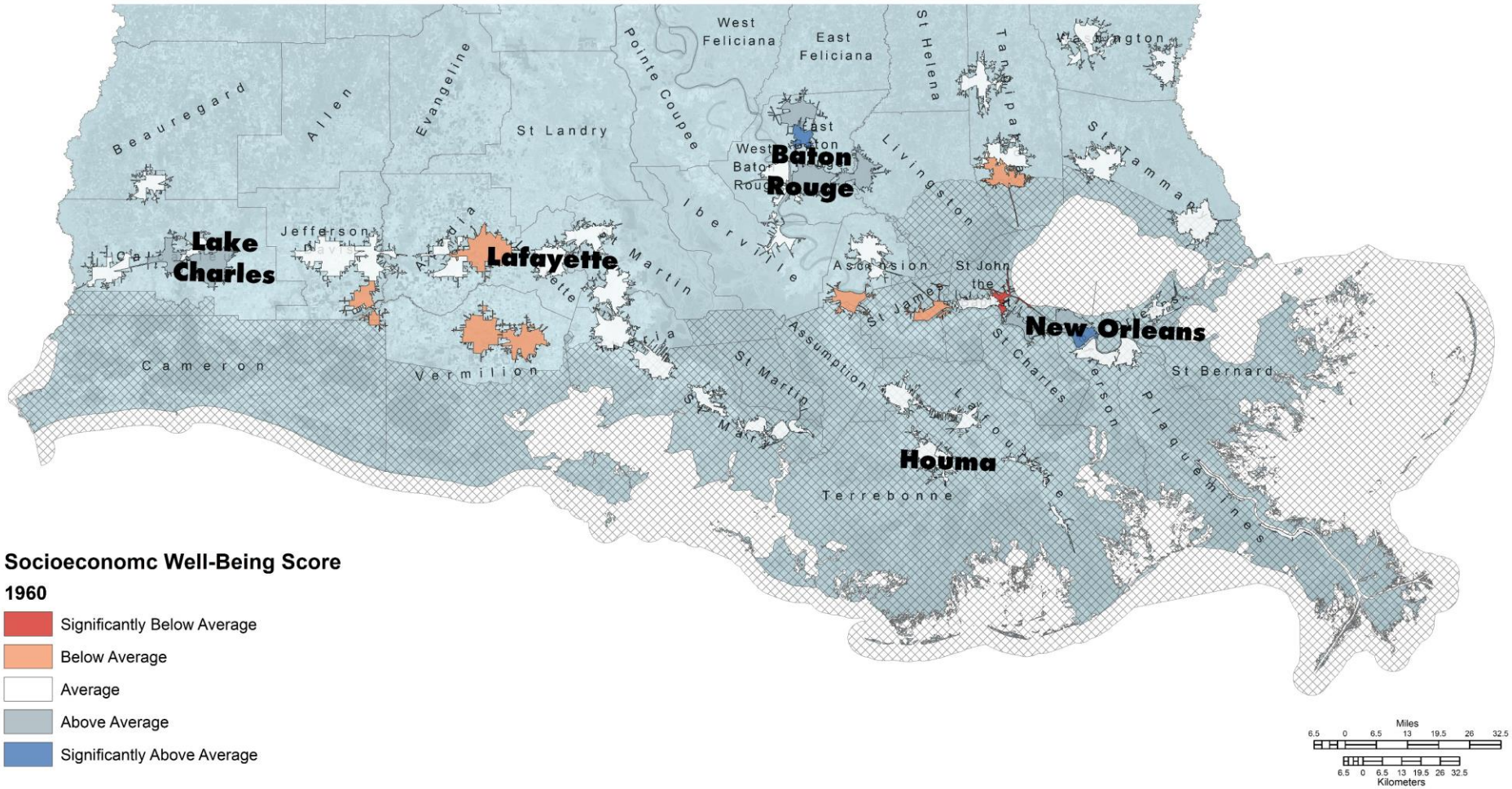
Trends in socioeconomic variables
1950's to 2010's

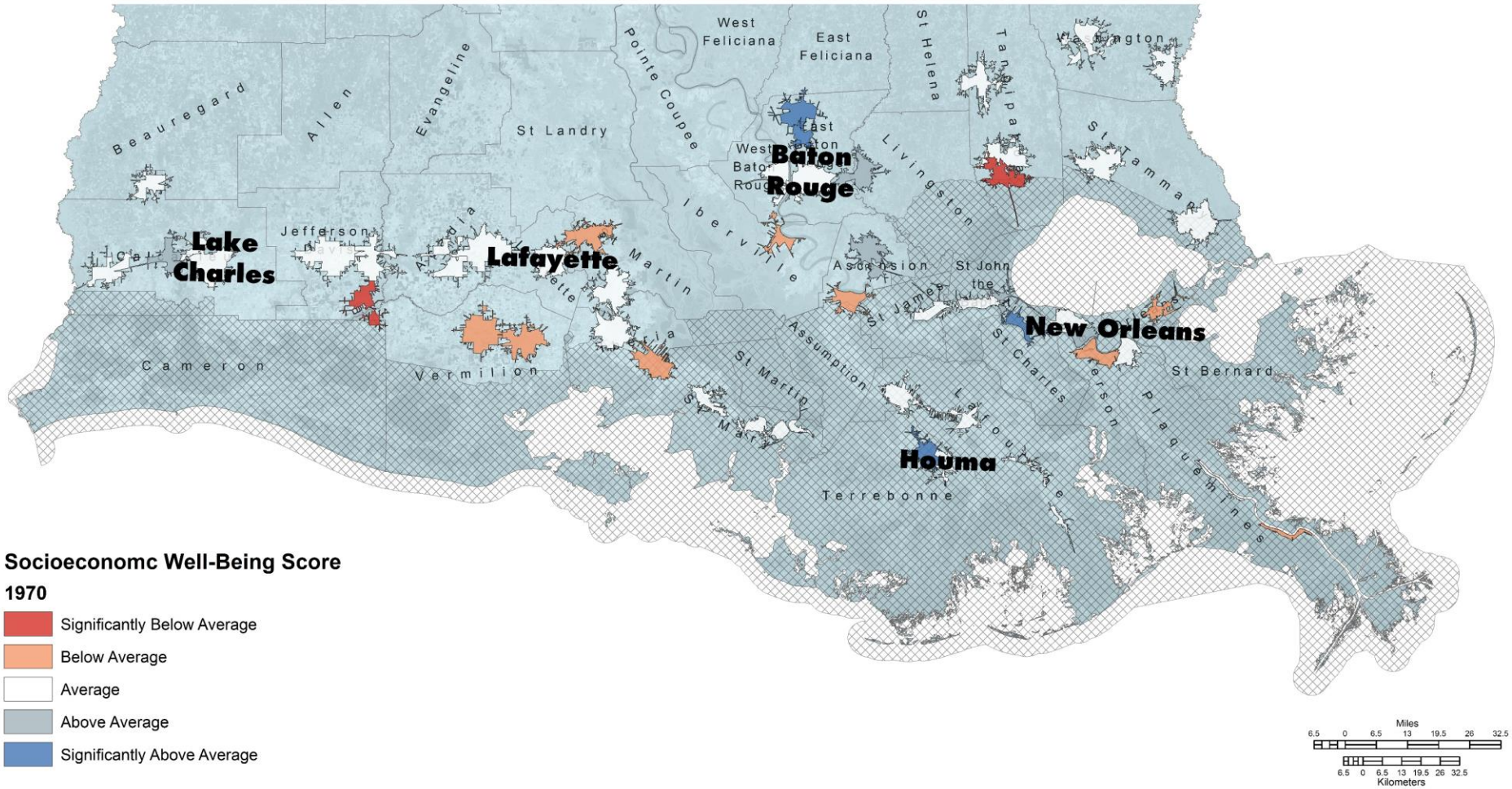
Trends in historical environmental change
1950's to 2010's

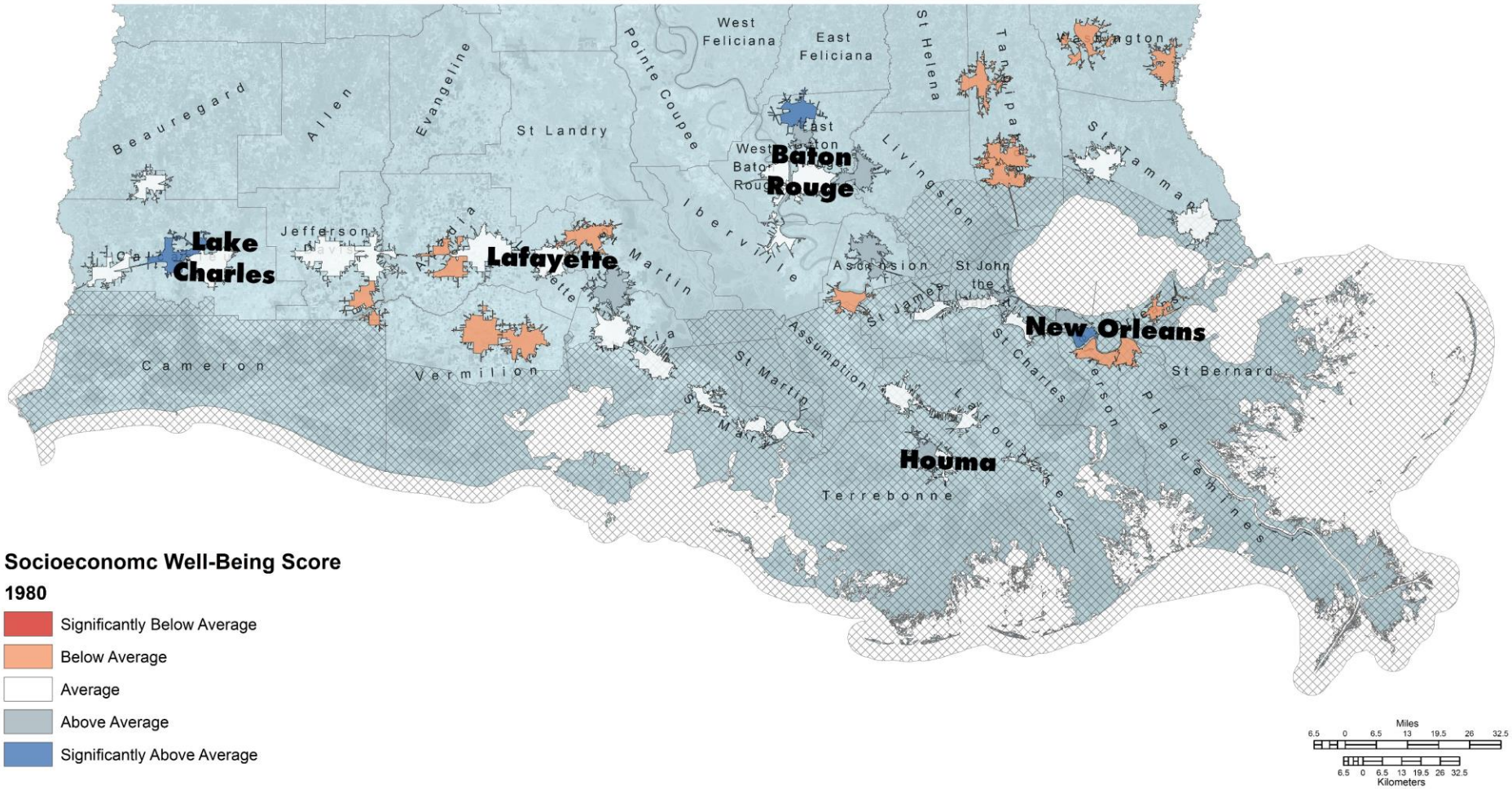
Trends in economic wellbeing
1950's to 2010's

Linkages and next phase


Socioeconomc Well-Being Score
1950
Significantly Below Average
Below Average
Average
Above Average
Significantly Above Average
Lake Charles
Lafayette
Baton Rouge
New Orleans
Houma
Beauregard
Allen
Evangeline
St Landry
Pointe Coupee
West Feliciana
East Feliciana
St Helena
Washington
Tangipahoa
St Tammany
East Baton Rouge
West Baton Rouge
Livingston
Iberville
Jefferson Davis
Acadia
St Martin
Ascension
St John the
St James
Cameron
Vermilion
Assumption
St Mary
St Charles
St Bernard
Jefferson
Plaquemines
Lafourche
Terrebonne
Miles
6.5 0 6.5 13 19.5 26 32.5
6.5 0 6.5 13 19.5 26 32.5
Kilometers


Socioeconomc Well-Being Score
1960
Significantly Below Average
Below Average
Average
Above Average
Significantly Above Average
Beauregard
Allen
Evangeline
St Landry
Pointe Coupee
West Feliciana
East Feliciana
St Helena
Tangipahoa
St Tammany
Baton Rouge
Livingston
Iberville
Jefferson
Lake Charles
Lafayette
Martin
Assumption
St John the
St James
New Orleans
St Charles
St Bernard
Plaquemines
Cameron
Vermilion
St Martin
Houma
Terrebonne
Miles
6.5 0 6.5 13 19.5 26 32.5
6.5 0 6.5 13 19.5 26 32.5
Kilometers

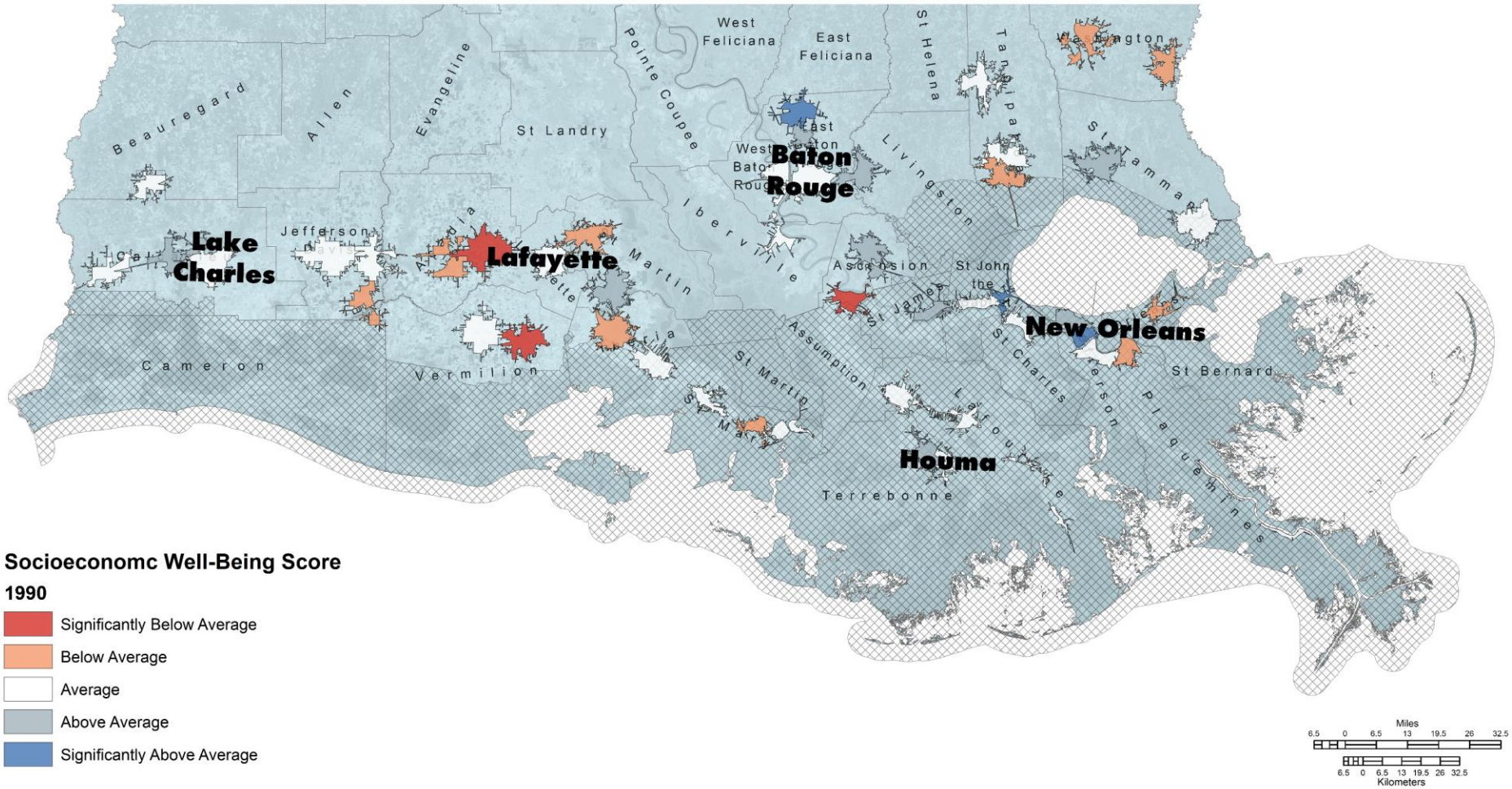

Beauregard
Allen
Evangeline
St Landry
Pointe Coupee
West Feliciana
East Feliciana
St Helena
Tangipahoa
Washington
St Tammany
Livingston
Baton Rouge
Iberville
Jefferson
Lake Charles
Lafayette
Martin
Ascension
St John the
St James
New Orleans
St Bernard
Cameron
Vermilion
Assumption
St Charles
Jefferson
Plaquemines
St Martin
Lafourche
Houma
Terrebonne
Socioeconomc Well-Being Score
1970
Significantly Below Average
Below Average
Average
Above Average
Significantly Above Average
Miles
6.5 0 6.5 13 19.5 26 32.5
6.5 0 6.5 13 19.5 26 32.5
Kilometers



Socioeconomc Well-Being Score

1980

- Significantly Below Average
- Below Average
- Average
- Above Average
- Significantly Above Average


Socioeconomc Well-Being Score
1990
Significantly Below Average
Below Average
Average
Above Average
Significantly Above Average
Beauregard
Allen
Evangeline
St Landry
Pointe Coupee
West Feliciana
East Feliciana
St Helena
Livingston
St Tammany
Baton Rouge
Lake Charles
Jefferson
Lafayette
Iberville
Martin
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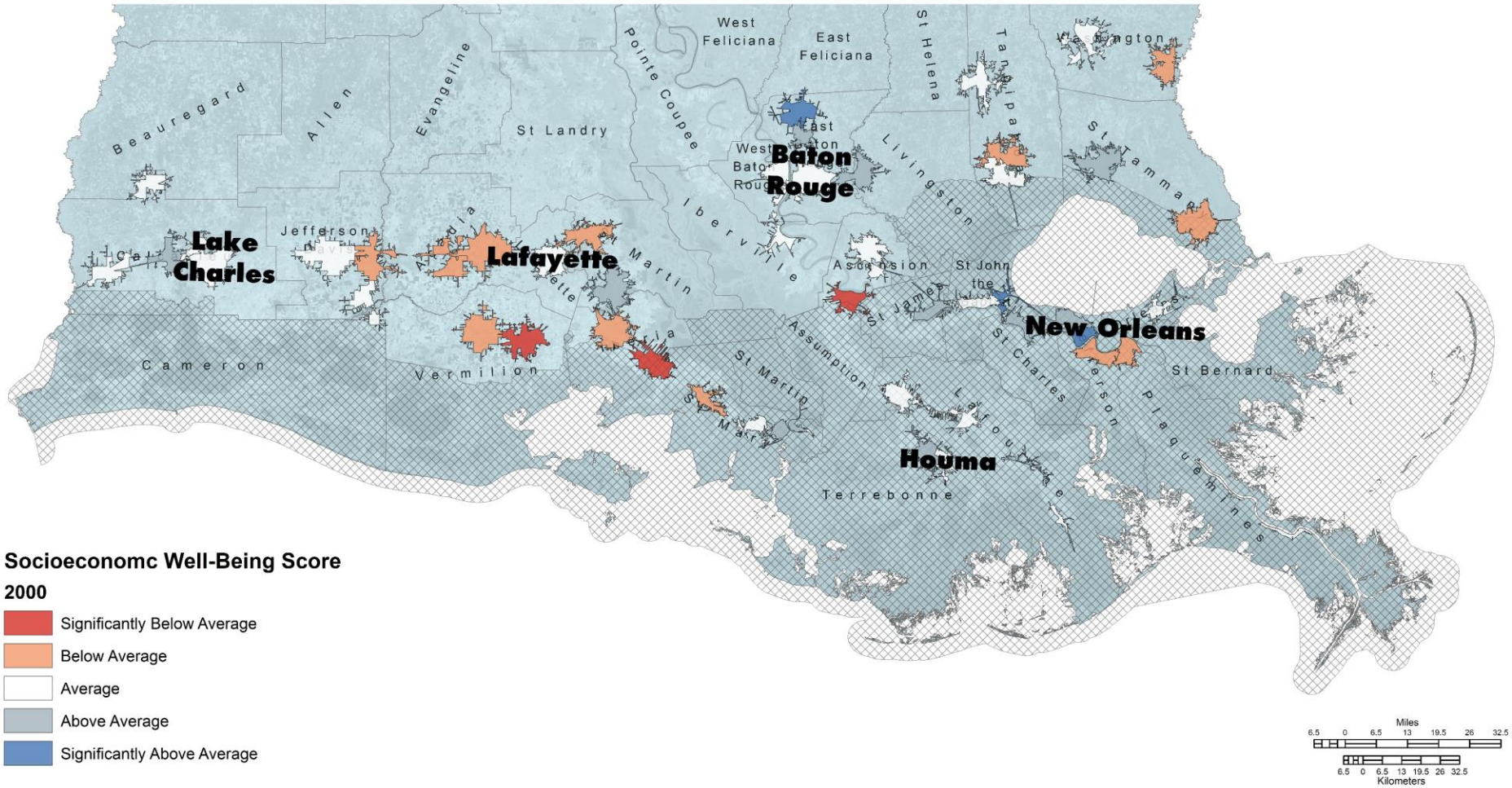
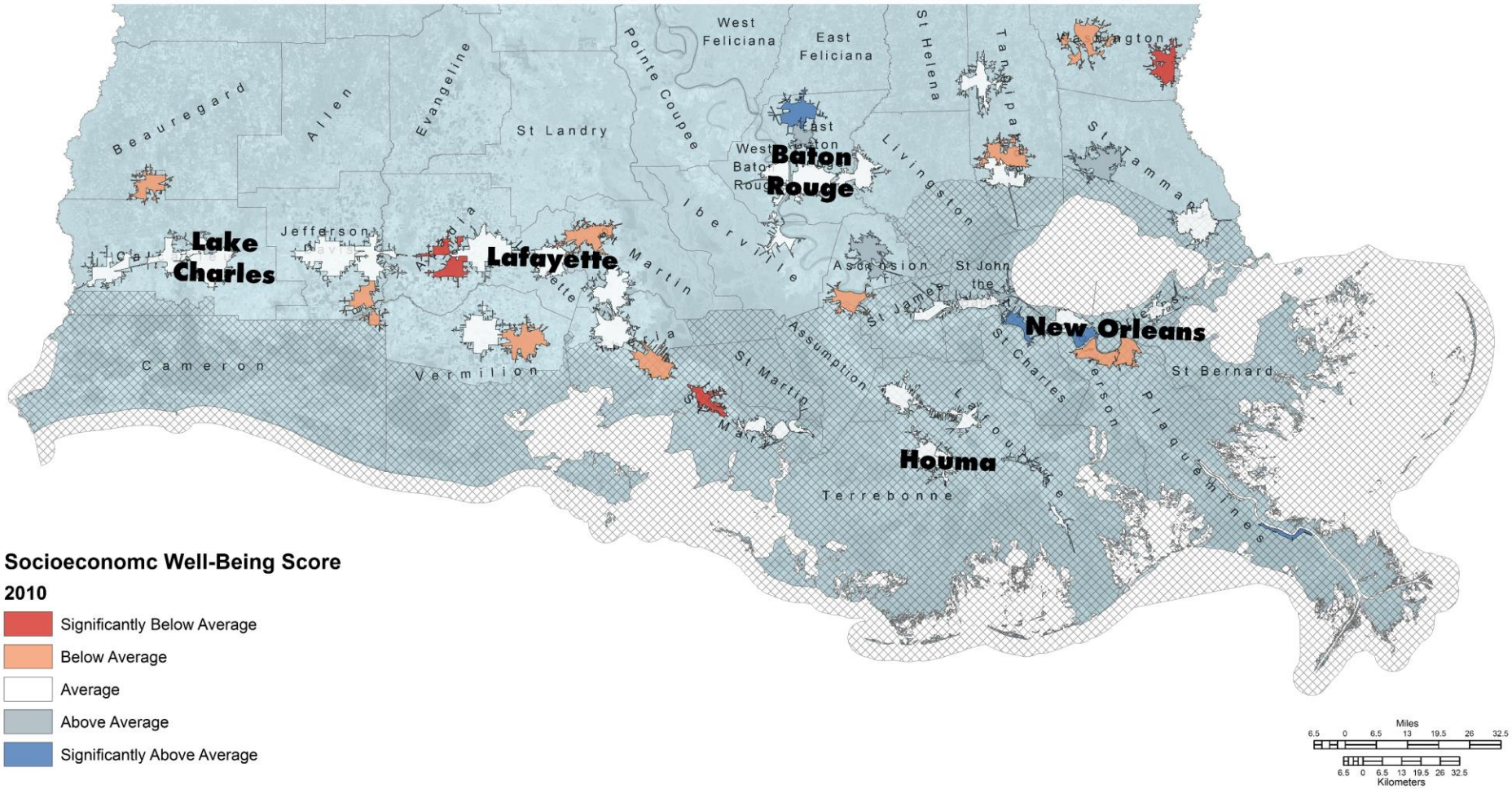
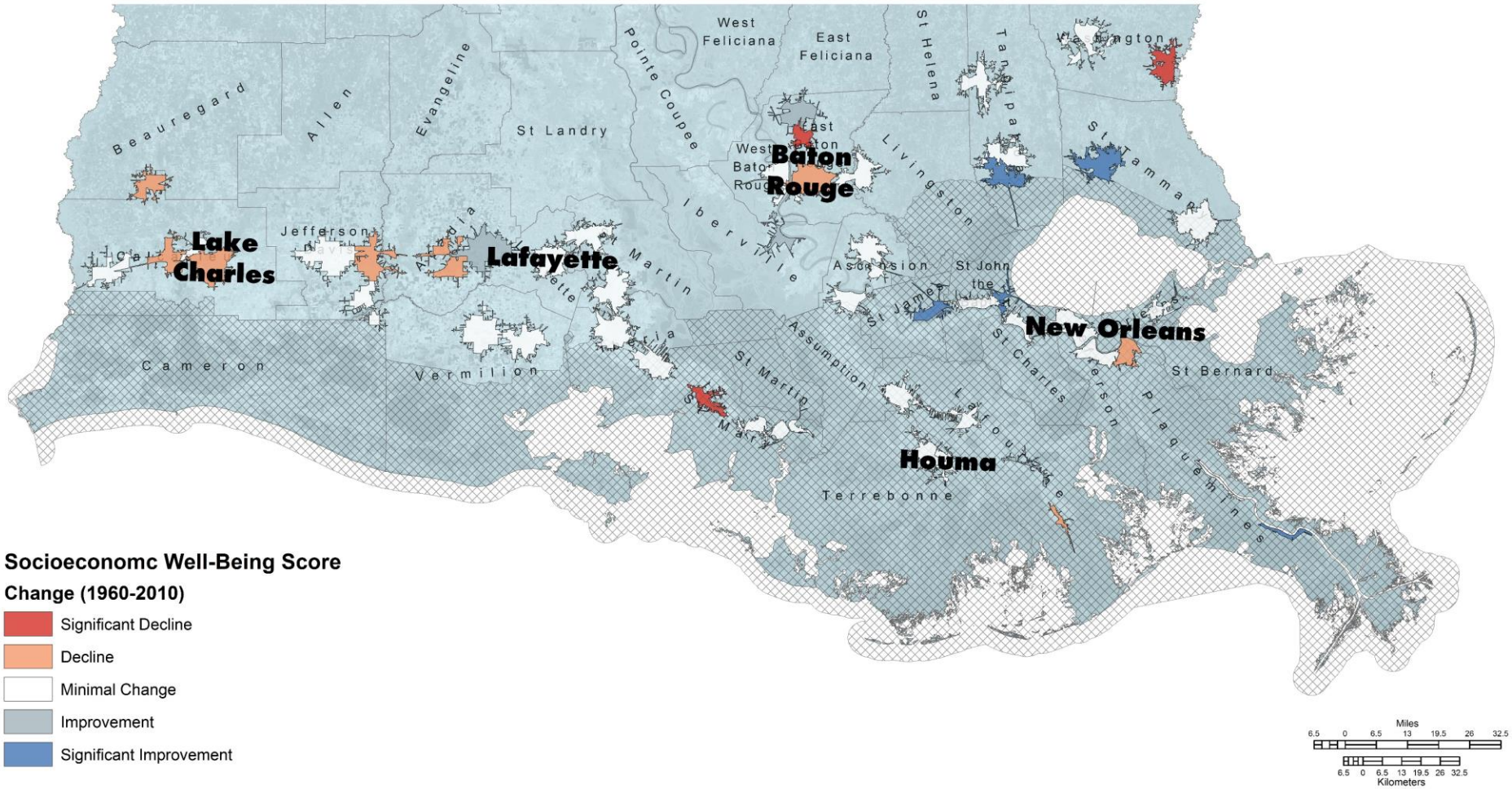
St John the
New Orleans
St Bernard
Cameron
Vermilion
Assumption
St Charles
Houma
Terrebonne
Miles
6.5 0 6.5 13 19.5 26 32.5
Kilometers
6.5 0 6.5 13 19.5 26 32.5


Beauregard
Allen
Evangeline
St Landry
Pointe Coupee
West Feliciana
East Feliciana
St Helena
Tangipahoa
Washington
St Tammany
Livingston
Baton Rouge
Iberville
Jefferson
Lake Charles
Lafayette
Martin
Acadia
Vermilion
Cameron
Assumption
St James
St John the
New Orleans
St Charles
St Bernard
Plaquemines
St Martin
Lafourche
Houma
Terrebonne
Socioeconomc Well-Being Score
2000
Significantly Below Average
Below Average
Average
Above Average
Significantly Above Average
Miles
6.5 0 6.5 13 19.5 26 32.5
6.5 0 6.5 13 19.5 26 32.5
Kilometers


Beauregard
Allen
Evangeline
St Landry
Pointe Coupee
West Feliciana
East Feliciana
St Helena
Tangipahoa
St Tammany
Livingston
Iberville
Ascension
St James
St John the
Jefferson
Martin
Assumption
St Charles
St Bernard
Plaquemines
Cameron
Vermilion
St Martin
Lafourche
Terrebonne
Lake Charles
Lafayette
Baton Rouge
New Orleans
Houma
Socioeconomc Well-Being Score
2010
Significantly Below Average
Below Average
Average
Above Average
Significantly Above Average
Miles
6.5 0 6.5 13 19.5 26 32.5
6.5 0 6.5 13 19.5 26 32.5
Kilometers


Beauregard
Allen
Evangeline
St Landry
Pointe Coupee
West Feliciana
East Feliciana
St Helena
Tangipahoa
Washington
St Tammany
Livingston
Baton Rouge
Iberville
Ascension
St John the
St James
Jefferson
Lake Charles
Lafayette
Martin
Assumption
New Orleans
St Bernard
St Charles
Jefferson
Plaquemines
Cameron
Vermilion
St Martin
Lafourche
Houma
Terrebonne
Socioeconomc Well-Being Score
Change (1960-2010)
Significant Decline
Decline
Minimal Change
Improvement
Significant Improvement
Miles
6.5 0 6.5 13 19.5 26 32.5
6.5 0 6.5 13 19.5 26 32.5
Kilometers

PRESENTATION OUTLINE

Trends in oil and gas development
1950's to 2010's

Trends in socioeconomic variables
1950's to 2010's

Trends in historical environmental change
1950's to 2010's

Trends in economic wellbeing
1950's to 2010's

Linkages and next phase

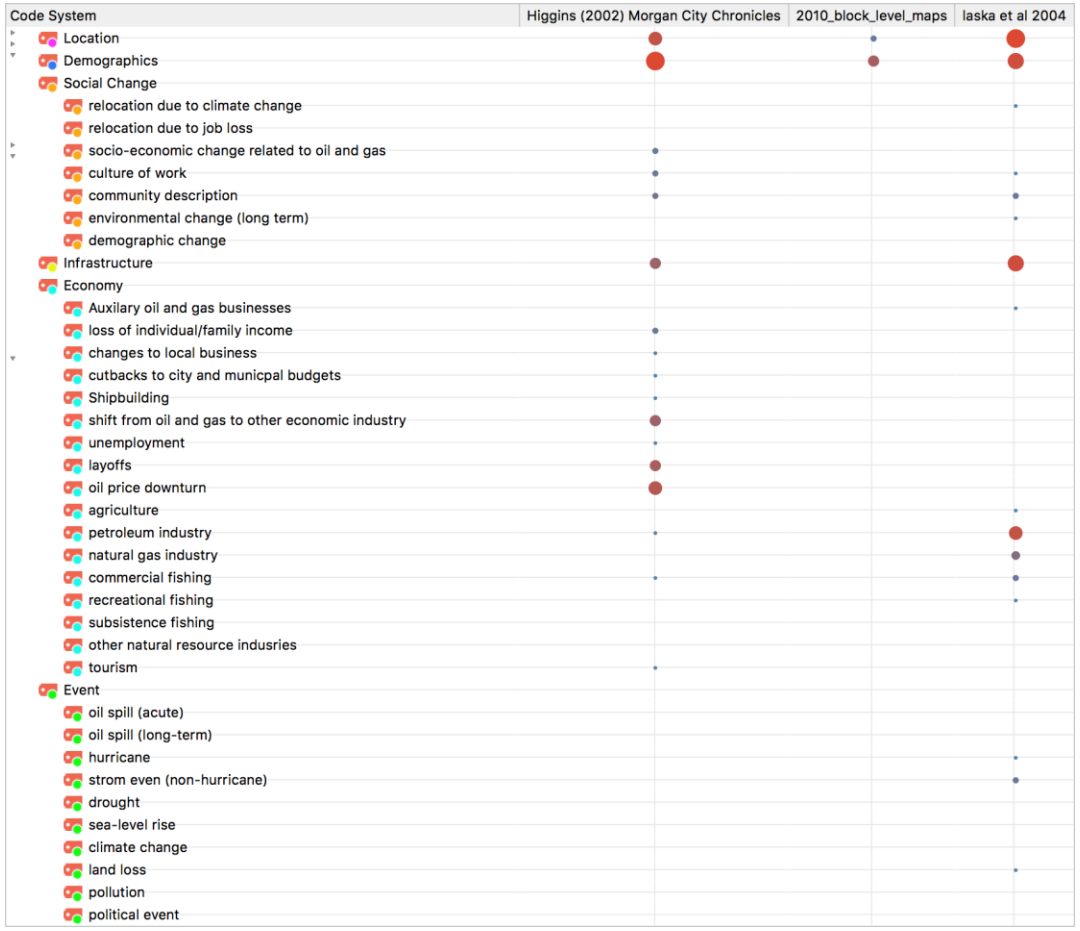
LINKAGES AND NEXT PHASE

- Initial results suggest that the development of the oil and gas industry is not a primary driver of population movement and migration.
- The growth of the oil and gas economy does correlate with changes in economic wellbeing (indicated by factors such as poverty, unemployment levels, and property ownership) at both the parish and community scale.
- The next phase of research will utilize statistical analysis and modeling to explore the impacts of exogenous environmental and economic conditions on these variables.

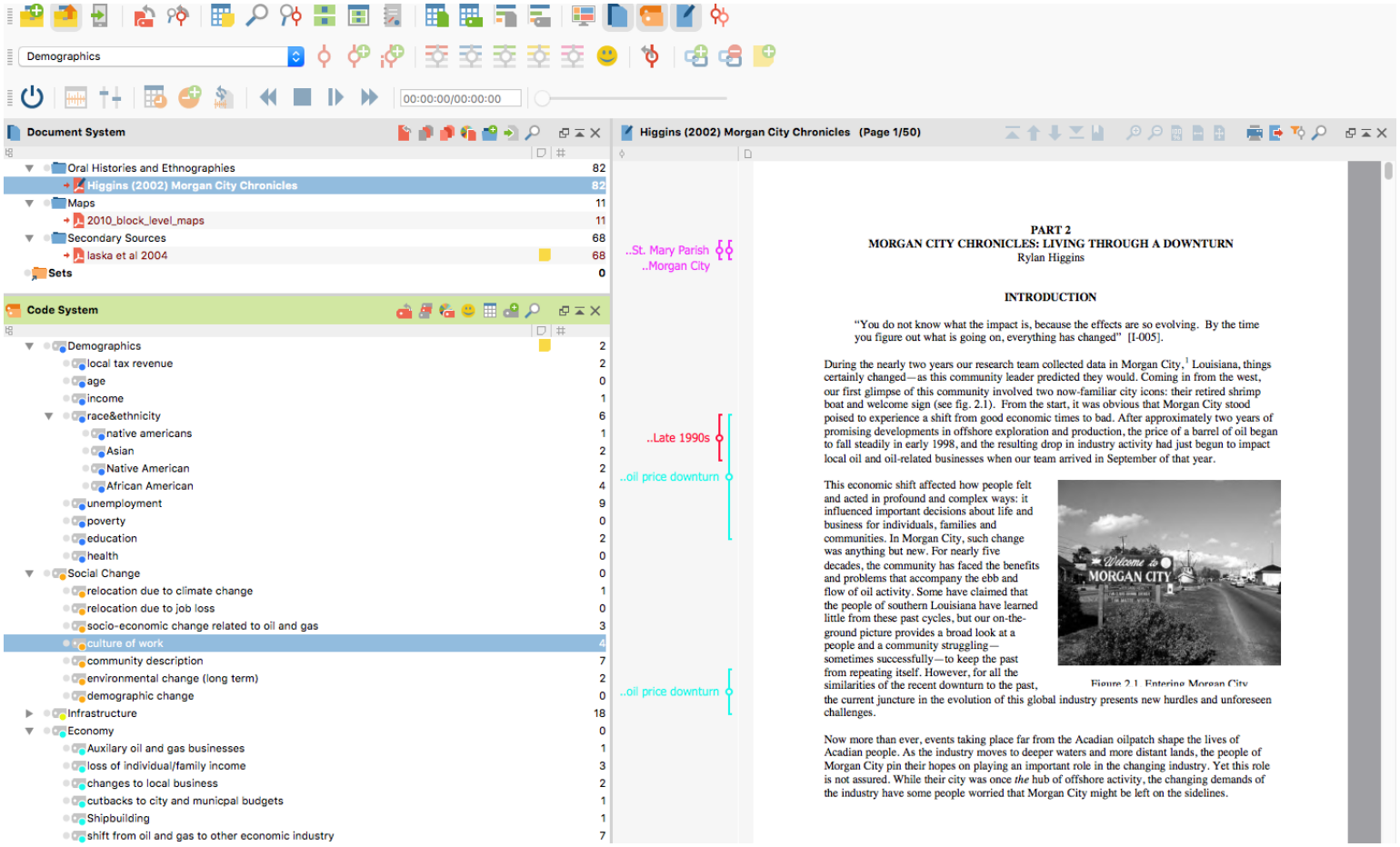
LINKAGES AND NEXT PHASE

- Mapping and assessing the historical interactions of oil and gas development, environmental change, and socioeconomic change to anticipate future impacts of development.
- However, observed patterns in the data allow us to see significant correlations, but not establish direct cause and effect relationships.
- The next phase of research will utilize qualitative research methods to assess the linkages and correlations observed in the data.

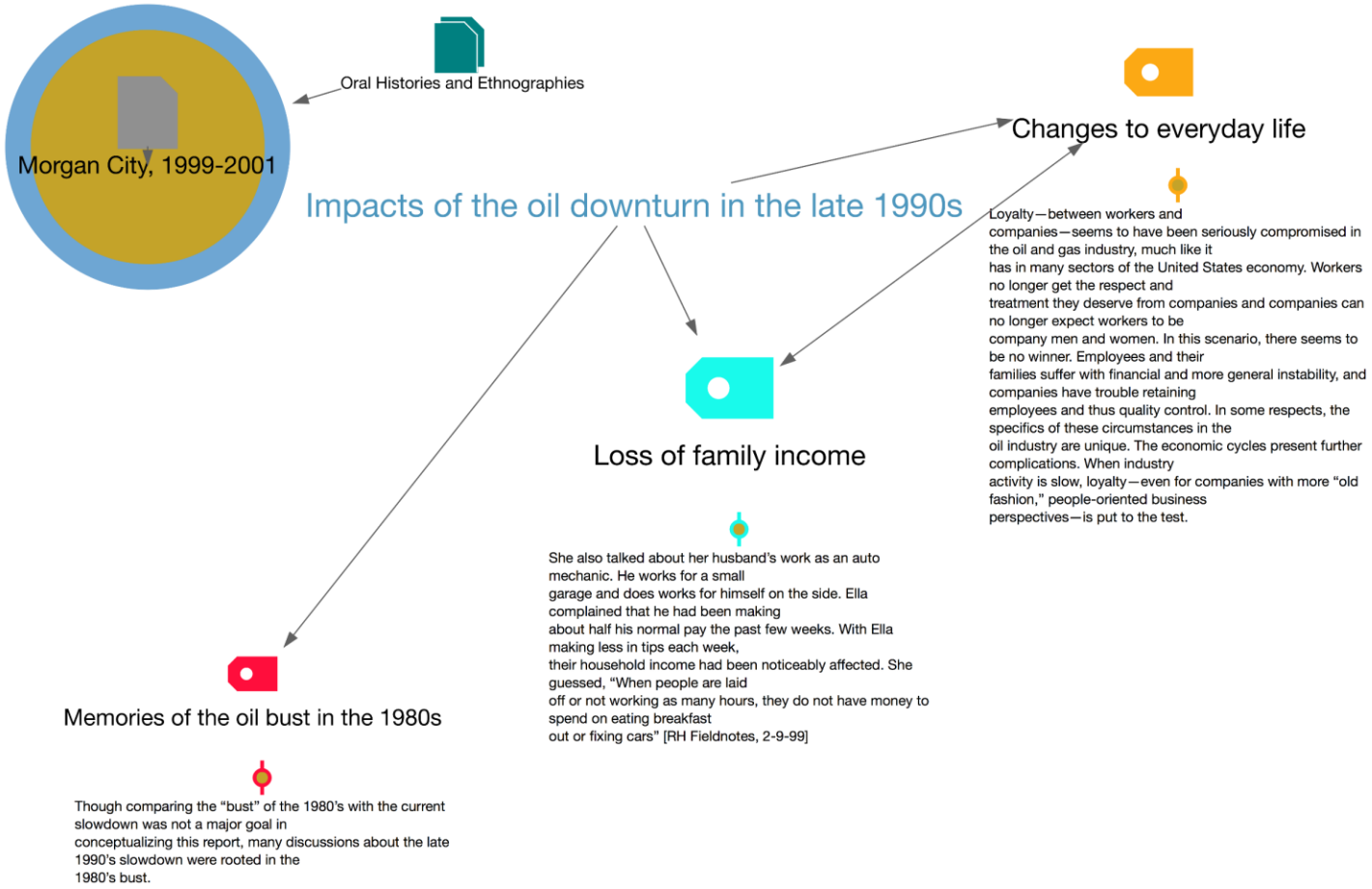
NEXT STEP: TYING PATTERNS IN THE DATA TO EXISTING ETHNOGRAPHIC WORK



NEXT STEP: TYING PATTERNS IN THE DATA TO EXISTING ETHNOGRAPHIC WORK



NEXT STEP: TYING PATTERNS IN THE DATA TO EXISTING ETHNOGRAPHIC WORK



NEXT STEP: QUALITATIVE RESEARCH WITH RESIDENTS OF OIL AND GAS COMMUNITIES

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Bureau of Ocean Energy Management

THE WATER INSTITUTE OF THE GULF

COLLEGE OF SOCIAL & BEHAVIORAL SCIENCES
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THANK YOU

Scott A. Hemmerling
Director of Human Dimensions

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