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Demographic Impacts of Climate-Induced Migration and Environmental Shocks and Stressors in Cameron Parish, Louisiana

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Demographic Impacts of Climate-Induced Migration and Environmental Shocks and Stressors in Cameron Parish, Louisiana

by

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Introduction

Human migration is a likely impact of climate change often discussed on a global scale among international organizations, often in reference to climate-induced migration from the Global South, low lying nations in Africa, Central America, and the South Pacific, as a result of heat waves and sea level rise (ICPP 2007). Earlier this year, the New York Times reported on the likelihood that climate change will induce an overwhelming amount of human migration also within the United States (Lustgarten 2020). Little academic research exists on the extent of this potential migration within the United States for a few reasons. Climate change is considered to exacerbate existing economic and social stressors leading individuals to relocate, and it is rarely the sole driver behind migration. In fact, most instances of migration are caused by a number of considerations, making it difficult for researchers and policymakers to attribute migration to a single cause such as climate change (Burzyńskia 2019).

When the environmental stressors associated with climate change, such as sea level rise and hurricanes, induce human migration, it is often because traditional means of adaptation or recovery are no longer feasible due to the intensity of those stressors (Correll 2020). In the Gulf Coast, many of these intensifying effects have become evident in recent years. For example, the year 2020 was the busiest Atlantic Hurricane season on record (NOAA 2020). Rural and coastal parishes in Louisiana are the most vulnerable and increasingly least resilient to these intensifying hurricanes. There is evidence that coastal parishes, such as Cameron Parish have been impacted significantly by 21st century hurricanes (Tootle 2007). The specific impacts on relocation and demographics in rural coastal parishes are unknown, mainly due to limitations in our understanding of how environmental impacts influence relocation. However, theories of climate-induced migration and past anthropological research can allow us to make inferences on how

environmental stressors have affected coastal Louisiana parishes and perhaps give us some insight into how they will change as climate change intensifies (Colten 2018, Colten 2012, Hauer 2019, Simms 2017).

Background

Climate-Induced Migration

The United Nations High Commissioner for Refugees estimates that every two seconds, a person is forcibly displaced from their home, and that as of 2019 there were over 70 million refugees displaced either within countries or internationally (United Nations 2019). One of the expected causes of climate change and relative sea level rise is increased internal and cross-border migration induced by environmental degradation. In 2018, the United Nations General Assembly recognized that "climate, environmental degradation and natural disasters increasingly interact with the drivers of refugee movements," (McAdam 2018). Climate-induced migration occurs when devastating natural disasters--the slow onset of sea level rise, or heat waves and drought—linked to climate change renders a home uninhabitable and forces relocation, either within one's home country or internationally (Atapattu 2018). To identify migration due to climate change is difficult because migration is most often made as a decision on an individual level. It is difficult to determine how many people will migrate for climate reasons, but research and experts have been able to determine how migration will increase in the future, where climate change will be an exacerbating influence. The International Organization for Migration estimates that between 25 million and 1 billion people will be internationally displaced by 2050; with 200 million being the most cited estimate (IOM 2019). In 2018, The World Bank estimated that by 2050, 140 million people will migrate internally, relocating within their home country. The

Intergovernmental Panel for Climate Change states that 64 million people have already been displaced by climate change, and by 2050 that number will reach 200 million (IPCC 2007).

186.4 million people were displaced internationally between 2008 and 2014 as a result of natural hazards, making natural hazards a prime motivator of migration flows, along with poverty and violent conflicts (Heimann 2015). Most climate-induced migration globally has occurred historically in the Global South, with those countries having more low-lying coastlines and warmer temperatures, and much of the work being done by International Organizations such as the United Nations and IPCC have thus far been concerned with the more immediate threats faced by the Global South. However, the United States is also expected to in the future deal with both international displacements resulting from immigration flows from the Global South and its own internal migration. In the United States, roughly 162 million people are expected to undergo a decline in quality of life due to environmental changes by 2070, and 93 million of these individuals are expected to undergo severe impacts to livelihoods (Lustgarten 2020). In a worst-case scenario of carbon emissions, researchers expect one in four Americans to be housed in less than ideal living conditions in places they currently inhabit. Though many Americans will face climate-induced stressors through drought and forest fires, a significant portion will be those residing in low-lying coastal areas, which are prevalent on the Gulf Coast (National Climate Assessment 2018). It is projected that 13.1 million Americans will be forced to relocate due to submerged coastlines by 2100, which would become the largest human migration in North American history (Robinson 2020). One in twelve Americans living in the South, including the Gulf coast, is expected to relocate northward within 45 years due to climate influences (Fan 2018).

Louisiana Environmental Shocks and Stressors

The Louisiana coast is the location of the seventh largest delta on Earth and accounts for 90% of wetland loss in the United States (Hauer 2019). Between contributing factors of subsidence, erosion, and sea level rise, Louisiana was losing roughly 28 square kilometers annually as of 2017. Since the 1930s Louisiana has lost nearly 5000 square kilometers of land and is expected to lose roughly 4500 more in the next 50 years (Simms 2017). This ranked Louisiana among the highest rates of coastal land loss from a delta globally during the 20th century. Increased loss of coastal marshes is also known to reduce natural storm surge barriers and increase the impacts of hurricanes on coastal communities. The inhabitants of the disappearing Louisiana coast who are most vulnerable to the effects of this land loss are those who are most socially disadvantaged. Journalist Bob Marshall, when covering coastal land loss in Louisiana, stated that "the largest forced migration for environmental reasons in the history of the country" could occur in coastal Louisiana (quoted in Simms 2017).

Small communities on the Louisiana coast reside in fragmented landscapes affected by human alteration and are increasingly vulnerable to the shocks of disasters and stressors of coastal erosion and sea level rise, and these communities have proven costly to protect (Correll 2020). Louisiana's $50 billion plan to protect and restore the coastline shows that only portions of the coast and its communities can be preserved (CPRA 2017), and the sources for the majority of funding for this project has not yet been identified or secured. With respect to migration that will occur in these communities, policy solutions and the extent of influence the state will have on relocation remains undetermined.

The main effort to date for managed retreat in the state of Louisiana through the Office of Community Development has been a $92 million grant through the U.S. Department of Housing

and Urban Development Natural Disaster Resilience competition, where over half of the grant was allocated to the relocation of the Isle de Jean Charles community (Simms 2017). However, the relocation planning for this small island community has been riddled with challenges and has been notably difficult despite the size of the grant received. The other portion of the grant is earmarked towards the Louisiana Strategic Adaptations for Future Environments (LASAFE) program to create resilient housing infrastructure and plan further resettlements. Additionally, the Isle de Jean Charles is just one community in Louisiana projected to face relocation. There are countless others that have yet to be addressed on a policy level. Communities in other coastal parishes, such as Cameron and Plaquemines parishes that have undergone population shifts as a result of climate-induced stressors and relocation but have not been considered on a policy level in terms of managed retreat (CPRA 2017). When managed retreat is not pursued on a policy level, migration and relocation is decided on an individual basis as an adaptation strategy when rebuilding and fortifying are no longer viable options (Correll 2020).

Climate stressors in Louisiana also have an economic impact on individuals and the state as well as a physical impact; these economic impacts can serve as further driving factors for migration. Louisiana's heavily resource-based economy is in turbulence with coastal changes, which may be a motivating factor in relocation (Colten 2018). The Louisiana economy consists of a seafood industry worth about $3 billion a year, 16,000 km of oilfield canals, numerous waterways, five of the fifteen largest US ports, and 90 % of outer continental oil and gas production in the US (Correll 2020). The anticipated cost of capital stock at risk in Louisiana from coastal land loss and sea level rise over the next fifty years ranges from $2.1 billion to $3.5 billion, and 60% to 75% off these costs are associated with non-residential structures (Barnes 2015). There also an expected $5.8 billion to $7.8 billion reduction in economic activity output

as a result of land loss as trade and resource-based services are affected. Storm damage to capital stock properties estimates range from less than $10 billion to as $133 billion in high scenarios. As a result of this storm damage, there should also be an indirect loss of economic activities due to disruption ranging between $5 billion to $51 billion (Barnes 2015).

Cameron Parish

In September 2005, Category 3 Hurricane Rita made landfall in Southwest Louisiana. Cameron Parish, the Southwest-most parish in the state, was inundated with tidal surge between 15 and 20 feet (Tootle 2007). The southernmost portion of the parish was completely devastated with property and livestock swept away. Although the parish was effectively evacuated, and no deaths were attributed to the disaster, property damage was widespread, many houses were completely gutted, and debris remained in streets and fields for over a year. This kind of environmental shock that can become a motivating factor in relocation; especially when it occurs in a rural community whose ability to recover long term from disasters is limited. Prior to the storm, Cameron Parish had been growing in population, rising in by 7.9 percent between 1990 and 2000 (Tootle 2007). However, as this study will show, that population growth has aggressively reversed in the years following Hurricane Rita.

Review of the Literature

There is little understanding to what extent climate-induced stressors affect rural communities in the long term (Tootle 2007). It is considered one of the least known aspects of disaster impacts. The long-term stressors of coastal land loss exacerbating the shocks of intensifying hurricanes, which are becoming more frequent with climate change, surely will impact the population and makeup of small coastal parishes like Cameron Parish. However, the extent of that impact depends on several factors influencing the determination and ability for individuals and families to recover from these hurricanes.

Inherent Resilience

There are three traditional responses coastal Louisiana residents have to relative sea level rise and coastal land loss: shore protection, adaptation, and relocation (Hauer 2019). Individual action with respect to these responses is dictated mostly by socioeconomic and environmental conditions. Migration, or relocation, has just recently become an accepted adaptive response to environmental stressors (Simms 2017). In addition to changing environmental situations, business closures and economic downturns have become contributing factors to out migration in Louisiana.

Historically the population of coastal Louisiana has not moved in response to the changing shoreline between the mid-1900s to the 2000s. (Hauer 2019). However, from 2005 on, Louisiana saw a landward shift of population in some parishes resulting from a series of unprecedented hurricane seasons. Past research suggests a tipping point for a community to pursue relocation as an adaptation strategy (Hauer 2019) people relocate when a neighborhood loses 50% of its land area. The lack of landward movement in Louisiana could either have been attributed to larger landward moves, such as relocation to different states or cities, localized strategies to adapt, or

that land loss has not reached this tipping point in most coastal communities yet (Hauer 2019). It is also difficult to specifically quantify climate-induced migration in coastal Louisiana due to the modifiable area unit problem, an issue in spatial analysis of data caused by data aggregation.

Many studies attribute coastal Louisiana residents with adaptive ability and resilience in resisting long-term impacts of environmental stressors. Craig Colten defined the term "inherent resilience" as follows: "…practices that natural resource-dependent residents deploy to cope with disruptions and that are retained in their collective memory" (Colten 2012). Historical and interview-based research shows that this inherent resilience embodies a "toughness" and value for community, and that coastal Louisiana residents attribute their inherent resilience and resistance to relocation to a "strong sense of place" (Simms 2017). Disaster after disaster, residents will return and rebuild through reliance on family, friends and neighbors.

The Colten framework posits that there are three components that make up this inherent resilience: mobility, social networks, and ingenuity (Colten 2018). Mobility refers to geographic and economic movements on any scale, such as commuting, evacuation, and relocation. Many coastal residents have integrated mobility into their identity and livelihood either through economic movement such as fishing or commuting to petrochemical plants or through disaster preparation. Social networks, as previously mentioned, also hold communities together. Social relations, however, can, in degrading scenarios, cause people to move through creating a "culture of migration" when prominent community networks begin to relocate (Simms 2017). Intense natural disasters have been shown in rural communities to instill a "collective trauma" that can lead to a loss of community and social networks (Tootle 2007). Ingenuity describes local resilience practices as well as individual adaptative actions with the purpose of securing social and environmental justice.

Opposite to resilience, vulnerability should also be considered in assessing the response of Louisiana coastal communities to environmental risk. Different social groups experience greater risk to livelihood and resources from environmental impacts of sea level rise and natural hazards than others (Thomas 2019). Interworking social, political, economic, and environmental forces can increase the vulnerability of certain groups of people, reducing their ability to adapt or recover from disasters. Increased vulnerability can come from barriers to access political and social services as well as social disparities increasing sensitivity to shocks and stressors (Thomas 2019). It is possible that without attention paid to these vulnerabilities through reallocation of resources or prioritization of vulnerable populations in relief or disaster mitigation that the resilience attributed to Louisiana coastal communities could decrease.

Hypothesis

I anticipate a qualitative study of Cameron Parish and comparisons to other rural parishes and statewide trends will reveal a greater drop in population following Hurricane Rita than other population losses in parishes that did not experience direct hurricane impacts. I also anticipate an "increase by subtraction" of median household income as primarily lower income individuals and families leave the parish. The literature shows that socioeconomically disadvantaged communities are less likely to recover from environmental stresses like Hurricane Rita, and that when recovery is not an option, relocation is an adaptation strategy pursued on an individual level (Simms 2017, Tootle 2007, Colten 2018, Colten 2012, Hauer 2019). I expect that when compared to parishes of similar size and makeup that have not experienced a storm like Hurricane Rita, Cameron Parish will have more significant shifts in population, median household income, unemployment, and rental status, as increased relocation induced by the hurricane alters these variables.

Methods

Based on past studies and literature, I expected that a descriptive study of population and demographic changes on the county level would reveal whether Cameron Parish could have experienced climate-induced migration compared to other parishes similar in size and economic conditions. To do this, I needed to be able to compare changes in population and other variables on the parish-level at time intervals before and after the intense hurricane damage Cameron Parish experienced between 2005 and 2008. Based on limitations involved with using census data and quantifying climate-induced migration, I did not expect the differences between Cameron Parish and inland small parishes to be statistically significant. However, the use of Census and American Census Survey data supplemented with USDA data on the county level can provide us with answers by visualizing meaningful differences between Cameron Parish and other inland rural parishes before and after Cameron was impacted by catastrophic hurricanes in the 2000s.

Data

Data Used: 2000 and 2010 census county level data, 2005-2009 and 2014-2018 ACS county level data, USDA county level unemployment, poverty, and median household income data from 2000-2018

Census and USDA data outlining changes in population, income, rental status, and unemployment were collected between the years of interest, 2000 to 2018, from all Louisiana parishes. US Census county level data was used for the years 2000 and 2010 and ACS county level five-year averages were used to represent the periods between 2005-2009 and 2014-2018

for data on population, rental status, and median household income. USDA county-level datasets were used to give insight on unemployment and poverty 2000-2018 and median household income in the year 2010.

To determine whether the population and demographic changes in Cameron Parish between 2000 and 2018 could have been in part due to environmental shocks, I selected inland parishes in similar size and unemployment rates to compare. Three parishes most similar to Cameron Parish in population and unemployment that I selected were La Salle, Red River, and Tensas Parishes. These parishes are all somewhat different in makeup and economic drivers, but all three are of similar size and income distribution as Cameron. Additionally, they are inland parishes and thus more insulated from tropical storms and hurricanes than Cameron Parish.

For all Louisiana parishes, percent change between census periods was calculated for population and median household income. Comparisons were then made between Cameron parish and the other three selected parishes in unemployment, population, population change, change in median household income, and rental properties. Comparisons were also made statewide for variables in which Cameron Parish underwent changes larger than general statewide trends.

Results

Cameron Parish

Year	Population	Unemployment (%)
2000	9,991	5.0
2009	7,588	5.9
2010	6,839	6.3
2018	6,868	3.5

Red River Parish

Year	Population	Unemployment (%)
2000	9,622	6.9
2009	9,117	9.5
2010	9,091	8.5
2018	8,618	4.4

La Salle Parish

Year	Population	Unemployment (%)
2000	14,282	5.8
2009	13,973	6.8
2010	14,890	6.5
2018	14,949	4.3

Tensas Parish

Year	Population	Unemployment (%)
2000	6,618	7.6
2009	5,798	12.0
2010	5,252	13.8
2018	4,666	7.7

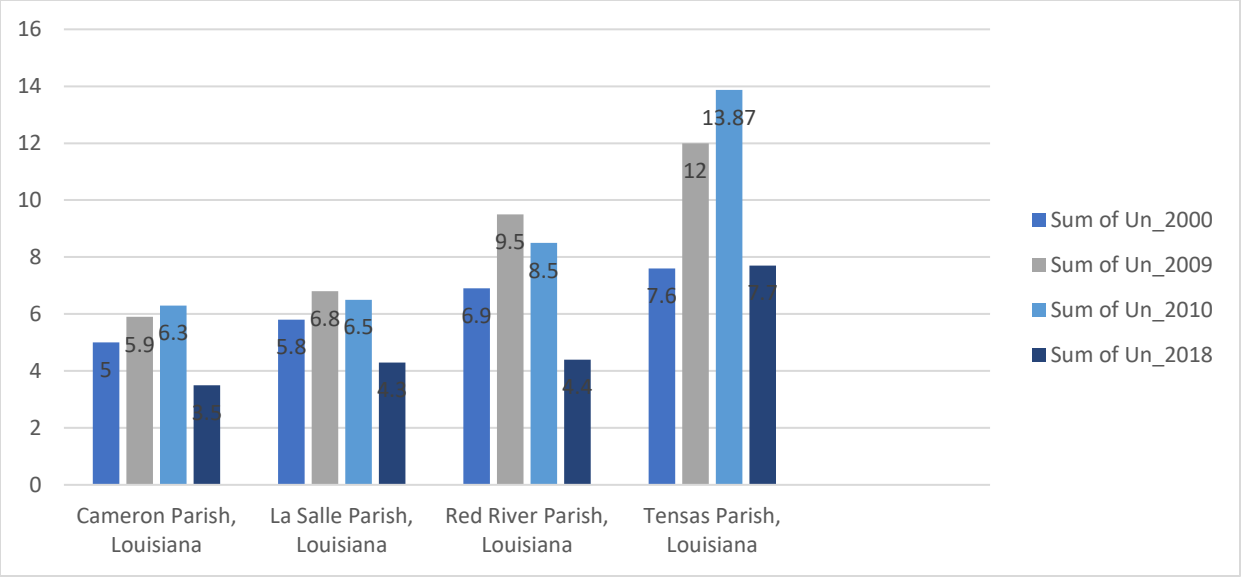

Figure 1: Unemployment Rates in Cameron and comparison parishes 2000-2018

The changes in unemployment rate in Cameron Parish were not significantly different than the changes in the inland Parishes. However, the data do show Cameron parish to have one of the lowest unemployment rates statewide. In 2000, Cameron had the 8th lowest unemployment rate of all parishes, 6th lowest rate in 2009, and as of 2018 Cameron had the lowest unemployment rate in the state at 3.5%.

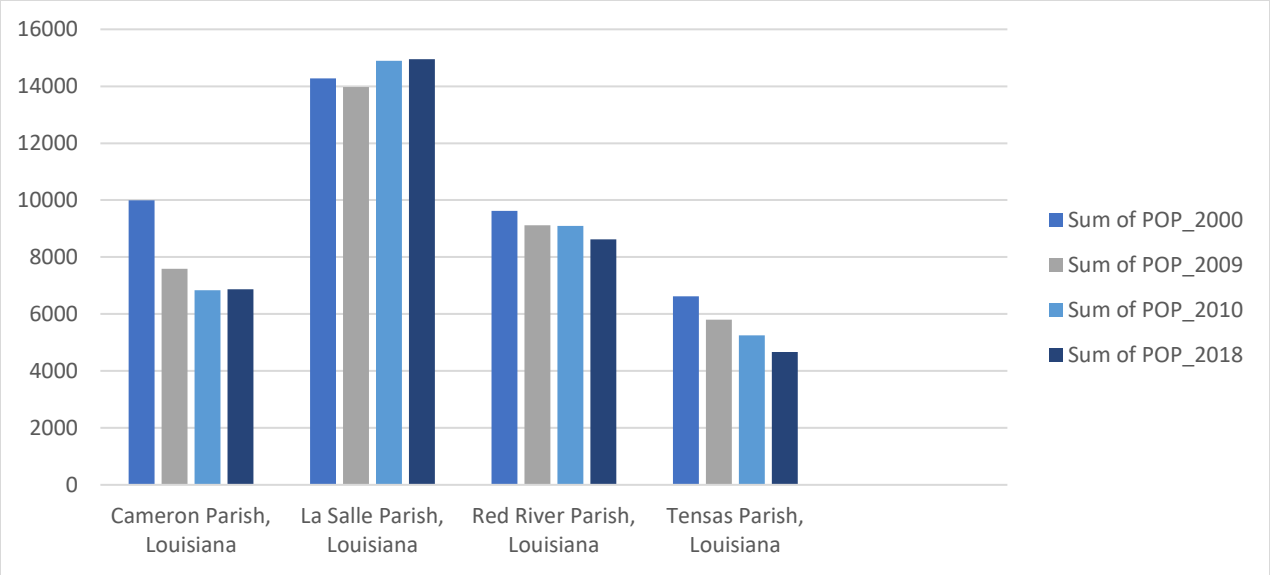

Figure 2: Total Populations of Cameron and comparison parishes 2000-2018

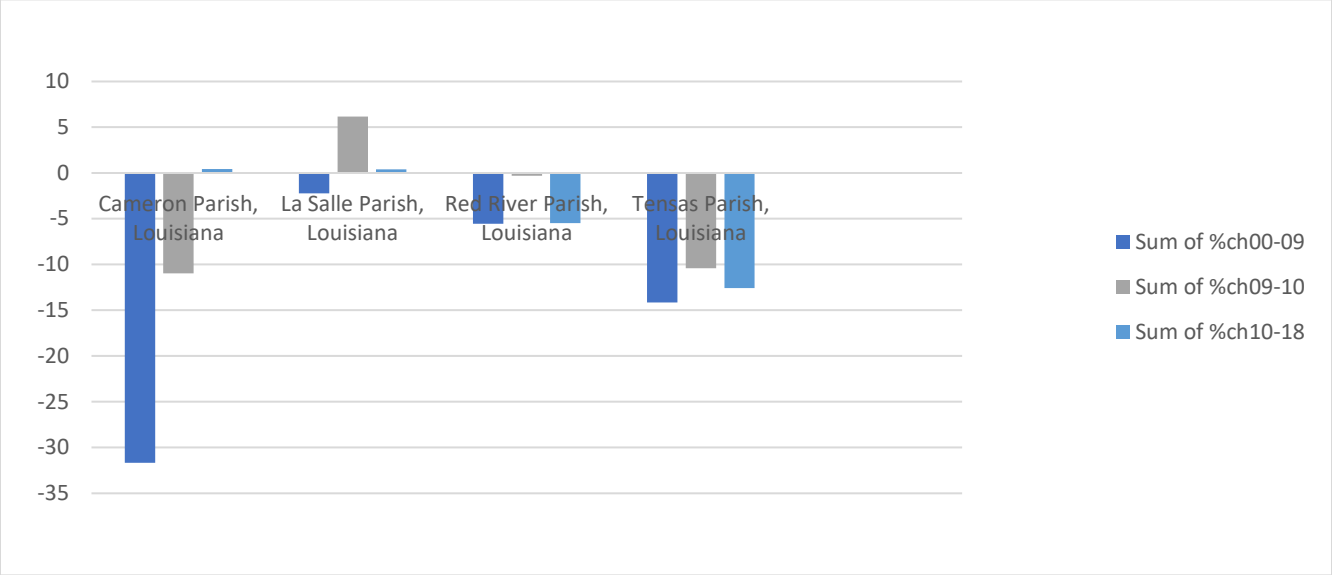

Figure 3: Changes in population in Cameron and comparison parishes 2000-2018

Between 2000 and 2009, Cameron underwent a much more dramatic drop in population than the other three selected parishes, losing roughly 32% of their population. Between 2009 and 2010, Cameron also underwent the largest drop in population out of the four parishes, though less significantly than the 2000 and 2009 difference. In a statewide comparison, Cameron parish

underwent the third largest drop in population statewide from 2000 to 2009, only less than St Bernard Parish (-75.8%) and Orleans Parish (-47.5%).

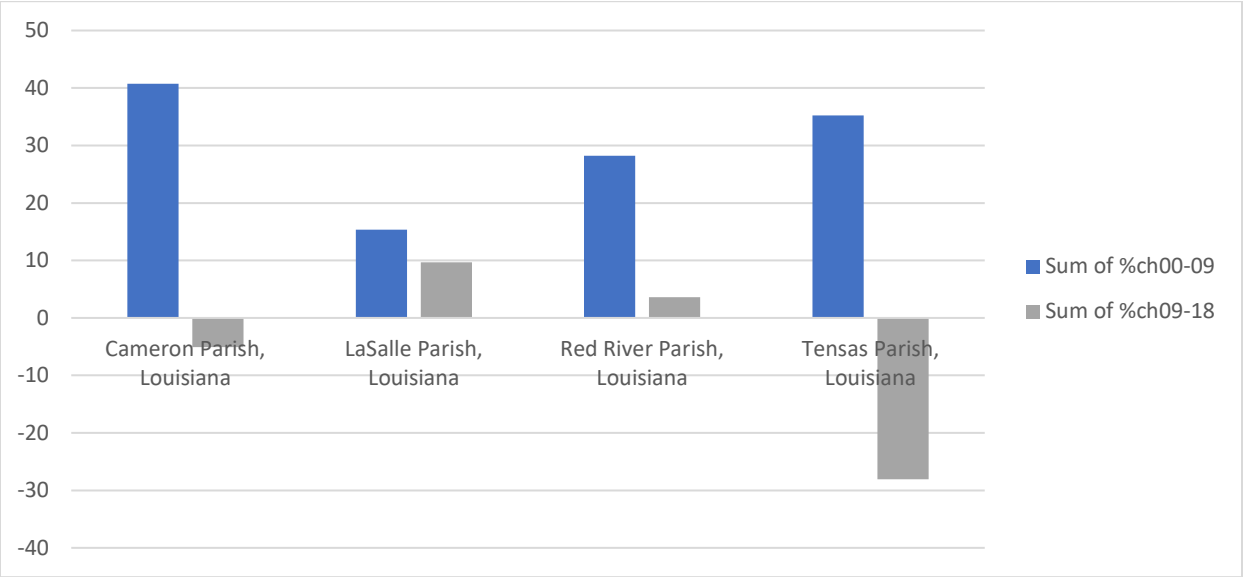

Figure 4: Change in Median Household Income in Cameron and comparison parishes 2000-2018

Between 2000 and 2009 Cameron Parish underwent the largest increase in median household income between not only the selected parishes, but all parishes in the state with an increase of 40.8%. As of 2009, Cameron Parish had the 4th highest median household income in the state, and still maintained a relatively high median household income into 2018.

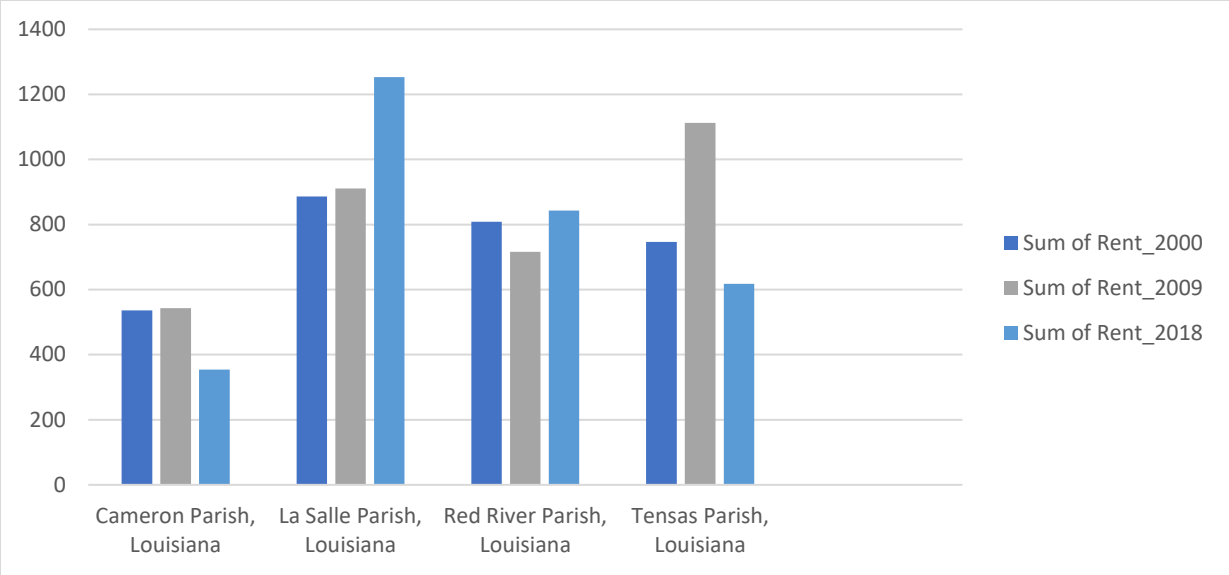

Figure 5: Share of Rental Properties in Cameron and comparison parishes 2000-2018

Cameron Parish did not change more meaningfully in total rentals than the other selected parishes during this time. However, it should be noted that Cameron Parish has consistently lower number of properties rented than the three other parishes, even with similar populations. In a statewide comparison, Cameron Parish had the lowest number of rental properties in 2000, 2009, and 2018 out of all parishes.

These comparisons show Cameron Parish being at the extremes at many demographic changes in the state of Louisiana. Across all variables, Cameron stood out from the selected parishes of Red River, La Salle, and Tensas in some way. For unemployment and rental properties, Cameron parish's values were lower than either most parishes or all parishes depending on the year. In population and median household income, Cameron changed at more dramatic rates than the other three parishes, and relatively dramatic statewide. Between 2000 and 2009, Cameron Parish dropped in population by 32% and rose in median household income by 40.8%, both rates well above statewide averages.

Discussion

This comparison of Census and USDA data shows that between 2000 and 2010, Cameron Parish underwent both one of the largest declines in population and the largest increase in median household income in the state. Without migration data on the individual level, it isn't possible to determine with certainty that this shows out-migration of lower income individuals as a result of hurricanes. However, much of the new industrial development that increased economic productivity and employs many residents today did not occur during the period between 2000 and 2010 (Gunn 2015). So, if this increase in median household income is attributed to out-migration of lower income individuals, there must be an explanation as to why lower income individuals had less of an ability to adapt from environmental shocks and stressors; less "inherent resilience."

Disaster Recovery in Rural and Low-Income Communities

One potential cause in out-migration of lower income individuals from Cameron Parish as a result of environmental shocks could be the difficulties rural communities face in recovering from disasters long term. Another issue to consider should be the barriers to access to federal disaster relief that lower income communities face. As discussed earlier, relocation is an individual decision made, and in situation of migration induced by environmental causes, it is a decision made when other forms of adaptation are not alternatives (Correll 2020). Local efforts and federal assistance in the U.S. is intended to allow communities to recover from natural hazards like hurricanes, but if for some reason lower income individuals in a rural parish like Cameron did not have access to those resources, that could provide one potential explanation to the trends shown by the census and USDA data.

A 2007 case study of southwest Louisiana's response to Hurricane Rita by Deborah Tootle described the barriers rural and under resourced communities face in disaster response. Communities impacted by catastrophic storms like Hurricane Rita need to address immediate needs of individuals and the collective trauma of the community before "long range community development" can be addressed (Tootle 2007). In rural communities like Cameron Parish, that are supported far less by local tax revenues than metropolitan areas, local officials like mayors, police juries, and heads of first responder services struggle to balance mobilization of resources, emergency management, and political processes needed to be addressed to increase community resilience to disasters. In struggling to mobilize resources, Cameron Parish officials took much longer to take full charge of recovery efforts in Cameron Parish than the officials in Calcasieu Parish, the more metropolitan parish directly north of Cameron that was also impacted by Hurricane Rita (Tootle 2007). This was because of both a greater share of damages in Cameron Parish and the political and organizational challenges faced by Cameron as a rural parish.

This study shows how "Pre-existing socioeconomic conditions and pre and post disaster political environment are the most frequently cited factors affecting disaster recovery (Tootle 2007)." The inherent social vulnerability of rural communities makes them not only more at risk to disasters, but it also makes them less equipped to execute lasting disaster response and recovery. If the "inherent resilience" of coastal communities is what has allowed individuals affected by hazards to recover in the past, it is possible that this resilience has decreased in rural communities with intensifying disasters like Hurricane Rita due to this vulnerability. When local disaster response is inadequate or does not serve every member of the community, especially the most vulnerable, federal disaster assistance is still available.

Federal assistance, however, is likely also something that low-income individuals within Cameron Parish struggled with accessing. FEMA's emergency disaster relief has been shown to be ineffective and hard to access for minority communities, renters, and low-income individuals (Hooks 2007). Though Cameron Parish is generally racially homogenous (the population is around 93% white, without much change over time) and as the Census data showed, rental status was not clearly impacted between 2000 and 2010, the change in median household income clearly shows that low-income individuals could have been affected (US Census Bureau 2020). There exist both procedural and substantive aspects of the structure of FEMA's disaster relief application process that prohibits access to assistance to low-income families (Hooks 2007). In some instances, rules for applying for relief in programs such as the Individuals and Households Program are unclear or unavailable and require hired council to navigate. For other types of relief, such as applying for temporary housing assistance, FEMA has imposed unnecessary requirements for eligibility such as applying for small business loans. Many of FEMA's disaster relief programs were designed for relief to complement an individual or family's existing assets, leaving low-income individuals and families at a disadvantage from receiving their necessary benefits (Hooks 2007). Finally, unlike other housing assistance programs like HUD's Disaster Voucher Program, FEMA's housing assistance programs for tenants require landlord voluntary participation, and it is not uncommon for landlords to refuse tenants receiving FEMA benefits or requiring proof of a sizeable income.

After Hurricane Rita, a total of $273.1 million in federal assistance was allocated to Cameron Parish; $223.5 million in Public Assistance to rebuild public infrastructure and $38.6 million in Individual Assistance to rebuild and fortify homes (FEMA 2015). About 4,300 out of 9,500 residents received some form of relief, though nearly all homes incurred light to heavy

storm surge and wind damage (Gunn 2015). Some of this individual assistance was used to compensate for new building codes that followed the disaster, requiring renovation or construction cost to grow between $30,000 to $50,000 (Gunn 2015).

Conclusion

The direct impacts of climate and environmental shocks and stressors on human migration and relocation, and the extent of those impacts, are hard to determine. This is mainly because relocation is often a personal decision that weights several social, political, economic, and environmental factors. What is known is that climate and the environment can exacerbate existing tensions and contribute to one's decision to relocate. Though the United States has not yet had to address internal migration induced by climate on a large scale, some reports estimate that in the future the United States will undergo the largest migration in its history resulting from climate stressors (Lustgarten 2020).

The Louisiana coast and its inhabitants possess a long history of adapting to hurricanes, flooding, and land loss. In the past, the state's coastal inhabitants have not relocated in response to natural hazards, and they have used learned adaptation measures, mobility, and social networks to withstand environmental shocks and stressors. However, the years between 2000 and 2010 saw a number of catastrophic hurricanes resulting in mass property damage, injury, and loss of life in coastal Louisiana. Hurricane Rita in 2005 and to a lesser extent Hurricane Ike in 2008 caused widespread flooding and wind damage in Cameron Parish, the southwestern-most rural parish in Louisiana. This decade of storms and the inherent vulnerability of rural parishes and low-income individuals to natural hazards may have played a key role in the changes in population and income distribution of Cameron Parish. If a key trait of the "inherent resilience"

of coastal communities is their ability to adapt through local measures and ingenuity, then the rising costs of relief with catastrophic storms, barriers to access federal assistance, and challenges faced by rural communities in recovery likely have reduced this resilience and capacity to adapt.

There are several limitations to this study. First, the use of census data does not provide information on the individual level, so there is no way to directly source information about the individuals who migrated in or out of a given county. Census data and ACS data together also do not provide data on an annual basis, so the gaps in data are quite large, leaving us unable to determine the immediate effects of natural hazards in adjacent years. Finally, due to the nature of human migration and the number of factors coming into play when one decides to migrate, it is difficult to make any certain conclusions about the impacts of hurricanes on out-migration from Cameron Parish. It needs to be noted that any major economic developments could have also influenced the changes visible in the Census data.

There is much potential for future research to follow up this study. A closer analysis of disaster relief claims from 2005 could show to what extent low income individuals in Cameron Parish had access or struggled to have access to federal assistance. A qualitative study of economic development in Cameron Parish from 2000 to today could provide more clarity into what economic drivers could have influenced migration or income distribution and thus provide more relative context to the impact of natural hazards affecting Cameron. More research could also be done in determining where out-migrants from coastal parishes are relocating to. If metropolitan areas are more effective at addressing long term disaster relief, are individuals impacted by disasters relocating from rural areas to metropolitan areas?

Finally, both researchers and local policymakers should monitor the recovery process of rural parishes like Cameron in Southwest Louisiana affected by the 2020 hurricane season. Hurricane Laura impacted Cameron Parish this year with catastrophic damage to property, and a number of smaller hurricanes and tropical storms followed in the most active Atlantic Hurricane season in history (NOAA 2020). If rural parishes are less equipped to respond to disasters, low-income individuals face barriers to access for disaster relief, and intense hurricanes can induce out-migration, then attention needs to be given to vulnerable communities impacted by this hurricane season to ensure resources and relief is distributed equitably.

The mechanisms behind climate-induced migration and theories discussed in this study will likely only become more relevant and more easily visualized as climate change and sea level rise pressure frontline communities more over time. Though Cameron Parish's population and makeup responded in this way to these shocks and stressors, a different community with different economic and political variables could respond differently. The literature on the subject of climate-induced migration will surely continue to grow and adapt to different sociopolitical frameworks as the reality of displacement influenced by climate change becomes more global.

References

"2020 Atlantic Hurricane Season Takes Infamous Top Spot for Busiest on Record." 2020 Atlantic Hurricane Season takes infamous top spot for busiest on record | National Oceanic and Atmospheric Administration. Accessed November 23, 2020. https://www.noaa.gov/news/2020-atlantic-hurricane-season-takes-infamous-top-spot-for-busiest-on-record.

"Adaptation to Climate Change." Climate Action - European Commission, February 16, 2017. https://ec.europa.eu/clima/policies/adaptation_en.

Andrijasevic, Rutvica, and William Walters. "The International Organization for Migration and the International Government of Borders." *Environment and Planning D: Society and Space* 28, no. 6 (2010): 977–99. https://doi.org/10.1068/d1509.

Andrews, Clinton J. "Toward a research agenda on climate-related migration." *Journal of Industrial Ecology* 24.2 (2020): 331-341.

Atapattu, Sumudu. "'Climate Refugees' and the Role of International Law." Oxford Research Group, November 21, 2018. https://www.oxfordresearchgroup.org.uk/blog/climate-refugees-and-the-role-of-international-law.

Barnes, Stephen, et al. "Economic Evaluation of Coastal Land Loss in Lousiana." rand.org. Louisiana State University, the RAND Corporation, December 2015. https://www.rand.org/content/dam/rand/pubs/external_publications/EP60000/EP67228/RAND_EP67228.pdf.

Bhamra, R., Dani, S., & Burnard, K. (2011). Resilience: the concept, a literature review and future directions. *International Journal of Production Research*, *49*(18), 5375-5393.

Black, R., Bennett, S., Thomas, S. *et al.* Migration as adaptation. *Nature* **478,** 447–449 (2011). https://doi.org/10.1038/478477a

Burzyńskia, Michal et al. "Climate Change, Inequality, and Human Migration." *IZA Institute of Labor Economic Discussion Paper Series* 12623 (September 2019).

"Climate Change Could Force Over 140 Million to Migrate Within Countries by 2050: World Bank Report." World Bank, 2018. https://www.worldbank.org/en/news/press-release/2018/03/19/climate-change-could-force-over-140-million-to-migrate-within-countries-by-2050-world-bank-report.

Colten, Craig E. (2019). Adaptive Transitions: The Long-Term Perspective on Humans in Changing Coastal Settings. *Geographical Review*, *109*(3), 416-435.

Colten, Craig E., et al. "Social justice and mobility in coastal Louisiana, USA." *Regional environmental change* 18.2 (2018): 371-383.

"Contribution of the International Organization for Migration to the Seventh Coordination Meeting." UN.ORG, n.d. https://www.un.org/en/development/desa/population/migration/events/coordination/7/docs/P11_IOM.pdf.

Correll, Rachel M., et al. "Economics over Risk: Flooding Is Not the Only Driving Factor of Migration Considerations on a Vulnerable Coast." *Annals of the American Association of Geographers* (2020): 1-16.

Dannenberg, A. L., Frumkin, H., Hess, J. J., & Ebi, K. L. (2019). Managed retreat as a strategy for climate change adaptation in small communities: public health implications. Climatic Change, 153(1-2), 1-14.

Faist, T. (2020). Getting out of the Climate Migration Ghetto: Understanding Climate Degradation and Migration Processes of Social Inequalities. (COMCAD Working Papers, 174). Bielefeld: Universität Bielefeld, Fak. für Soziologie, Centre on Migration, Citizenship and Development (COMCAD). https://nbn-resolving.org/urn:nbn:de:0168-ssoar-70161-9

Fan, Qin, Karen Fisher-Vanden, and H. Allen Klaiber. "Climate Change, Migration, and Regional Economic Impacts in the United States." *Journal of the Association of Environmental and Resource Economists* 5, no. 3 (2018): 643–71. https://doi.org/10.1086/697168.

FEMA. "Cameron Parish-Hurricanes Katrina and Rita." fema.gov, 2015. https://www.fema.gov/media-library-data/1439929073210-2741ee543b024fdab8b3bef80b835f3c/FS_Cameron_Final_081415.pdf.

Füssel, H. M. (2007). Vulnerability: A generally applicable conceptual framework for climate change research. *Global environmental change*, *17*(2), 155-167.

Georgi, Fabian. "For the Benefit of Some: The International Organization for Migration and Its Global Migration Management." In *The Politics of International Migration Management*, edited by Martin Geiger and Antoine Pecoud, 45–72. London, England: Palgrave Macmillian, 2010.

Gunn, Billy. "A Smaller Cameron Parish Emerges 10 Years after Hurricane Rita's Devastation." The Advocate, September 27, 2015. https://www.theadvocate.com/acadiana/news/article_5c3e5bdb-a239-5f8e-8733-2c1e9281be5d.html.

Hartmann, Betsy. “Rethinking Climate Refugees and Climate Conflict: Rhetoric, Reality and the Politics of Policy Discourse.” *Journal of International Development* 22, no. 2 (2010): 233–46. https://doi.org/10.1002/jid.1676.

Hauer, Mathew E., et al. "No landward movement: examining 80 years of population migration and shoreline change in Louisiana." *Population and Environment* 40.4 (2019): 369-387.

Heimann, Liz. “Climate Change and Natural Disasters Displace Millions, Affect Migration Flows.” *Migration Information Source*, no. 7 (December 10, 2015). https://www.migrationpolicy.org/article/climate-change-and-natural-disasters-displace-millions-affect-migration-flows.

Hooks, Jonathan P. and Miller, Trisha B. (2006) "The Continuing Storm: How Disaster Recovery Excludes Those Most in Need," California Western Law Review: Vol. 43 : No. 1 , Article 4.

IPCC, “Working group II contribution to the intergovernmental panel on climate change fourth assessment report climate change 2007: Climate change impacts, adaptation and vulnerability”, April 2007, p. 10.

Jane McAdam, The Global Compacts on Refugees and Migration: A New Era for International Protection?, *International Journal of Refugee Law*, Volume 30, Issue 4, December 2018, Pages 571–574, https://doi.org/10.1093/ijrl/eez004

John K. Pierre and Gail S. Stephenson, After Katrina: A Critical Look at FEMA's Failure to Provide Housing for Victims of Natural Disasters, 68 La. L. Rev. (2008)

Karns, Margaret, et al. *International Organizations: The Politics and Processes of Global Governance* . 3rd ed., Rienner, 2015.

Louisiana Coastal Protection and Restoration Authority. "2017 Coastal Master Plan Parish Fact Sheet," September 2017. http://coastal.la.gov/wp-content/uploads/2017/04/Attachment-A9_FINAL_08.09.2018.pdf.

"Louisiana's Comprehensive Master Plan for a Sustainable Coast." Coastal Protection and Restoration Authority. OTS-State Printing, June 2, 2017. http://coastal.la.gov/wp-content/uploads/2017/04/2017-Coastal-Master-Plan_Web-Book_CFinal-with-Effective-Date-06092017.pdf.

Lustgarten, Abrahm. "How Climate Migration Will Reshape America." The New York Times. The New York Times, September 15, 2020. https://www.nytimes.com/interactive/2020/09/15/magazine/climate-crisis-migration-america.html.

Mahajan, Parag, and Dean Yang. "Taken by Storm: Hurricanes, Migrant Networks, and U.S. Immigration." *National Bureau of Economic Research Working Paper Series* 23756 (August 2017). https://doi.org/10.3386/w23756.

Meerow, S., & Stults, M. (2016). Comparing conceptualizations of urban climate resilience in theory and practice. *Sustainability*, *8*(7), 701.

"Migration, Environment and Climate Change (MECC) Division." International Organization for Migration, February 15, 2019. https://www.iom.int/migration-and-climate-change.

"National Institute of Building Sciences Issues New Report on the Value of Mitigation." National Institute of Building Sciences Issues New Report on the Value of Mitigation - National Institute of Building Sciences, January 11, 2018.

https://www.nibs.org/news/381874/National-Institute-of-Building-Sciences-Issues-New-Report-on-the-Value-of-Mitigation.htm.

Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American journal of community psychology*, *41*(1-2), 127-150.

Plyer, Allison. "Facts for Features: Katrina Impact." The Data Center, August 26, 2016. https://www.datacenterresearch.org/data-resources/katrina/facts-for-impact/.

Pécoud, Antione. 2018. "What do we know about the International Organization for Migration?" Journal of Ethnic and Migration Studies 44(10): 1621-1638. doi: 10.1080/1369183X.2017.1354028

Robinson, C., Dilkina, B., & Moreno-Cruz, J. (2020). Modeling migration patterns in the USA under sea level rise. *Plos one*, *15*(1), e0227436.

Simms, J. R. (2017). "Why Would I Live Anyplace Else?": Resilience, Sense of Place, and Possibilities of Migration in Coastal Louisiana. Journal of Coastal Research, 33(2), 408-420.

"Task Force on Displacement." UNFCCC, June 2017. https://unfccc.int/wim-excom/sub-groups/TFD.

Thomas, K., Hardy, R. D., Lazrus, H., Mendez, M., Orlove, B., Rivera-Collazo, I., ... & Winthrop, R. (2019). Explaining differential vulnerability to climate change: A social science review. *Wiley Interdisciplinary Reviews: Climate Change*, *10*(2), e565.

Tootle, Deborah M. "Disaster Recovery in Rural Communities: a Case Study of Southwest Louisiana." *Southern Rural Society* 22 (2007).

UN General Assembly, Convention Relating to the Status of Refugees, 28 July 1951, United Nations, Treaty Series, vol. 189, p. 137, available at: https://www.refworld.org/docid/3be01b964.html

United Nations. “Figures at a Glance.” UNHCR, June 19, 2019. https://www.unhcr.org/en-us/figures-at-a-glance.html.

United Nations. “What Is a Refugee?” UNHCR. Accessed April 23, 2020. https://www.unhcr.org/afr/what-is-a-refugee.html.

“U.S. Census Bureau QuickFacts: Cameron Parish, Louisiana.” Census Bureau QuickFacts. Accessed November 23, 2020. https://www.census.gov/quickfacts/cameronparishlouisiana.

Usgcrp. “Fourth National Climate Assessment: Summary Findings.” NCA4, January 1, 1970. https://nca2018.globalchange.gov/.