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Katrina Cottages: the value of place and permanence in a post-disaster landscape

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Hurricane Katrina overwhelmed the government's capacity to provide adequate long-term housing to disaster victims. In response, Congress created a pilot program to test the efficacy of permanent disaster housing prototypes known as "Katrina Cottages." However, implementation was hindered by a lack of planning and local opposition. In Mississippi, residents feared adverse impacts to property values, citing poor design quality resembling manufactured mobile homes as a primary concern. Using standardized local tax appraisals, this study finds that Katrina Cottages are valued significantly higher than manufactured homes. It further reveals no significant difference between Katrina Cottages and single-family homes. It also suggests a strong relationship between value and smart growth design metrics, including density, walkability, and urban context. However, it shows that Mississippi Katrina Cottages are valued lower than those in Alabama and Louisiana. Furthermore, analysis of community demographics suggests Katrina Cottages may be less valuable in wealthy communities.

DEDICATION

This thesis is dedicated to my family and friends who have provided unwavering love and support throughout my life. I would like to start by thanking my mother and father for their patience and sacrifice over the years. Their devotion has inspired my pursuits and taught me the value of resilience. I would also like to thank my grandfather who has been the bedrock of our family. His steadfast support has made this possible. Finally, I would like to express my love and gratitude to those who are no longer with me, including my grandmothers, my grandfather, my aunt, and my dear friend. It is in their memories and honor that I continue my endeavors. I owe my success in life to those who have loved and encouraged me along the way.

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I would like to acknowledge the mentors, friends, and colleagues who have helped me reach this point. I would like to start by thanking my thesis committee members for providing invaluable insight and thoughtful suggestions that made this thesis meaningful. I would especially like to thank Cory Gallo for guiding me through this process and directing my focus when I strayed off course. His patience and dedication made this possible. I would also like to thank the entire faculty of the Mississippi State University Department of Landscape Architecture. The breadth of knowledge and perspectives I have received from the faculty at MSU has sharpened my interests and ensured my success.

I would be remiss if I failed to acknowledge those friends, colleagues, and mentors who helped to guide my journey into planning and design. First, I would like to thank Doctor Amelia Fox, who encouraged me to pursue a post-graduate degree in community planning. Her love and support have made my career possible. I would also like to thank Cheryl Morgan, who inspired my passion for urban design through her work at the Auburn University Urban Studio. Finally, I would like to acknowledge the colleagues who have shaped my professional career, including Wade Burcham, Ashley Campbell, Jordan Hillman, Mayor Mike McMillan, Bruce Renkert, and the staff at the Mobile Bay National Estuary Program. Their passion and dedication to their communities exemplifies the power of planning and collaboration in driving positive change. For those who have invested themselves in me, I am truly grateful.

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INTRODUCTION

Introduction

Using appraisal values based on market valuations provided by local tax assessors, this study explores the long-term value of Katrina Cottages within Federal Emergency Management Agency (FEMA) group sites in five Gulf Coast communities. Valuation patterns were compared among group sites and against other residential land uses to determine differences within communities. Next, means tests were conducted to analyze the significance of valuation differences between land use groups. Finally, linear relationships were observed to understand the correlation between appraisal values and smart growth metrics endorsed by FEMA. This chapter introduces the contents of the study.

Goal and Objectives

The primary goal of this study is to compare the market value of Katrina Cottages against manufactured homes and other residential land uses to understand the long-term impact of disaster housing group sites on local property values. A secondary goal is to observe the role of design and context in valuation outcomes. The following objectives were defined to meet these goals:

1. Conduct a literature review to understand the history of Katrina Cottages within the context of post-disaster recovery, implementation of the disaster housing program, and post-Katrina disaster housing policy reforms.

2. Conduct case studies to understand the history, purpose, and design characteristics of each Katrina Cottage group site selected for study.

3. Examine the impact of different design and construction methods on appraisal valuations.

4. Understand the relationship between local demographics and Katrina Cottage appraisal values.

5. Observe patterns of residential land use values across Gulf Coast communities using standardized data.

6. Conduct means tests to analyze the significance of differences between common residential land use values.

7. Observe relationships between Katrina Cottage values and smart growth design metrics endorsed by FEMA.

Scope of Study

The purpose of this study is to examine the appraised market value of "Katrina Cottages" compared with other nearby residential land uses to provide insight on the long-term impact of permanent prefabricated disaster housing within communities. The scope of this study specifically focuses on the role of land use, design, and community characteristics in determining valuation outcomes in five communities impacted by Hurricane Katrina. While valuation analysis and relational patterns could apply to other communities, this study uses tax appraisal information from Jefferson and Orleans Parishes in Louisiana, Harrison and Jackson Counties in Mississippi, and Mobile County in Alabama.

Organization of Thesis

The remainder of this thesis is organized by literature review, methodology, case study results, valuation results and analysis, and discussion and conclusions. The literature review covers: the exponential rise in catastrophic disasters and their implications for coastal and inland communities; post-disaster recovery timelines and barriers to recovery; planning for disaster

resilience through mitigation and the role of housing as infrastructure; Federal housing policy, post-Katrina reforms, and the origins of Katrina Cottages and the Adequate Housing Pilot Program (AHPP); the Mississippi Adequate Housing Program; the Louisiana Pilot Program; the Alabama Pilot Program; and lessons learned from the AHPP. The methodology section describes data sources, methods for selecting subject properties (Katrina Cottage group sites) and comparative residential properties (comps), methods for producing case studies, and the process of measuring economic value using standardized appraisal data.

The case study results section provides details about each selected group site, including general background information, design characteristics of property improvements, community context and demographics, and representative comps chosen within the community. The valuation results and analysis section details: differences in design and construction characteristics between Katrina Cottages; relationships between community demographics and Katrina Cottage valuations; observation and evaluation of residential land uses based on standardized appraisal values; and observations of relationships between Katrina Cottage valuations and smart growth design metrics. Finally, the discussion and conclusions section considers the implications of the study's findings and draws conclusions that may assist planners in developing effective long-term disaster housing programs in the future.

CHAPTER II

LITERATURE REVIEW

Catastrophic Disasters and the American Landscape

Accelerating Pace of Billion-Dollar Disasters

According to the National Oceanic and Atmospheric Administration (NOAA), the United States experienced 291 weather and climate disasters that caused more than $1 billion in damage (adjusted to 2020 Consumer Price Index) between 1980 and 2020 (Smith & NOAA National Centers for Environmental Information, 2020c). Fully one half (50%) of all billion-dollar disaster events have occurred since 2010 (Figure 2.1). Since 1980, the annual frequency of catastrophic disaster events has risen exponentially, increasing nearly fivefold in that time (Figure 2.2). Following the exponential curve in Figure 2.2, the 2020s are projected to produce an average of eighteen billion-dollar disaster events per year. However, 2020 shattered records, producing twenty-two (22) billion-dollar disasters, breaking the previous annual record of sixteen (16) billion-dollar events by September (Figure 2.3), amid a historic hurricane season.

NOAA suggests this is part of a growing trend that has accelerated within the past five years (2016-2020), in which the United States has averaged 16.2-billion-dollar disaster events per year, more than double the forty-year average of 6.9 events per year. NOAA reported that "2020 [was] the sixth consecutive year (2015-2020) in which ten or more billion-dollar weather and climate disaster events [had] impacted the United States. Over the last 41 years (1980-2020), the years with 10 or more separate billion-dollar disaster events include 1998, 2008, 2011-2012,

and 2015-2020." Despite the extraordinary number of catastrophic events, however, 2020 ranked just fifth among the costliest years on record, causing only $90 billion in damage, as population centers in Texas and Florida were largely spared.

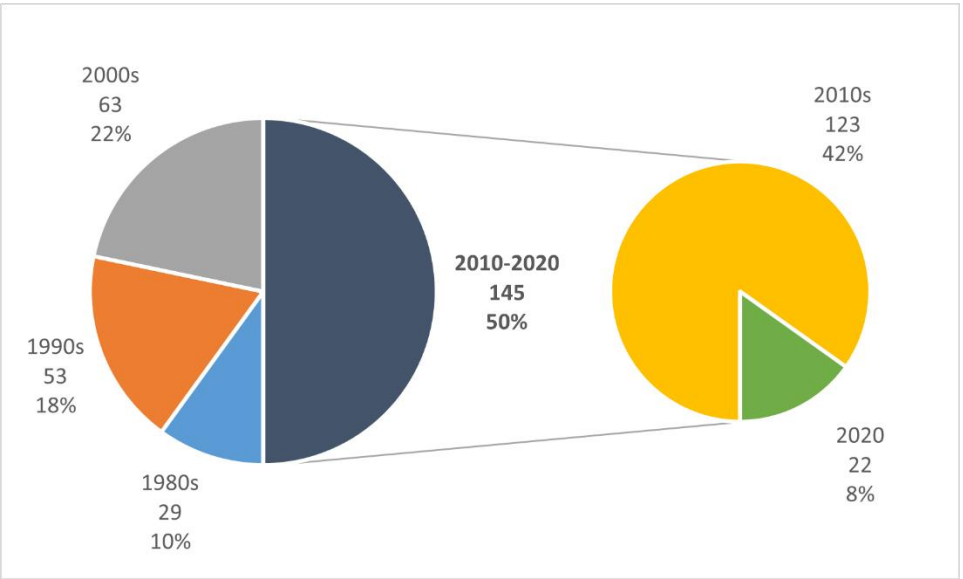


Figure 2.1 Pie Chart Illustrating Proportion of Billion-Dollar Disaster Events by Decade

Pie charts depicting the number of catastrophic disasters in the United States by decade (adjusted for inflation), 1980 – 2020. Half of all billion-dollar disaster events since 1980 have occurred since 2010. The year 2020 produced only seven fewer billion-dollar events than the entire 1980s (Smith & NOAA National Centers for Environmental Information, 2020c).

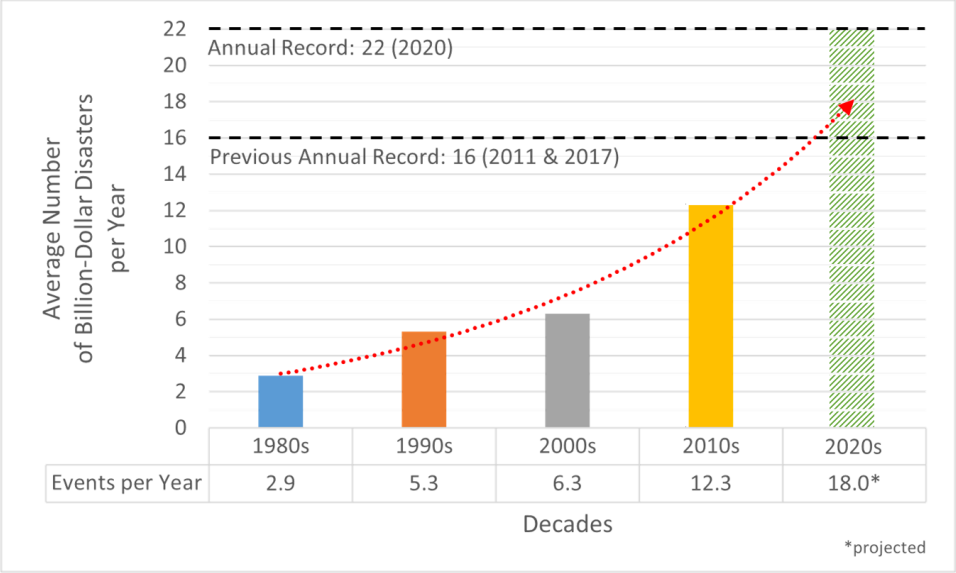


Figure 2.2 Bar Chart Illustrating the Exponential Rise in Average Billion-Dollar Disaster Frequency per Year by Decade

Bar chart depicting the average number of billion-dollar disaster events per year by decade, beginning in the 1980s through the 2010s. The dotted red line depicts the exponential rate of increase in the average number of billion-dollar disaster events per year projected forward one decade, forecasting an average of eighteen-billion-dollar disaster events per year during the 2020s (Smith & NOAA National Centers for Environmental Information, 2020c).

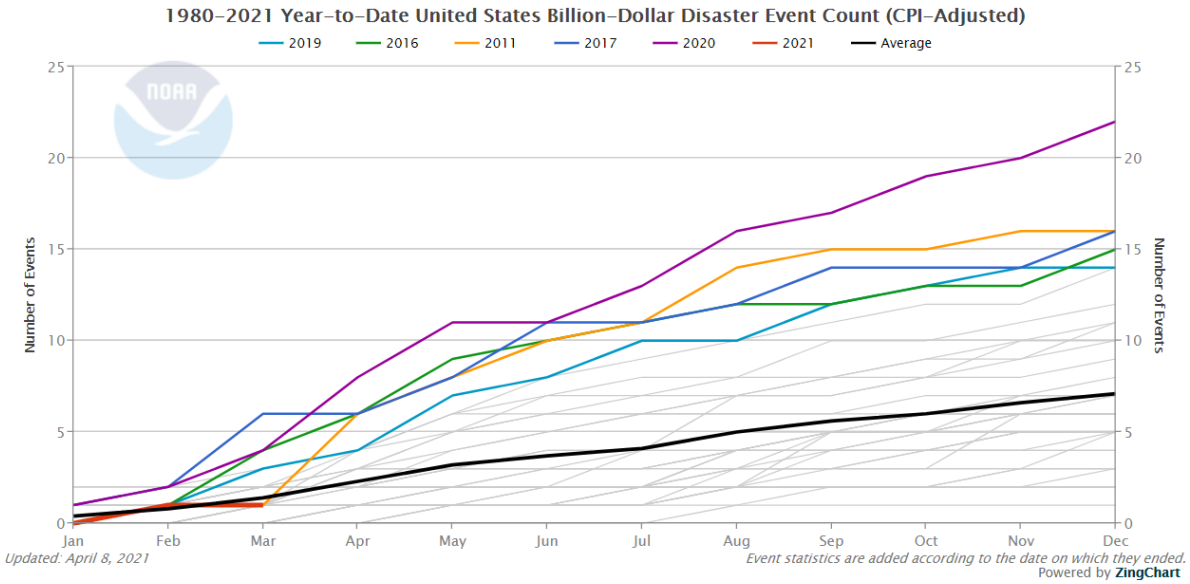


Figure 2.3 Billion-Dollar Disaster Event Count per Year

Chart depicting the number of billion-dollar disaster events each year by month. In 2020, the annual record of sixteen events was surpassed in September as the historic Atlantic hurricane season got underway (Smith & NOAA National Centers for Environmental Information, 2020b).

Cost of Billion-Dollar Disasters

Billion-dollar climate and weather events have caused an average of $46.5 billion in damage per year and almost 15,000 total deaths since 1980 (Smith & NOAA National Centers for Environmental Information, 2020c). Of the estimated $1.9 trillion in damage inflicted since 1980, more than forty-eight percent (48%) of all losses have occurred within the past eleven years (Figure 2.4). Since 2010, catastrophic climate and weather events have cost Americans five times (5x) more than during the 1980s. Following the exponential curve in Figure 2.5, catastrophic disasters are projected to cause more than $140 billion in damage per year between 2020 and 2029, totaling $1.4 trillion in losses by the end of the decade, comparable to the total losses experienced over the previous four decades combined.

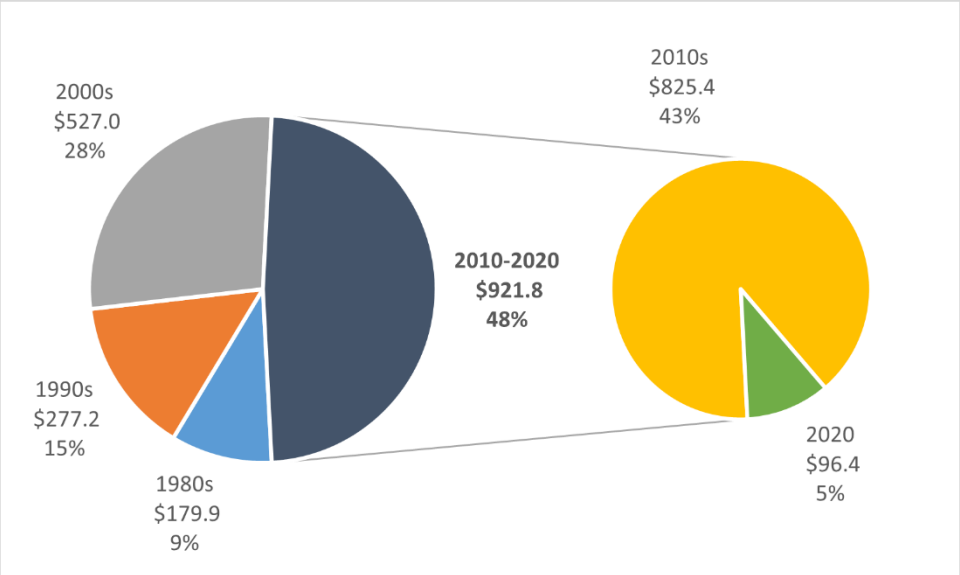


Figure 2.4 Pie Chart Illustrating the Proportion of Billion-Dollar Disaster Costs in Billions by Decade

Pie charts depicting the total cost of billion-dollar disaster events in the United States by decade in billions, adjusted for inflation. Nearly half of all billion-dollar-disaster-related costs have occurred since 2010 (Smith & NOAA National Centers for Environmental Information, 2020c).

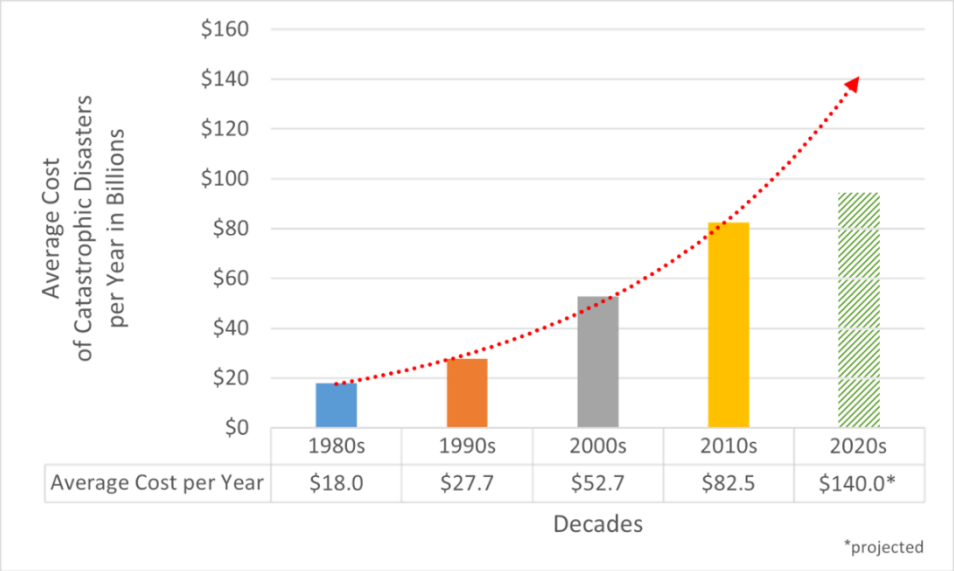


Figure 2.5 Bar Chart Illustrating the Exponential Rise in Average Billion-Dollar Disaster Costs per Year by Decade

Bar chart depicting the average cost (in billions) of billion-dollar disaster events per year by decade, beginning in the 1980s through 2019. The dotted red line depicts the exponential rate of increase in the average number of billion-dollar disaster events per year projected forward one decade, forecasting an average cost of $140 billion per year during the 2020s (Smith & NOAA National Centers for Environmental Information, 2020c).

Historic Atlantic Hurricane Season

Amid a crushing global pandemic, 2020 delivered a historic hurricane season that produced a record thirty (30) named tropical cyclones in the Atlantic basin, twelve (12) of which made landfall in the United States – another record (National Oceanic and Atmospheric Administration, 2021b). Louisiana bore the brunt of the 2020 hurricane season as a record five (5) named storms struck the state (Wells, 2020). Two hurricanes, Category 4 Laura – the strongest hurricane to strike Louisiana since 1856 (Bianchi, 2020) – and Category 2 Delta, made landfall within forty-two days and thirteen miles of one another in Cameron Parish, Louisiana (Figure 2.6) (Wells, 2020). Alabama was struck by Category 3 Hurricane Sally in September, followed closely by Category 3 Hurricane Zeta, which impacted Southeast Louisiana and Coastal

Mississippi in October 2020 (Klotzbach et al., 2020; Blake et al., 2021). Tropical cyclones caused more than $40 billion in damage, “more than 42% of the total U.S. billion-dollar disaster price tag in 2020” (National Oceanic and Atmospheric Administration, 2021a).

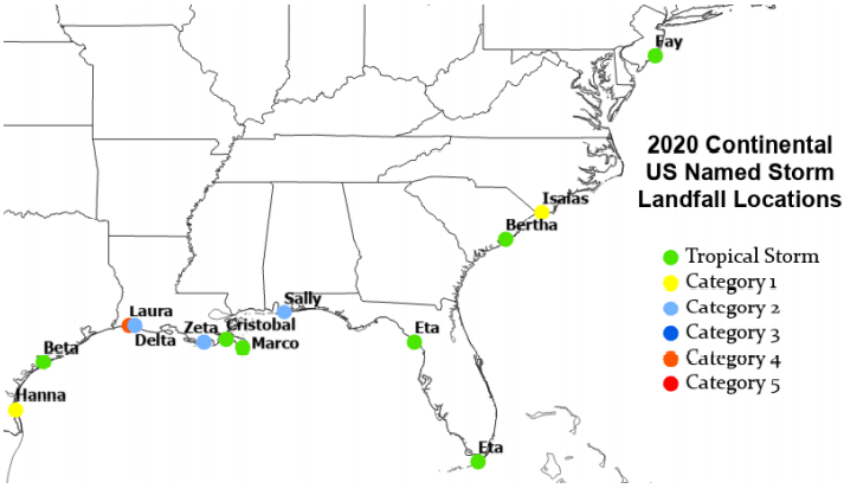


Figure 3: Location of the named storms making landfall in the continental US during the 2020 Atlantic hurricane season. Eta made two separate landfalls in Florida.

Figure 2.6 2020 Continental United States Named Storm Landfall Locations

Graphic illustration of landfalling tropical cyclones in the continental United States with category indicated in color (Klotzbach et al., 2020, p. 16, Figure 3). Hurricane Zeta has since been upgraded to a Category 3 hurricane (Blake et al., 2021).

Billion-Dollar Tropical Cyclones

According to NOAA, tropical cyclones are the most destructive disaster type in the United States. Representing only eighteen percent (18%) of all billion-dollar disaster events since 1980 (Figure 2.7), they account for more than half (53%) of all catastrophic disaster losses during that time (Figure 2.8) (Smith & NOAA National Centers for Environmental Information, 2020c). In total, tropical cyclones have caused more than $1 trillion in damage in the past forty (40) years, with nearly half of that total – $491.1 billion – accruing since 2010. Tropical storms have been particularly destructive in the southeastern United States where Florida leads the

nation in total number of catastrophic tropical events, followed by North Carolina, Louisiana, Alabama, and Mississippi, respectively. Texas, despite tallying less than half as many billion-dollar tropical cyclones as Florida, ties the Sunshine State with more than $200 billion in damage during that time. Still, tropical cyclones have had a disproportionate impact on Louisiana, costing between $20 and $50 billion per million residents, followed by Mississippi and Florida with more than $10 billion in damage per million residents (Smith & NOAA National Centers for Environmental Information, 2020a).

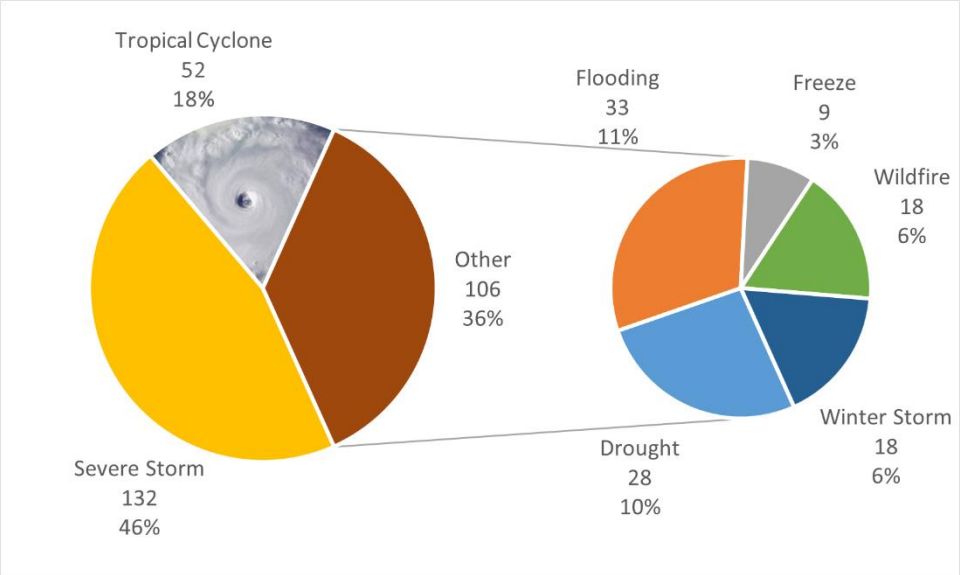


Figure 2.7 Pie Chart Illustrating the Total Number of Catastrophic Climate Events by Type, 1980 – 2020

Pie chart depicting the total number of billion-dollar climate disasters in the United States by type between 1980 and 2020. Severe storms represent the most frequent billion-dollar disaster type, accounting for 46% of all events since 1980. Tropical cyclones represent eighteen percent of all billion-dollar disaster events in that time (Smith & NOAA National Centers for Environmental Information, 2020c).

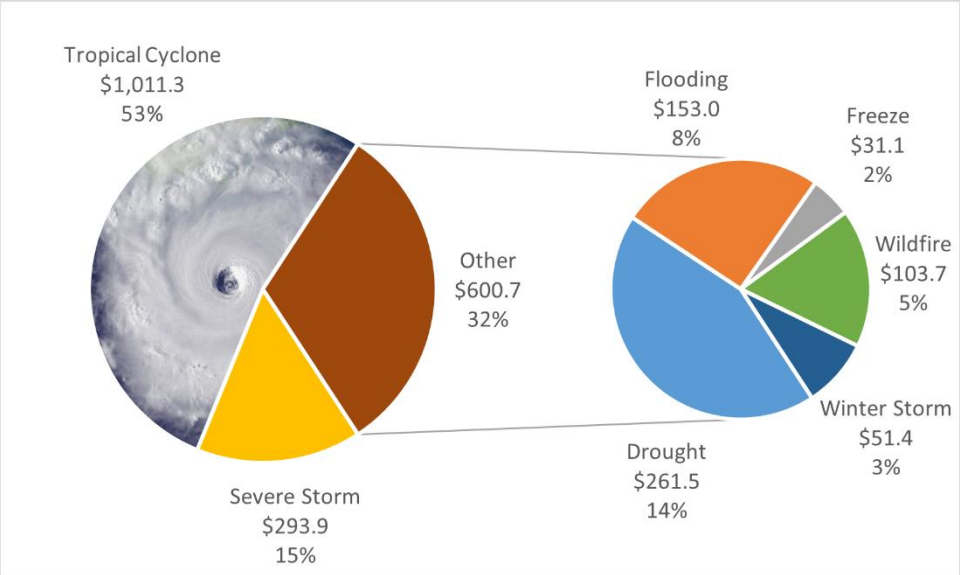


Figure 2.8 Pie Chart Illustrating the Total Cost of Catastrophic Climate Events by Type, 1980 – 2020

Pie chart depicting the total cost of billion-dollar climate disasters in the United States by type between 1980 and 2020. Tropical cyclones represent only 18% of all billion-dollar events, but account for 53% of billion-dollar disaster costs since 1980. Catastrophic tropical cyclones have caused more than $1 trillion in losses over the past four decades (Smith & NOAA National Centers for Environmental Information, 2020c).

Climate Change Fueling Mass Migrations

Dr. Mathew Hauer (2017) of Florida State University suggests the accelerating frequency and severity of catastrophic events, coupled with sea level rise, could trigger more frequent climate-fueled migrations throughout the 21st century. He argues that climate change will "reshape the U.S. population distribution" (2017, p. 16) by displacing more than 13 million Americans from coastal cities to more favorable inland locations like Atlanta, Austin, Houston, and Orlando (Flurry, 2017) (Hauer, 2017, p. 10). Hauer emphasizes that such migrations "could stress some landlocked areas unprepared for these migrations…" (Figure 2.9) (Hauer, 2017, p. 16). Thus, the impact of sea level rise and tropical cyclones is not limited to coastal areas.

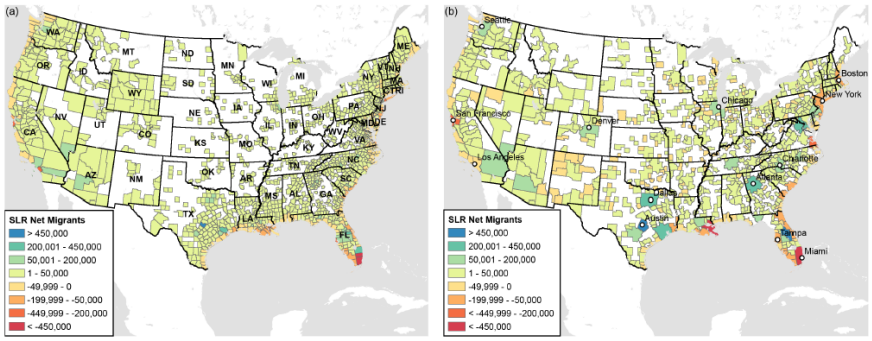


Figure 4: **Estimated sea level rise net migrants (in-migrants minus out-migrants) for counties (a) and core based statistical areas (b) under the 1.8m scenario and no adaptation.** I considered migration destinations for all 50 states and the District of Columbia and migration origins for 22 states and the District of Columbia. These are the net changes in population due to both in- and out-migration due to sea level rise.

Figure 2.9 Map of Projected Population Changes Fueled by Climate Change

Map of projected population change caused by sea level rise by county (left) and metropolitan area (right) from Mathew E. Hauer's "Migration Induced by Sea Level Rise could Reshape the U.S. Population Landscape," depicting projected climate migration for counties and metropolitan areas without adaptation measures (Hauer, 2017, p. 14, Figure 4). Coastal areas in red and orange are projected to lose millions of residents, while inland metropolitan areas are projected to gain millions in population by the year 2100.

Hauer points to ongoing land use and resource challenges facing many cities poised to receive climate migrants over the coming decades. "For many destinations… already experiencing water management and growth management challenges, the sea level rise migrants who wash across the landscape over the coming century could place undue burden in these places if accommodation strategies are left unplanned" (Hauer, 2017, p. 12). However, Hauer's results suggest that the number of climate migrants and their impact on inland communities could be reduced significantly with proper planning and adaptation measures (Hauer, 2017, p. 12, Table 2). Hence, Kates and Pijawka (1977, as cited in Evans-Cowley & Kitchen, 2011, p. 103) argue that disaster mitigation and recovery efforts should also focus on the "invisible city", or the areas outside the damage zone where development is likely to occur. Thus, coastal

disasters and recovery therefrom have broad implications for planning and housing development in the United States writ large.

Post-Disaster Recovery

Recovery Timeline

Post-disaster recovery is defined by Smith and Wenger (as cited in Rouhanizadeh et al., 2020) as "the differential process of restoring, rebuilding, and reshaping the physical, social, economic, and natural environment through pre-event planning and post-event actions." More literally, Schwab et al. (as cited in Rouhanizadeh et al., 2020, p. 1) define the process as the restoration of "housing, transportation, and public services; restarting economic activity; and fostering long-term community redevelopment in improvements." Rouhanizadeh et al. (2020, p. 1) notes that the United Nations Office of Disaster Risk Reduction emphasizes both short- and long-term recovery, "with short term focusing on returning the community to normality, and the long term focusing on helping communities become more resilient so that they are less vulnerable and more capable of dealing with future disasters." According to Chang and Shinozuka (as cited in Rouhanizadeh et al., 2020, p. 2), resilience is best measured by the "rapidity and robustness" of post-disaster recovery. Thus, resilience is a measure of how quickly a community can recover from a disaster.

In 1977, Kates and Pijawka (as cited in Evans-Cowley & Kitchen, 2011, p. 102) developed a "Model of Recovery Activity", which divides the recovery process into four phases, "with each phase lasting ten times longer than the prior phase." The initial emergency phase includes search and rescue, temporary shelter, and the cessation of normal social and economic activities, while the Restoration phase includes the restoration of utilities, removal of debris, and

return of residents. Functional Reconstruction involves the return to "normalcy", including the restoration of housing, businesses, and economic activity to pre-disaster levels.

Hurricane Katrina offers a pertinent case study in catastrophic disaster recovery. As Evans-Cowley and Kitchen (2011, p.102) note, "the emergency phase of the post-Katrina recovery timeline lasted six weeks." Based on the Model of Recovery Activity, Restoration would be expected to take sixty (60) weeks, while Functional Reconstruction could take nearly twelve (12) years. In 2011 they noted, "the continuing demand for temporary housing five years post-Katrina suggest that the decade plus estimate of recovery time may be quite reasonable" (Evans-Cowley & Kitchen, 2011, p. 102). However, fifteen years after the storm, most of the impacted communities have not yet regained their pre-Katrina populations (U.S. Census Bureau, 2015-2019a).

Barriers to Recovery

Disaster recovery is a complex process that involves multiple inter-dependent challenges concerning infrastructure, housing, and services that must be addressed simultaneously. However, until recently, there had not been a thorough analysis of the barriers to post-disaster recovery to aid mitigation planners (Orabi et al. as cited in Rouhanizadeh et al., 2020, p. 2). In 2020, Rouhanizadeh et al. published a study of more than 1,500 publications that identified sixty-three (63) barriers to recovery, with a specific focus on hurricanes. These barriers were divided into five groups, including: financial and economic; social; infrastructure and housing reconstruction; environment; and coordination of resources.

According to Rouhanizadeh et al. (2020), the most frequently cited barrier to disaster recovery is unemployment, as businesses, industries, and infrastructure are often damaged and inoperable. They note that high unemployment often leads to higher crime rates, drains financial

resources, and contributes to post-disaster blight, which further disrupts the recovery process. Furthermore, high unemployment often hurts small businesses' ability to reopen and results in lower revenues for local governments. To curb unemployment, they stress the need to repair damage to major infrastructure and transportation systems, along with commercial and industrial buildings to avoid prolonged delays in recovery.

In addition to unemployment, Rouhanizadeh et al. (2020) list several factors that delay post-disaster housing recovery, including a lack of adequate insurance, a lack of competent contractors, and slow decision-making by government agencies. Unclear restrictions, regulations, and other obstacles imposed by governments further limit housing recovery. These factors, among others, often produce illegal and insufficient construction that is dangerous to occupants and threatens community resilience in the face of future disasters. Furthermore, they produce a prolonged imbalance of housing supply that causes home and rental prices to rise beyond the means of many struggling to recover. Renters are particularly vulnerable to this market imbalance, as research suggests that rental housing is unlikely to be replaced as landlords often choose to collect insurance payments without rebuilding (Morrow and Whoriskey as cited in Evans-Cowley & Kitchen, 2011, p. 101).

As Evans-Cowley and Kitchen (2011, p. 100) note, "the slow recovery of housing is not always the result of extensive damage." Rather, slow recovery is often the result of "economic and social inequalities" that pre-date the disaster. Kates and Pijawka (1977, as cited in Evans-Cowley and Kitchen, 2011, p. 103) suggest that reconstruction tends to bolster existing urbanization patterns that work to eliminate less desirable land uses, "resulting in greater segregation based on social class and/or ethnic origin." Rouhanizadeh et al. (2020, p. 6, Table 4) cite the prevalence of laws targeting low-income residents that obstruct reconstruction approval,

including “inappropriate land-use determinations for rebuilding” and a “lack of appropriate policies for people’s relocation” as primary barriers to housing recovery.

Lee et al. (2007, p. 744) describe the phenomenon of the “not-in-my-back-yard” (NIMBY) mindset as “negative community attitudes [toward] locally undesirable land uses” (LULUs) like garbage dumps, prisons, and low-income housing. As a result, local governments avoid pressure from NIMBY opponents by ensuring “minimal zoning intervention” through exclusionary zoning practices that severely limit development within urbanized areas. This, in turn, supports low density development outside of urban areas that increases infrastructure costs and requires use of automobiles, effectively raising the barrier to entry for low-income residents (Evans-Cowley & Kitchen, 2011, p. 103; Kushner, 2010, p. 194). According to Pendall (as cited in Evans-Cowley & Kitchen, 2011, p. 104), “these practices can include low-density zoning, building permit caps, building permit moratoria, adequate public facilities ordinances, urban growth boundaries, and limitations on urban expansion.” Cumbersome and restrictive regulations fuel distrust among different groups during the outset of recovery and often “lead to chaotic situations, complexities, and conflicts among the stakeholders during reconstruction” that ultimately hampers long-term recovery and resilience (Rouhanizadeh et al., 2020, p. 7).

Planning for Resilience

Pre-disaster planning is crucial to overcoming barriers to reconstruction and accelerating the recovery process (Rouhanizadeh et al., 2020, p. 5; Evans-Cowley & Kitchen, 2011, p. 104; National Building Museum, 2012, 1:12:00-1:12:13; Abt Associates Inc. & Amy Jones & Associates, 2009, p. 14). According to the Federal Emergency Management Agency (FEMA), hazard mitigation planning “reduces loss of life and property by minimizing the impact of disasters.” Furthermore, “mitigation plans are key to breaking the cycle of disaster damage and

reconstruction" (FEMA, 2021a). A study by the National Institute of Building Sciences and the Multihazard Mitigation Council (2019) suggests that public-sector mitigation grants saved taxpayers six dollars per one dollar invested since 1995, an estimated $160 billion in averted damage costs for only $27 billion in mitigation investments. However, mitigation efforts are often overlooked in post-disaster recovery due to the urgency of reconstruction (Evans-Cowley & Gough as cited in Evans-Cowley & Kitchen, 2011, p. 102). This underscores the need for planning before disaster strikes.

Yet many communities lack the will to plan for disaster recovery, "resulting in stopgap emergency planning after disasters" (Johnson as cited in Evans-Cowley & Kitchen, 2011, p. 104). As a result, most communities rely on "ad hoc tactical decision making" when addressing post-disaster recovery, resulting in inefficient and inequitable outcomes. According to Evans-Cowley and Kitchen (2011), states like Mississippi are "poorly equipped to address the relocation, land development, infrastructure, and market problems associated with widespread long-term displacement." This is due to the state's lax and outdated planning and zoning regulations, many of which are based on models from the 1920s. By contrast, Florida mandates frequent planning, and "requires its comprehensive plans to have an emergency planning element." This, they argue, is indicative of "uneven levels of hazard planning along the Gulf Coast" that explain higher per capita disaster costs in states like Louisiana, Mississippi, and Texas (Evans-Cowley & Kitchen, 2011, p. 103).

However, newly established funding through FEMA's Building Resilient Infrastructure and Communities (BRIC) grant program may entice more communities to undergo the mitigation planning process (FEMA, 2021b). BRIC is a key component of the bipartisan *Disaster Recovery Reform Act of 2018* (DRRA), which aims to "create a culture of preparedness" rather than

focusing solely on post-disaster recovery. The DRRA allocates six percent (6%) of annual post-disaster relief funds to the BRIC program. Beginning in 2021, BRIC will dispense up to $1 billion toward green infrastructure projects that deliver "multiple benefits," as well as building code adoption and enforcement, technical assistance, planning, and partnerships (FEMA, 2020e; The White House, 2021). According to FEMA, "leveraging community lifelines in hazard mitigation planning and project implementation can be transformational in terms of a community's ability to respond to and recover from the impacts of natural hazards and ensure long-term resilience outcomes" (FEMA, 2020d, p. 8).

Affordable Housing as Infrastructure

Affordable housing is likely to be severely impacted by rising sea levels and worsening coastal events, causing a disproportionate impact on low-income and otherwise vulnerable residents (American Planning Association, et al., 2019, p. 45; Evans-Cowley, 2011, p. 101). While recovery and mitigation efforts often focus on vital infrastructure projects, including roads, utilities, and public services, James Kushner (2010, p. 215), Professor of Law Emeritus at the Southwestern Law School, suggests that affordable housing should be considered as infrastructure, particularly after catastrophic disasters. He argues that affordable housing is crucial to maintaining the state and local tax base as it ensures a sufficient source of labor to service and manufacturing industries. Kushner contends that "an adequate supply [of affordable housing should be] assured through planning and implementation just as communities assure the availability of adequate retail, office, industry, schools, or streets" (Kushner, 2010, p. 179). However, as previously demonstrated, the scale and complexity of disaster recovery necessitates the use of temporary housing to stem migration in search of jobs and permanent housing. Thus, planning for temporary disaster housing is essential to ensuring resilience.

Temporary Housing Isn't Temporary

While temporary post-disaster housing is often criticized as a waste of resources, it is necessary to speed recovery, as it "allows extra time for safe rebuilding of permanent housing" (Johnson as cited in Evans-Cowley & Kitchen, 2011, p.100). Turner et al. (as cited in Evans-Cowley & Kitchen, 2011, p. 100) suggest that temporary housing is "part of a process of re-housing… rather than product." Quarantelli (as cited in Evans-Cowley & Kitchen, 2011, p. 100) describes post-disaster housing in four sequential stages: emergency shelter, temporary shelter, temporary housing, and permanent housing. In the United States, temporary disaster housing provided under the *Stafford Act* includes financial assistance for apartments, hotels, and other rentals. In extreme circumstances, FEMA deploys direct housing assistance, typically in the form of manufactured FEMA trailers, for up to eighteen months after a disaster declaration (FEMA, 2019, pp. 43-45).

However, as Dana Bres, research engineer at the Department of Housing and Urban Development (HUD), explains, "temporary housing isn't temporary," it is slow, expensive, and often inadequate (National Building Museum, 2012, 1:13:40-1:14:00). Evans-Cowley and Kitchen (2011, p. 102) note that temporary disaster housing often transitions to permanent housing for vulnerable residents lacking other affordable options, regardless of its suitability to long-term use. This can create blight and social problems that hamper recovery further. Moreover, it can be dangerous for residents occupying temporary travel trailers in hazardous areas. Therefore, they suggest that "temporary housing should not be framed in terms of months, but in terms of years." As a result, Gopalakrishnan and Okada (as cited in Evans-Cowley & Kitchen, 2011, p. 101) recommend that disaster housing be efficient, affordable, adaptable, and sustainable for long-term use.

Long-Term Disaster Housing

Abt Associates Inc. and Amy Jones & Associates (2009, p. 14) recommend communities address both short- and long-term temporary housing, including prefabricated units that could transition to permanent housing. According to FEMA's National Disaster Housing Strategy of 2009 (NDHS), prefabricated housing provides an opportunity to deliver "stronger and more energy-efficient housing in less time and at a lower cost" (FEMA, 2009, p.84). However, in its 2020 report entitled, *Planning Considerations: Disaster Housing*, FEMA emphasizes the continued need to "build capabilities to provide a broad range of flexible housing options" and "improve disaster housing planning to better recover from disasters, including catastrophic events" (FEMA, 2020a, pp. 3-4). FEMA acknowledges the use of prefabricated units would require local government acceptance of prefabricated housing and standardization of building codes across jurisdictions (FEMA, 2009, pp. 84-85).

FEMA recommends planners establish planning teams to understand the local housing situation, establish goals and objectives, and determine strategies to implement the plan. The agency suggests including public, private, and non-profit partners to establish "relationships that bring creativity and innovation to disaster housing planning" (FEMA, 2020a, pp. 27-28). It suggests that local jurisdictions should engage private sector developers on provision of temporary housing to "alleviate the need to navigate legal requirements during the height of a response to an incident" and consider waiving fees and requirements, including zoning, that may hamper delivery of affordable housing after a storm (FEMA, 2020a, p. 19). Abt Associates Inc. and Amy Jones & Associates (2009, p. 14) suggest that communities in agreement on design and implementation policies ahead of a disaster will "foster a sense of control and mitigate future community resistance."

Smart Growth

Burby and Godschalk (as cited in Evans-Cowley & Kitchen, 2011, p. 103) note that "zoning policies are necessary to balance creating disaster-resistant communities, while supporting new development in appropriate locations to meet housing demand." To address the availability, affordability, and livability of post-disaster housing, FEMA and the Environmental Protection Agency (EPA) have partnered to produce "smart growth" strategies for disaster planning and recovery efforts "to help communities hit by disasters rebuild in ways that protect the environment, create long-term economic prosperity, and enhance neighborhoods" (U.S. Environmental Protection Agency, 2020b). According to the EPA, smart growth strategies for disaster resilience include "flexible land use policies" that focus on providing mixed land uses and a variety of housing types within compact, walkable communities that are accessible to various age groups and incomes. Kushner (2010, p. 197) defines smart growth as "growth that supports environmental, economic, and social sustainability" by promoting the pedestrian over the automobile. Inclusion of transportation in the housing discussion is particularly important for housing affordability, as housing and transportation costs account for nearly half of all household expenses in America. According to Lipman (2006), transportation costs consume a higher percentage of working families' income than does housing (Figure 2.10).

TYPICAL HOUSEHOLD BUDGET IN 28 METROPOLITAN AREAS

(Expenses as a share of income)

	All Households	Working Families Incomes $20,000 – $50,000
Housing	27.4%	27.7%
Transportation	20.2%	29.6%
Food	10.6%	15.1%
Healthcare	4.7%	7.7%

Note: Housing costs include mortgage payments, operating costs and utilities for homeowners and contract rent and utilities for renters; transportation costs include the cost of owning and operating a vehicle and the cost of public transit.

Source: Figures derived by the Center for Neighborhood Technology (CNT) and the Center for Housing Policy from the 2000 Census of the U.S. Census Bureau and the 2002 and 2004 Consumer Expenditure Surveys of the Bureau of Labor Statistics.

Figure 2.10 Comparison of Household Expenses as a Share of Income

The figure above depicts the average share of household income on housing, transportation, food, and healthcare. For working-class families, transportation makes up a larger share of income than housing (Lipman, 2006).

Kushner (2010, p. 199) suggests that affordable housing could be developed near walkable community centers on “infill, brownfields, and areas of the city that are lying fallow such as rail yards, former industrial sites, and parking lots.” Likewise, the EPA notes that redevelopment of abandoned brownfield sites “can remove blight and environmental contamination, catalyze neighborhood revitalization, lessen development pressure on undeveloped land, and use existing infrastructure” (U.S. Environmental Protection Agency, 2020a). In that vein, FEMA’s National Disaster Housing Strategy suggests that disaster housing group sites offer communities future resilience by “building out from an area of strength, especially in areas that are relatively ‘safer’ from a repeat event”. This can ultimately “stimulate permanent housing recovery,” and “help the community focus investment in the public utilities

infrastructure." It further acknowledges that permanent group housing could make the housing process more efficient, eliminate waste, and leave a lasting impact on communities; thus, "clusters of permanent housing opportunities can speed and enhance recovery," by creating a "nucleus and catalyst for more permanent housing – a positive snowballing effect" (FEMA, 2009, pp. 73-74).

The Adequate Housing Pilot Program

FEMA (2020a, p. 33) recommends disaster housing planners and participants study "real-world incidents" that "offer an opportunity to assess existing plans and identify planning or resource gaps." Many of the long-term disaster housing concepts and policies previously discussed herein were derived from experiences with the Adequate Housing Pilot Program (AHPP). Created in the wake of Hurricane Katrina, the AHPP was the first modern attempt at addressing the long-term housing needs of disaster victims in the United States and thus provides lessons that can be applied to disaster housing plans in the future. Importantly, it illustrates the challenges of implementing long-term disaster housing in the absence of prior planning. This section details disaster assistance provided by FEMA under the *Stafford Act*, FEMA's disastrous response to Hurricane Katrina and the resulting disaster reforms, and lessons learned through the AHPP.

Federal Disaster Aid

In the aftermath of disasters, governments and individuals depend on federal assistance provided by the *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (*Stafford Act*). Under the *Stafford Act*, the FEMA acts as a "source of financing and technical assistance" to individuals and state and local governments. State governments are responsible for managing

disaster housing programs and requesting federal assistance, while local governments are responsible for land use decisions, permitting, and provision of services. The *Stafford Act* directs FEMA to administer the Individuals and Households Program (IHP) which provides Financial Housing Assistance (FHA) and Direct Housing Assistance (DAH) to disaster victims under Section 408. FHA includes reimbursements for lodging expenses, rental assistance, and costs associated with repair and replacement of damaged primary residences and other personal property not otherwise covered by insurance. When FHA is insufficient, impractical, or otherwise unavailable, FEMA may consider applicants for DHA (FEMA, 2019, pp. 75-78).

Eligibility for Direct Housing Assistance is predicated on a lack of available housing resources, leaving applicants unable to utilize FEMA's FHA program. Applicants may also qualify for DHA if local rental rates rise above 125% of the HUD Federal Market Rate and assistance from other providers is insufficient to meet a household's needs. Applicants must provide proof of at least $17,000 in damage to their primary residence or major damage sustained to a rental unit because of the disaster. For those who qualify, FEMA will generally provide "one bedroom for every two persons in the applicant's household," with exceptions based on age, sex, disabilities, and familial relationships within reason (FEMA, 2019, p. 97).

Direct Housing Assistance is provided in one of two forms: Temporary Housing Assistance and Permanent Housing Construction (FEMA, 2019, p. 93). The latter provides direct assistance in new home construction. However, it is only available "in insular areas outside the continental U.S.," or "other locations where no alternative housing resources are available, and other types of Temporary Housing Assistance are unavailable, infeasible, or not cost-effective" (FEMA, 2019, p. 127). Temporary Housing Assistance is composed of three categories, including: (1) direct lease and repair of multi-family units; (2) the direct lease of other individual

units; and (3) the provision of "Transportable Temporary Housing Units" (TTHU) (FEMA, 2019, p. 93). The lease and repair of existing multi-family units is the preferred method of direct housing assistance provided by FEMA, while direct lease of existing individual units and TTHU group sites are the least preferred methods (Figure 2.11) (FEMA, 2019, p. 124).

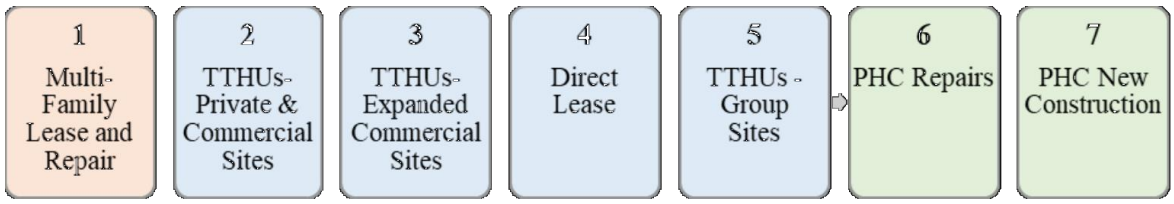


Figure 2.11 Housing Priorities under FEMA's Individual Assistance Policy

"General Sequence of FEMA Direct Housing Assistance Options," describing the order of housing priorities under FEMA Individual Assistance Policy (FEMA, 2019, p. 96, Figure 20). This policy contradicts policies endorsed by the National Disaster Housing Strategy of 2009.

FEMA supplies two types of TTHUs: Recreational Vehicles (RV) and Manufactured Housing Units (MHU). Today, FEMA deploys RVs only when applicants are expected to require temporary housing for a period of less than six months (FEMA, 2019, p. 113). For those requiring longer periods of time, FEMA deploys an MHU (Figure 2.12), built to HUD manufactured home standards and equipped with fire suppression systems, full-size kitchens and bathrooms, and handicap accessibility options. The MHU option is a recent addition to FEMA's housing arsenal developed to provide for longer-term habitation than the small RVs deployed after Hurricane Katrina.

Figure 2.12 Manufactured Housing Units Provided by FEMA

Manufactured Housing Units provided to Camp Fire victims at the Rosewood Estates group site in Oroville, California in 2019 (Stryker, 2019).

MHUs are placed on one of three types of sites: private, commercial, or group sites. Private sites are those owned or rented by the applicant, provided that the site is clear of debris, has access to utilities, and meets local building and zoning requirements. For applicants without access to land, FEMA often contracts with exiting manufactured home parks, or "commercial sites" to locate its MHUs. FEMA may consider expansion of a private commercial site as a "cost-effective alternative to building a group site" (FEMA, 2019, pp. 114-115). Group sites, commonly known as "FEMA trailer parks", are typically located on publicly owned land equipped with utilities. These are considered an option of last resort by FEMA because of the time and cost to building, maintaining, and removing the temporary sites (FEMA, 2019, p. 96).

The Post-Katrina Housing Disaster

Hurricane Katrina was a harbinger for the increasing threat to coastal communities posed by worsening tropical storms. The hurricane produced record storm surge up to thirty feet above sea level in Mississippi and flooded more than 80% of the City of New Orleans, displacing more than 770,000 Americans along the Gulf Coast and overwhelming FEMA's capacity to provide

adequate shelter (Knabb et al., 2005; Watson, 2010). The *New York Times* called the agency's Katrina response "one of the most extraordinary displays of scams, schemes, and stupefying bureaucratic bungles in modern history…" (Lipton, 2006). In the rush to house victims, FEMA dispersed more than $7 billion through its Financial Housing Assistance program, an estimated $1.5 billion of which was lost to fraudulent claims across the country (Kutz, 2007, pp.1-2).

Overwhelmed by the scale of destruction, FEMA was excoriated for its inability to produce housing in a timely manner. In Mississippi alone, Hurricane Katrina damaged more than 220,000 homes, fully one quarter of all housing in the state. Moreover, Katrina destroyed more than 60,000 homes, nearly all of which were in Mississippi's three coastal counties. Yet, two months after the storm, only 5,000 temporary housing units had been distributed to hurricane victims in the state (Evans-Cowley & Kitchen, 2011, p. 100). As a result, thousands lived in shelters, tents, and hotels for months after the storm. "The need for temporary housing along the coast of Mississippi, coupled with the limited number of trailers available for temporary housing, prompted both FEMA and the public to realize that the scope of the disaster was beyond the capacity of the agency" (Evans-Cowley & Kitchen, 2011, p. 96).

FEMA ultimately deployed about 145,000 manufactured homes, known as "FEMA trailers," to disaster victims (Watson, 2010). However, FEMA drew heavy criticism over shoddy construction and inadequacy for long-term habitation. As Verderber (2008, p. 369) explains, FEMA trailers were "conceived and built as a generic, no frills, and strictly utilitarian building type." Averaging less than 300 square feet, FEMA trailers were criticized for being too small for most families. Moreover, the trailers lacked basic amenities like full-sized bathrooms, kitchens, and appliances, and private rooms. In many cases, the trailers were found to be outright dangerous, as an estimated 42% contained toxic levels of formaldehyde, which led to a host of

respiratory issues for long-term residents (Watson, 2010). Others were placed in flood zones and hazardous coastal areas, a violation of FEMA's own standards (Verderber, 2008, p. 369).

Problems extended beyond the trailer units as FEMA trailer parks gained a reputation as "social wastelands filled with criminal elements and other undesirables" (Lee et al., 2007, p. 741). Kathy Lohr (2006) describes the so-called "FEMAvilles" as dens of drugs and crime in which "children roam at all hours" and addicts offer to sell their wives for cocaine. As a result, many residents came to view the parks as a threat to their communities. However, problems at FEMA trailer parks were largely due to the agency's philosophy on disaster housing. As Lee et al. (2007, p. 742) explain, FEMA's goal was to "expedite the process of finding alternative long-term housing." As such, "the general policy of FEMA [had] been to intentionally limit the services and amenities available in these trailer parks. In other words, FEMA [did] not want people to get too comfortable there." But as recovery dragged on for months and years, many had no choice but to remain (Lohr, 2006; Watson, 2010).

The Mississippi Renewal Forum

In October 2005, at the apex of FEMA's bewildered response, a coalition of nearly 200 multi-disciplinary planning and design professionals gathered for the Mississippi Renewal Forum in Biloxi, Mississippi, at the invitation of Mississippi Governor Haley Barbour. The gathering deemed the "largest planning event in human history," was organized to address the many problems facing the Mississippi Coast's long-term recovery (Mouzon, 2015). The group was led by architect Andrés Duany, founder of the Congress for the New Urbanism (CNU) and architect of notable new urbanist communities like Seaside, Florida. The CNU included design professionals that had been developing and advancing the ideas of smart growth for more than a decade. Members of the CNU proposed a series of "smart codes" that emphasized urban form

and walkability based on “pattern books” (Figure 2.13) describing historical urban patterns and architectural styles of Gulf Coast communities (Congress for the New Urbanism, 2017; Governor’s Commission on Recovery, Rebuilding, and Renewal, 2005). The Mississippi Renewal Forum represents the first attempt to implement smart growth policies at a regional scale, though few communities ultimately adopted the group’s smart code framework.

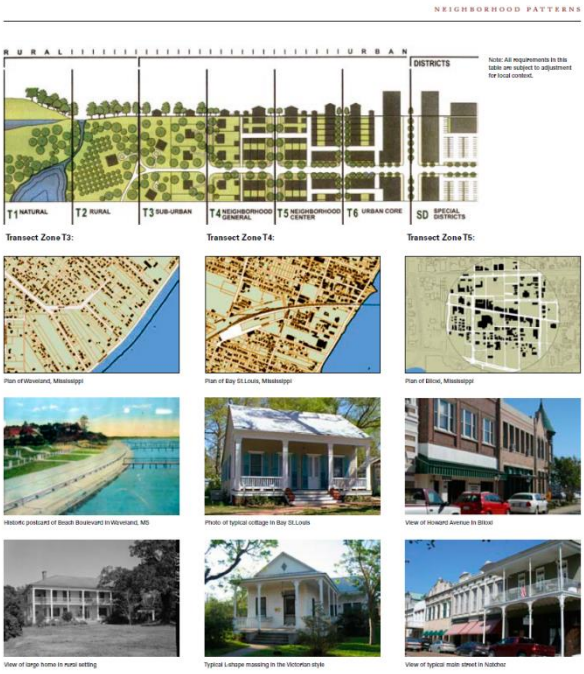


Figure 2.13 Excerpt from Pattern Book for Gulf Coast Neighborhoods

The page above is an excerpt from the Pattern Book for Gulf Coast Neighborhoods developed by participants at the Mississippi Renewal Forum, describing the Rural-to-Urban Transect within the context of Coastal Mississippi communities (Urban Design Associates, 2005, p. 5).

Perhaps the most enduring legacy of the Mississippi Renewal Forum was the development of the “Katrina Cottage” long-term housing concept. Envisioned as a “FEMA trailer with dignity” the original concept, sketched by architect Marianne Cusato (Figure 2.14), proposed a shotgun-style cottage in keeping with traditional Gulf Coast architecture (Mouzon,

2015). According to Evans-Cowley and Kitchen (2011, p. 105), “the initial Katrina Cottage was designed to be constructed at the same cost as a FEMA trailer and to be resistant to hurricane-force winds.” It ultimately became a “temporary-to-permanent housing solution” for those living in FEMA trailers. After the Forum, Governor Barbour directed representatives of the Office of Recovery to seek funding for a pilot program. The idea gained national attention after a prototype (Figure 2.15) was displayed at the International Builders’ Show in early 2006 (Mouzon, 2015).

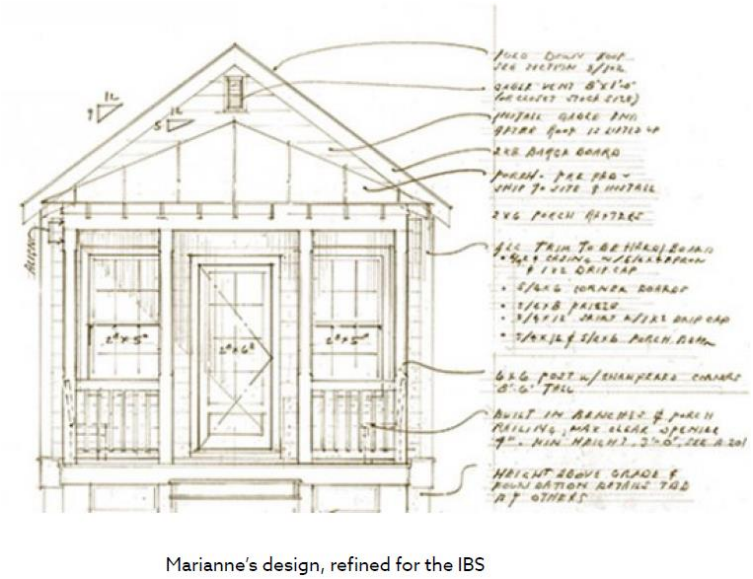


Figure 2.14 Katrina Cottage Concept Sketch

The original Katrina Cottage concept, sketched by architect Marianne Cusato at the Mississippi Renewal Forum in October 2005 (Mouzon, 2015).

Figure 2.15 Katrina Cottage Prototype

The constructed prototype of Marianne Cusato's Katrina Cottage on display at the International Builders' Show in Orlando, Florida in January 2006 (New Urban Guild, 2017).

The Adequate Housing Pilot Program

Ultimately, Governor Barbour and Louisiana Senator Mary Landrieu lobbied Congress to fund the Katrina Cottage concept (Mouzon, 2015). In 2006, Congress passed *The Post-Katrina Emergency Reform Act of 2006* (*Post-Katrina Act*), which required FEMA to develop a National Disaster Housing Strategy (NDHS). The *Post-Katrina Act* directed FEMA to specify "the most efficient and cost-effective Federal programs that will best meet the short-term and long-term housing needs of individuals and households affected by major disaster" and to develop plans for "clusters of housing provided to individuals and households" (Homeland Security, 2011, p. 2).

Later that year, Congress passed the *Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006*, which authorized $400 million to produce an "intermediate term housing solution for the Gulf Coast" (U.S. Senate Committee on Appropriations as cited in Homeland Security, 2011, p. 2). In turn, FEMA

developed a grant competition known as the Alternative Housing Pilot Program (AHPP), opened to select agencies in the five Gulf Coast states (Homeland Security, 2011, p. 2). According to Dana Bres, the AHPP provided an opportunity to look at different approaches to disaster housing, a "salad bar for the future," to learn new techniques and determine what works (National Building Museum, 2012, 1:12:15 – 1:13:00).

FEMA and Homeland Security officials ultimately selected five housing programs from twenty-nine (29) project applications (Homeland Security, 2011, p. 3; Evans-Cowley, 2011, p. 104). Selected projects included an affordable housing development in Bayou La Batre, Alabama, the Mississippi Cottage and Park Model program, the Mississippi "Green Mobile" program, the Louisiana Cottage and Carpet Cottage program, and "Heston Group USA" project in Texas. Some of the projects proved more difficult than others, as the Texas project ultimately folded, while the Green Mobile and Carpet Cottage concepts faced significant challenges in design and cost overruns (Homeland Security, 2011, pp. 3 – 5).

Implementation

In its 2011 report, "Future Directions of FEMA's Temporary Housing Assistance Program," the Department of Homeland Security (2011) notes that the AHPP provided more than 3,700 prefabricated homes to Gulf Coast residents. As of 2011, over 1,600 units were retained as permanent housing, largely by low-income residents. Hundreds more were auctioned and transported to other locations around the country. Still, Homeland Security's report cast doubt on the future of disaster housing program, noting that the AHPP was not cost-effective. "The projects experienced problems with some contractors and per unit costs were generally higher than expected, so fewer units were constructed. Most of the projects fell significantly

behind schedule and community opposition reduced options for placing units, especially the more innovative units and group site units" (Homeland Security, 2011, p. 5).

Advantages of Prefabricated Housing

Under the AHPP, states contracted with manufacturers to produce hundreds of prefabricated units that could be shipped to the disaster zone and placed or assembled on-site. According to Dana Bres, prefabricated homes offered a distinct advantage over site-built construction in terms of cost, speed, and quality. Because prefabricated homes are constructed indoors, weather is not a limiting factor. Moreover, quality control inspections are more readily and easily performed by on-site inspectors. "The problem here is we had to add quantity to the mix, which makes the whole process a lot harder." (National Building Museum, 2012, 1:15:30-1:15:50). While states initially struggled to secure contracts with manufacturers (Homeland Security, 2011, p. 5), production ramped up quickly in Mississippi once agreements were in place. "During its peak month, [Mississippi] received and installed more than 400 units. Although a significantly higher volume would be required in a major disaster, this experience suggests that manufacturers of modular housing can quickly mobilize to produce the needed housing" (Abt Associates Inc. & Jones & Associates, 2009, p. 9).

The Katrina Cottage ultimately evolved to employ three forms of prefabricated construction: kit, panelized, and modular (Figure 2.16). Kit homes include pre-cut lumber and building materials that are numbered and shipped for assembly on-site. Panelized homes involve constructing pieces of the home, including walls, roofs, and floors, in a factory. These pieces are then numbered, stacked, and shipped "like a deck of cards" and assembled on-site. Modular homes are constructed and assembled in a factory, then shipped as one whole unit or as several units which fit together on-site (WickedWaki, 2012, 24:00-24:40).

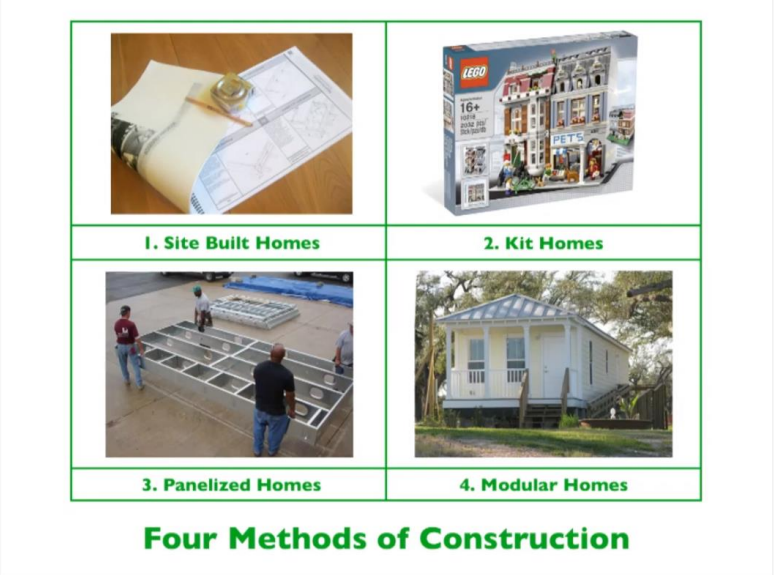


Figure 2.16 Four Methods of Construction

Screenshot of Marianne Cusato's lecture on Katrina Cottages, entitled "Merging Ideal and Real," illustrating the differences in construction methods, including site-built, kit, panelized, and modular construction methods (WickedWaki, 2012, 24:10).

Prefabricated housing, as described above, is distinct from "manufactured" housing or "mobile homes" because of the design and construction quality. Manufactured homes are built to standards set by the Department of Housing and Urban Development (HUD) and are generally less durable and energy efficient, more expensive to maintain, and more susceptible to future weather events (National Building Museum, 2012, 1:15:06-1:15:23). Katrina Cottages, on the other hand, were built to both HUD codes and International Building Code (IBC) standards to which other permanent homes are held. Dana Bres describes the Cottages as "really good quality products. We're using products that you would use on your home" (National Building Museum, 2012, 1:15:50). Katrina Cottages included 2x6 insulated walls, gypsum board interior finishes, and were often cladded with impact-resistant fiber cement siding and metal roofs (Snider, 2011).

Most importantly, the Cottages were built to withstand 150 mile per hour winds (Womack and Rent as cited in Evans-Cowley & Kitchen, 2011, p. 105).

Mississippi Cottages: The Good, the Bad, and the Ugly

The Good

The Mississippi Emergency Management Agency (MEMA) chose to adapt Marianne Cusato's original design concept to a modular construction affixed to a mobile home chassis (Snider, 2011). This method was practical, allowing for easy portability and temporary use from a unit that is rigid enough to be placed on a permanent foundation (National Building Museum, 2012, 1:15:15-1:17:00). Mississippi produced three Cottage models: The one-bedroom Park Model, the two-and-three-bedroom Mississippi Cottage, and the Mississippi Eco Cottage. At 340 square feet, the Park Model was similar in size to the FEMA RVs and was designed to remain on wheels permanently. These units were purchased by MEMA for about $35,000 each (Homeland Security, 2011, p. 12).

The two- and three-bedroom Mississippi Cottages were 700 square feet and 850 square feet, respectively (Evans-Cowley & Kitchen, 2011, p. 105). These cottages, designed to be installed on a permanent foundation, became the more popular models (Figure 2.17). Two-bedroom units were procured for $46,000 to $51,000 each, while three-bedroom units cost $48,000 to $52,000 to produce (Homeland Security, 2011, p. 12). The Mississippi Eco Cottage was an experimental prototype that emphasized "innovative site design features, green building technologies, reduced energy consumption, and an open interior design" (Homeland Security, 2011, p.15). These cottages were plagued with delays and cost overruns that hampered implementation. Moreover, the original design was rejected by MEMA, which considered the

homes “too modern and unconventional” for the Mississippi Coast (Homeland Security, 2011, p. 16).

Source: Christopher Cunningham

Figure 2.17 The Mississippi Cottage and the Park Model

A two-bedroom Mississippi Cottage (left) and one-bedroom Park Model (right) photographed in a staging area awaiting deployment (Evans-Cowley & Kitchen, 2011, p. 106).

The installation cost of a temporary unit averaged around $11,000 a piece, while the cost of converting units to permanent foundations was around $15,000 per unit. (Homeland Security, 2011, pp. 12-13). Installation costs were not anticipated by MEMA, and as houses transitioned from temporary to permanent, the program cost inflated, reducing the number of cottages produced by about 450 (Abt Associates Inc. & Amy Jones & Associates, 2009, p. 23). However, the cost to produce the modular units was about the same as the $70,000 price tag to install, maintain, and dispose of FEMA travel trailers (Mouzon, 2011).

MEMA director Mike Womack noted that “rather than spending $30,000 to $50,000 on a temporary unit … it makes more sense to give these families a permanent home” (Snider, 2011).

He estimated that costs could drop by as much as one-third without the oversight required in the pilot program. “Having successfully produced and deployed 3,000 dwellings, he is confident that his agency can resume production ‘within 90 days’” (Snider, 2011). Ultimately, around 700 surplus units were sold at auction in 2010 for between $7,000 and $22,000 each. By March of 2011, MEMA had sold over 1000 units to occupants and transferred more than 450 units to nonprofits and government entities (Homeland Security, 2011, p. 13). MEMA also deployed Katrina Cottages to Yazoo City just days after a violent tornado struck the town in 2011. In all, more than 2,500 Katrina Cottages were permanently installed in Mississippi.

As Evans-Cowley and Kitchen (2011, p. 106) note, “the intent of the Cottages was to create a place that felt like a home.” A case study of the Mississippi Alternative Housing Program noted a “clear consensus” that Mississippi Cottages were a “better solution for long-term temporary housing than [FEMA] trailers and even traditional mobile homes” (Abt Associates Inc. & Amy Jones & Associates, 2009, p. 11). The study noted the larger living space, full-size amenities, and front porches “were reported to contribute substantially to occupants’ well being.” Residents reported improvements in mental and physical health as a result, noting that the homes provided a “sense of normalcy” and security. Accessibility features aided disabled residents, one of whom noted that she “had not been able to leave her temporary [FEMA] trailer under her own power for more than two years.”

After eighteen months, residents were offered a chance to purchase the homes at income-adjusted rates that ranged between $351 and $13,096 per unit, provided they had secured a private site that was approved by the local municipality (Snider, 2011; Homeland Security, 2011, p. 13). An estimated 72% of pre-disaster homeowners and 92% of renters were interested in purchasing the units. However, only half of the homeowners and a third of renters felt financially

capable of purchasing the units. “About three-quarters of both groups indicated they could afford to pay between $0-$400 per month in mortgage, utilities, taxes, and insurance” (Abt Associates Inc. & Amy Jones & Associates, 2009, pp. 58 – 59).

The Bad

Despite the program’s success, local communities were strongly opposed to the cottages. Residents’ perceptions of FEMA housing drove fears that the cottages would affect property values and harm recovery efforts (Abt Associates, Inc. & Amy Jones & Associates, 2009). “Local government responses were driven by several forces, including the enormity of the recovery effort, concerns (and misconceptions) about the Cottages themselves and perceptions of the circumstances of households that remained in FEMA units” (Abt Associates Inc. & Amy Jones & Associates, 2009, pp. 30-32). The prolonged recovery, then in its second year, exacerbated efforts at implementation as local officials were still struggling to restore basic infrastructure and the local economy. By 2007, the idea of more “temporary” disaster housing was seen as detrimental to rebuilding efforts (Abt Associates Inc, 2009, p. 13).

Criticism of Katrina Cottages was often tied to the residents of cottages themselves. Some residents argued that Cottage occupants had “no intention of rebuilding” (Welsh, 2007). Many felt “that local residents should have been able to ‘get back on their feet’ by then” (Abt Associates Inc. & Amy Jones & Associates, 2009, p. 13). City Councilman Thriffiley of Bay Saint Louis, Mississippi, suggested that those intending to remain in cottages permanently were not contributing to the rebuilding effort, adding, “they’re not buying building materials. They’re not hiring workers. They’re not contributing to the community” (HBS Dealer, n.d.).

Many communities in Mississippi turned to local zoning ordinances to restrict the permanent placement of Cottages within city limits. Most communities along the Mississippi

Coast employed exclusionary zoning laws to restrict the permanent placement of Katrina Cottages inside corporate limits. As Abt Associates Inc. and Amy Jones & Associates (2009, p. 10) note, “none of the MAHP units have sufficient living space to meet the minimum square footage standards required for permanent housing by many Mississippi localities.” Instead, fourteen (14) communities relegated the cottages to existing mobile home parks (Figure 2.18) (Abt Associates Inc. & Amy Jones & Associates, 2009, p. 35).

Figure 2.18 Katrina Cottage in a Mobile Home Park

Photograph of a Katrina Cottage in a mobile home park near Gautier, Mississippi. Negative perceptions equating Cottages with mobile homes led most communities in Mississippi to allow their permanent installation only in designated trailer parks (Abt Associate, Inc., 2009, p. 63).

Bay Saint Louis, among others, eventually allowed the Cottages on private lots. However, the city council, weary of denying Cottages to applicants in public meetings, implemented new conditions for approval. As Welsh (2007) put it, “the problem [was] moved from a political to a bureaucratic arena.” Applicants were required to submit applications to the city’s building department proving ownership and providing plans for the cottage placement and site of a new permanent home. They were also required to provide any building plans and

permits, along with a certificate of flood elevation (Welsh, 2007). These requirements effectively disqualified renters, those with permission to place a cottage on someone else's land, and those in the process of buying land. "As a result, MAHP staff worked with the jurisdictions to make maximum use of spaces available in commercial mobile home parks in order to accommodate renters who needed a site for a Cottage" (Abt Associates Inc. & Amy Jones & Associates, 2009, p. 35).

MEMA's Katrina Cottage group site proposals were met with the fiercest opposition of all. "Concerns about recreating some of the visual and social problems experienced in FEMA trailer parks made the idea of creating new MAHP group sites unpalatable to local communities" (Abt Associates Inc. & Amy Jones & Associates, 2009, p. 35). As a result, no cottage group sites were initially created in Mississippi (Abt Associates Inc. & Amy Jones & Associates, 2009, p. 4). Instead, MEMA relented, and agreed to remove the Cottages from municipalities by March of 2009. However, three group sites were ultimately built in Mississippi, beginning with Cottage Square in Ocean Springs, followed by the neighboring Cottages at Oak Park and the Cottages at Second Street in Pass Christian (Tolar & Brown, 2015).

The Ugly

The implementation of Katrina Cottages in Mississippi was hampered by a few key design decisions. Chief among these was MEMA's decision to install and transport Mississippi Cottages on a chassis, which resulted in structures resembling manufactured mobile homes. The lack of aesthetic detail and use of cheap materials reinforced negative perceptions equating the units to trailers. Furthermore, MEMA's temporary installation of units on cinderblocks with exposed utilities amplified opposition to the Cottages, particularly within neighborhoods (Figure 2.19). "Even though MAHP emphasized that the Cottages met IRC requirements and qualified as

modular housing, leaders in some of the local jurisdictions could not get past 'the wheels'… One county supervisor admitted that if the same units had come into the community in two pieces on a flatbed truck, they would have been accepted as modular (permanent) units without question" (Abt Associates Inc. & Amy Jones & Associates, 2009, p. 83).

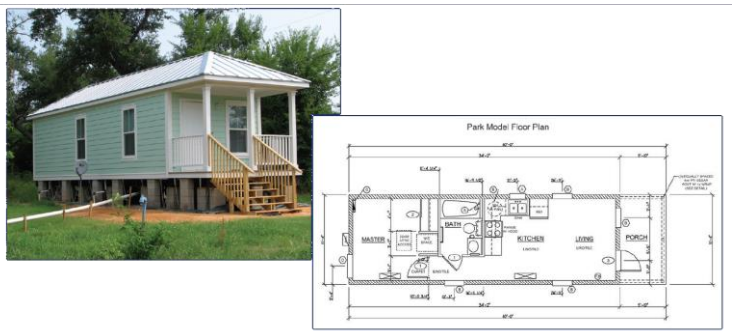


Figure 2.19 Mississippi Cottage Park Model Exterior and Floor Plan

Photo of a Mississippi Cottage one bedroom Park Model installation and floor plans (Abt Associates Inc. & Amy Jones & Associates, 2009, p. 21).

In Bay Saint Louis, one city councilman argued that the Mississippi Cottages were "mobile homes with siding and a porch" that would "destroy the ambiance" of the community (Welsh, 2007). Even Marianne Cusato, architect of the original Katrina Cottage, joined in the criticism, suggesting that she would not want to live next to "a house with wheels on it," adding that residents' concerns were "completely valid" (HBS Dealer, n.d.). Homeowners in the process of rebuilding became vocal with concerns about the Cottages' effect on property values, arguing the "size and style of the Cottages did not fit with many neighborhoods" (Figure 2.20) (Abt Associates Inc. & Amy Jones & Associates, 2009, p. 33). Local officials suggested the Cottages "would do less to restore the tax base than larger, more expensive homes that existed before

Katrina or new, high-rise condo or apartment buildings that could now be built" (Abt Associates Inc. & Amy Jones & Associates, 2009, p. 34).

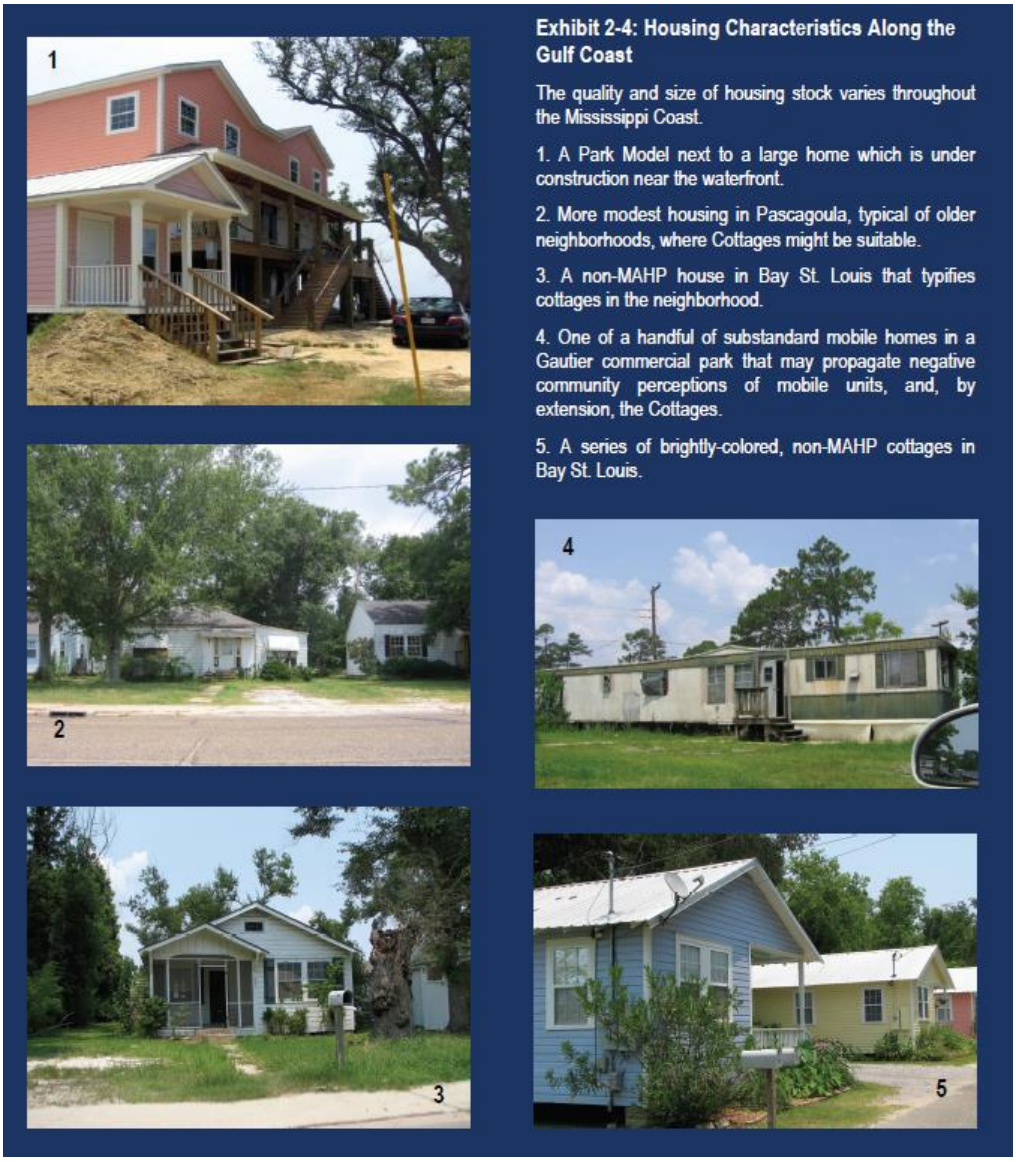


Figure 2.20 Housing Characteristics Along the Mississippi Gulf Coast

Exhibit 2-4 from *Developing a More Viable Disaster Housing Unit: A Case Study of the Mississippi Alternative Housing Program* illustrating a variety of housing characteristics along the Mississippi Coast in comparison to Mississippi Cottages (Evans-Cowley & Kitchen, 2011, Exhibit 2-4).

Cottage Square

Despite opposition, architects Bruce Tolar and Ben Brown eventually convinced officials in Ocean Springs, Mississippi to allow for a demonstration group site. They argued that Ocean Springs was a perfect location because of its "historic models of walkable urbanism [and] sympathetic local officials" (Tolar & Brown, 2015, p. 2). Between 2006 and 2010, Tolar and Brown planned and developed a mixed-use infill neighborhood named Cottage Square (Figure 2.21). There they created an affordable mixed-use neighborhood named Cottage Square on a commercial lot about one mile east of Ocean Springs' historic downtown.

Left Image: Installation of Mississippi Cottage.
Credit: Bruce Tolar

Right Image: Permanently placed Mississippi Cottages.
Credit: Bruce Tolar

Figure 2.21 Photos of Cottage Square in Ocean Springs, Mississippi

Photographs of installation (left) and final product (right) of Katrina Cottages at Cottage Square (Tolar & Brown, 2015, p. 3).

Tolar and Brown contend that Cottage Square achieved two things: first, it proved that small did not equal "ugly and uncomfortable." Second, it "demonstrated the potential of manufactured housing to deliver homes of site-built quality, provided… manufacturers were held to strict standards of design and materials" (Tolar & Brown, 2015, p. 3). When the community was complete, neighbors' objections ceased and "people lined up to rent them." Today, Cottage

Square is comprised mostly of residences and a few businesses, including a salon, real estate office, and Tolar's architecture firm (Benfield, 2011).

By 2011, the Tolar and Brown had transformed a blighted trailer park adjacent to Cottage Square into a community of twenty-nine (29) cottages, completed with funds left over from the AHPP. The community named Cottages at Oak Park (Figure 2.22) was a public-private partnership of state and federal agencies, nonprofit partners, and a private developer. "Their partnership made it possible to bridge the gap between entirely subsidized, temporary disaster housing units and permanent, mixed-income neighborhoods capable of attracting private-sector investment" (Tolar & Brown, 2015, p. 3). The development was fully occupied within sixty days of completion.

Figure 2.22 Photos of the Cottages at Oak Park in Ocean Springs, Mississippi (Tolar & Brown, 2015, p. 3)

The same partners went on to develop the "Cottages at Second Street" in Pass Christian, Mississippi, in early 2012 (Figure 2.23). Pass Christian had been the epicenter of Katrina's storm

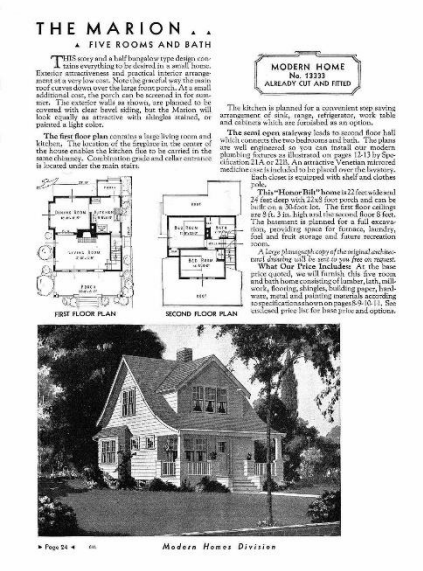
surge, and because of new FEMA flood requirements, the units were elevated eight feet. “It took seven years, but the opening of the Cottages at Second Street raised the number of permanently located, Katrina Cottage-inspired examples to 70 units in three neighborhoods. All were leased as residences or commercial spaces. All were designed and built with market-rate appeal yet made viable by public-private partnerships that could be replicated anywhere” (Tolar & Brown, 2015, p. 4).

Figure 2.23 Photos of the Cottages at Second Street in Pass Christian, Mississippi (Tolar & Brown, 2015, p. 4)

The Louisiana Pilot Project

Louisiana avoided some of the pitfalls experienced in Mississippi by employing kit and panelized construction methods, rather than modular. Marianne Cusato compares the approach to the Sears Roebuck & Co. mail order homes (Figure 2.24), which were “a variation on a theme,” meaning that the same home plan could be varied for various parts of the country. “We took from this this idea that you can have an economy of scale, but you can also calibrate locally.”

This meant that the specifications of each house – materials, design elements, etc. – could be different, yet the bones of the homes remained the same so that even the more affordable options felt like a nice house, according to Cusato. Lowe's hardware chain eventually joined the effort by selling the kit homes online and providing the labor for a number of installations (WickedWaki, 2012, 25:50-30:06).



THE MARION . .

▲ FIVE ROOMS AND BATH

THIS cosy and a half bungalow type design contains everything to be desired in a small home. Exterior attractiveness and practical interior arrangement at a very low cost. Note the graceful way the main roof curves down over the large front porch. At a small additional cost, the porch can be screened in for summer. The exterior walls as shown, are planned to be covered with clear bevel siding, but the Marion will look equally as attractive with shingles stained, or painted a light color.

MODERN HOME
No. 13233
ALREADY CUT AND FITTED

The first floor plan contains a large living room and kitchen. The location of the fireplace in the center of the house enables the kitchen flue to be carried in the same chimney. Combination grade and cellar entrance is located under the main stairs.

The kitchen is planned for a convenient step saving arrangement of sink, range, refrigerator, work table and cabinets which are furnished as an option.

The semi open stairway leads to second floor hall which connects the two bedrooms and bath. The plans are well engineered so you can install our modern plumbing fixtures as illustrated on pages 15-19 by Specification 21A or 21B. An attractive Venetian mirrored medicine case is included to be placed over the lavatory. Each closet is equipped with shelf and clothes pole.

This "Honor Bilt" home is 22 feet wide and 24 feet deep with 22x8 foot porch and can be built on a 30-foot lot. The first floor ceilings are 9 ft. 3 in. high and the second floor 8 feet. The basement is planned for a full excavation, providing space for furnace, laundry, fuel and fruit storage and future recreation room.

A large photograph copy of the original architectural drawing will be sent to you free on request.

What Our Price Includes: At the base price quoted, we will furnish this five room and bath home consisting of lumber, lath, millwork, flooring, shingles, building paper, hardware, metal and painting materials according to specifications shown on pages 8-9-10-11. See enclosed price list for base price and options.

FIRST FLOOR PLAN

SECOND FLOOR PLAN

Figure 2.24 "The Marion" Model Home from the 1938 Sears Roebuck & Co. Catalog

Excerpt from the 1938 Sears Roebuck & Co. catalog of prefabricated kit homes depicting "The Marion" prefabricated kit home, which sold between $1,330 and $1,537. These homes served as inspiration for the Louisiana Cottages (Sears Roebuck & Co., 1938).

Floor plans were interchangeable, meaning that one floor plan could accommodate a 900 square foot home up to 1,800 square feet by using the attic space. "We had a very set, limited number of variables, and then from that we were able to calibrate (and) get the right size of things to make the house appropriate for the place" (WickedWaki, 2012, 25:50-30:06). In total, the program used six different floor plans, each with two or more variations and numerous elevations that made them look different on the street (Figures 2.25 and 2.26). Cusato describes

the “plug-and-play” model that allowed for economies of scale and offered a variety of aesthetic choices. “Every house didn’t have to reinvent the wheel. We were building buildings that created (urban) fabric… we were able to reach a pretty good economy of scale and, I think, build communities that people would be quite proud to live in” (WickedWaki, 2012, 31:00-31:40).

Figure 2.25 Photographs of Three Variations of One Louisiana Cottage

Photographs of three variations on the same Louisiana Cottage floor plan provide an example of the “plug-and-play” model that allows for variations in size and aesthetic. Photographs are taken in New Orleans (top left) and Lake Charles, Louisiana (top right), and Pass Christian, Mississippi (bottom), demonstrating the ability to adapt to the aesthetic to different places (WickedWaki, 2012, 29:45).

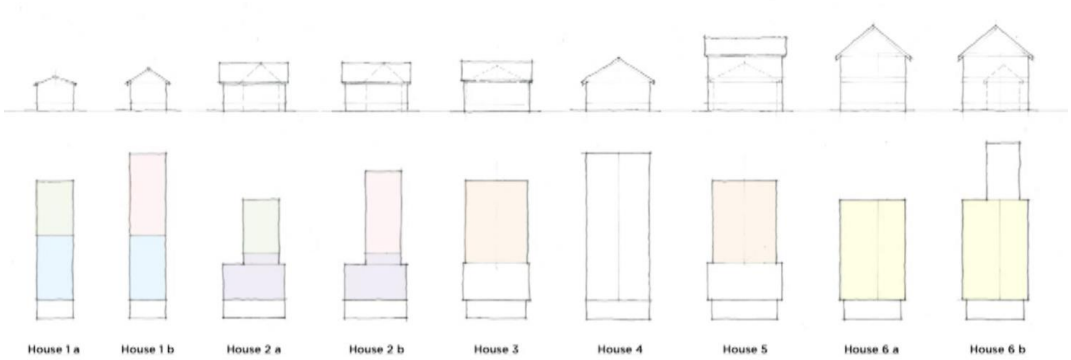


Figure 2.26 Diagrams of Interchangeable Floor Plans for Louisiana Cottages

Diagrams of variations on floor plans of Louisiana Cottages, allowing for a variety of sizes (WickedWaki, 2012, 30:45).

Problems in Louisiana

The Louisiana Pilot Program (LPP) was created to provide 475 affordable housing units for sale through "a soft-second-mortgage program meant to help hurricane victims and low-income" residents obtain affordable housing (Gogola & The Lens, 2012). However, the program was plagued by a series of bureaucratic blunders. For starters, the LPP began in September 2007, five months after Mississippi and Alabama's programs (Homeland Security, 2011, p. 20). At that point, Governor Kathleen Blanco awarded the sole contract to "an upstart company with zero experience in the real estate field but strong ties to a powerful Democratic tycoon" (Gogola & The Lens, 2012). The program was further delayed when Governor Bobby Jindal cancelled contracts and shifted administration to the Louisiana Recovery Authority. "Other states deftly implemented their pieces of the program. Mississippi, for example, could boast of having built at least 500 cottages by mid-2009… During the same interval, Louisiana – its program floundering in a sea of politics, liens, bankruptcy, mismanagement, and cost overruns – had built exactly none" (Gogola & The Lens, 2020). In fact, Louisiana did not start building its first cottages until more than a year after the project was set to be completed.

The program was further delayed by struggles to find suitable sites for the Cottages. Many sites faced local opposition, environmental permitting and drainage issues, historic commissions, liens, and other red tape (Gogola & The Lens, 2012). In New Orleans, "Cottages were designated for lots too small to accommodate them… At least one cottage was moved five times before reaching a final resting place, records show." According to Gogola and The Lens, "homes budgeted at $110,000 came in $40,000 above that figure…" Housing production in Louisiana was limited to 461 units for $75 million, an average of $150,000 each (Weber, 2007; Homeland Security, 2011), though the New Orleans Redevelopment Authority (NORA) sold three cottage models as affordable units for approximately $70,000 to $120,000 (Gogola & The Lens, 2012).

Finally, frustrated by delays, FEMA set a deadline to complete the program by April 30, 2012, "triggering the frantic effort to remediate damage incurred during the years they sat unused." As a result, "every one of them had to be completely gutted and rebuilt – obviating the efficiencies of off-site assembly line-style construction," resulting in more than $1 million in cost overruns (Gogola & The Lens, 2012). Homes in the Lower Ninth Ward prompted questions about quality and drew criticism for their placement next to blighted properties, despite an abundance of empty lots to build on (Figure 2.27) (Gogola & The Lens, 2012). Ultimately, many of the cottages were completed too late to serve the needs of Katrina's victims (Homeland Security, 2011, p.19).

Figure 2.27 Louisiana Cottage Adjacent to a Blighted Property in New Orleans' Lower 9th Ward

The photograph above exemplifies the concerns of residents in New Orleans' Lower Ninth Ward who questioned the placement of Louisiana Cottages near blighted properties (Gogola & The Lens, 2012).

Alabama's Bayou La Batre Project

Alabama's pilot program was administered by the City of Bayou La Batre as a public housing project. The Safe Harbor development was the first AHPP group site completed in July 2009. Though the initial proposal called for 194 units, only 100 units were produced (Homeland Security, 2011, p. 6). Safe Harbor is located in a rural setting outside the town of Bayou La Batre, chosen for its location at eighty-two (82) feet above sea level. Homeland Security describes it as "one of the more desirable (AHPP) neighborhoods" because of its proximity to a new school (Homeland Security, 2011, p.7).

Bayou La Batre proposed one-, two-, three-, and four-bedroom units in single-and-double-wide modular configurations ranging from 820 to 1,360 square feet (Homeland Security, 2011, p. 6). Each unit averaged about $88,000 each, not including land and infrastructure costs;

however, the total including furnishings rose to nearly $180,000 per unit, largely due to infrastructure costs (Figure 2.28). “By the time the units [were] converted to a Public Housing Authority project, the average unit [had] served as interim housing for disaster survivors for about 2 years”. Community opposition waned upon completion of the project (Homeland Security, 2011, pp. 6-10).

Figure 2.28 Katrina Cottages at Safe Harbor

Photographs of Katrina Cottages at the Safe Harbor development in Bayou La Batre, Alabama. Photos illustrate the exterior elevation (top left), interior furnishings (top right), and neighborhood character (bottom right) (Homeland Security, 2011, p. 8)

Although Bayou La Batre utilized up to $2 million in Community Development Block Grants, land acquisition and infrastructure costs inhibited the project. While land acquisition cost nearly $650,000, infrastructure costs were nearly $4 million. Safety improvement for the highway alone cost the project nearly $2 million. Unanticipated costs associated with unit accessibility cost an average of nearly $14,000 per unit. “Even after making some design changes, such as replacing the proposed metal roofs with composite shingle roofs, project

officials determined that the budget would be sufficient to construct only 100 units: 6 four-bedroom units (1360 sq. ft.); 19 three-bedroom units (1155 sq ft.); and 75 two-bedroom units (including ten 820-square-foot one-bedroom-plus-den single-wide deployable units" (Homeland Security, 2011, p. 8).

The project was initially delayed by the Florida Department of Transportation, which claimed the units exceeded size limits and could not be transported; however, FEMA ultimately negotiated a solution. Still, the project was further delayed on site by bad weather, business holidays, and environmental permitting (Homeland Security, 2011, p. 9). Safe Harbor was eventually managed by the City of Bayou La Batre Public Housing Authority, which agreed to charge rent based on ability to pay. However, fifteen residents in 2012 filed a lawsuit against the agency, alleging that it had reneged on promises to sell the homes at a reduced rate and increased rent significantly (Kirby, 2012).

Design Lessons from the AHPP

To be successful, Bres (2012) believes disaster housing must be designed as an asset to the community. He argues that attention to detail is the key factor in the success of permanent disaster housing. "Design professionals need to be at the table. This is not something that the cops and firefighters can do. This is something that builders, architects and engineers need to be involved with" (National Building Museum, 2012, 1:14:40 – 1:16:00). He suggests that prefabricated housing must consist of well designed, simple, easily constructed homes built of strong, durable materials. It should also be energy efficient, adaptable to local conditions, and sited appropriately (National Building Museum, 2012, 1:13:50 – 1:14:25).

Ben Brown (2011), an architect involved with development of Katrina Cottage group sites in Mississippi, explains that "the space has to be beautifully designed and the construction

detailed perfectly. Otherwise you've got exactly what Katrina Cottage critics warned against – a tricked-out trailer… Compromise on design and construction quality, including material choices, and you're off to the race to the bottom." Brown points to work by some of the leading Katrina Cottage architects in fighting to ensure manufacturers do not cut corners on furnishings and details. He says that this is counterintuitive to affordable housing advocates who look to drive down the price per square foot. However, he suggests it is "better to achieve the savings by intelligently compacting the space, as opposed to competing with production builders who amortize prices per square foot over thousands of under-performing square feet."

Small housing requires more than good design and materials, it also requires the proper environment. Tolar and Brown (2015, p. 5) argue that "small-scale housing needs small-scale contexts." They argue the structures are "better together," suggesting small homes need a "critical mass" to compete with larger homes. "They need small-lot site-planning and the company of friends." Brown (2011) suggests that Katrina Cottages do not fit into large-lot suburban communities where they look "eccentric and experimental."

Still, Brown believes that success of the Cottages cannot be determined by home and neighborhood design alone. Rather, "it takes a town." He argues, "the trick to living large in small spaces is to have great public places to go to – preferably by foot or on a bike – once you're outside your private retreat […] the smaller the nest, the bigger the balancing need for community" (Brown, 2011). Brown suggests that placement within the community and livability factors like walkable access to shopping districts, schools, and public space are key to maximizing the benefits of disaster housing group sites, emphasizing the importance of utilizing infill locations and maximizing accessibility to the surrounding community.

Summary of Literature Review

As the frequency and cost of catastrophic disasters increases at an exponential pace, the urgency to plan for post-disaster housing increases as well. The establishment of pre-disaster housing plans offer the opportunity to mitigate housing crises and improve resilience to future events. However, mitigation planning requires knowledge of past events to inform future implementation. The AHPP provides a unique case study in the long-term implications of permanently placed disaster housing across various communities and design styles. Moreover, it provides insight into future obstacles likely to be faced by communities implementing these plans.

The Mississippi Adequate Housing Program (MAHP), in particular, achieved a remarkable degree of success. It proved the viability of a permanent housing option that could drastically improve the quality of life for vulnerable disaster victims. Most notably, the MAHP demonstrated that adequate long-term housing could be produced at a similar cost and timeline as temporary FEMA housing, despite no prior experience or planning. However, efficiencies achieved through modular construction were negated by poor design choices and materials that fueled opposition. As a result, establishment of group sites, and the efficiencies that they provide, were largely thwarted. Ultimately, overwhelming opposition to the Mississippi Cottage design delayed implementation, drove up costs, divided communities, and tarnished the program. Frustrations around local opposition was evident in Homeland Security's (2011) assessment of the program, in which the agency questions the efficacy of future permanent housing options. Fifteen years after Katrina, FEMA now offers a full-size trailer, or "Mobile Housing Unit," to disaster victims; however, no permanent housing option is currently available.

While Homeland Security's assessment casts doubt on the AHPP, it fails to acknowledge the role of planning in mitigating problems experienced in the pilot program. In the years since the AHPP concluded, industry professionals have continued to advance the goal of long-term disaster housing. Designers and manufacturers have continued to improve production quality of prefabricated units (Brown, 2021) while Federal disaster reforms have laid the foundation for states and communities seeking to plan for long-term disaster housing (FEMA, 2020c; FEMA, 2009; FEMA, 2020a; FEMA, 2020b). However, as evidenced herein, mitigating negative perceptions toward prefabricated and low-income housing will be key to successful implementation of long-term disaster housing in the future.

Considering policy goals stated by FEMA, this study explores the implications of design on the long-term appraisal values of Katrina Cottages within five group sites as compared to other residential land uses across five Gulf Coast communities. It further examines variations in value across group sites themselves and observes relationships between value and smart growth metrics like walkability, urban context, and community design quality. The results of this study will aid planners in mitigating community opposition to future long-term disaster housing projects by providing evidence and observations that may serve to improve design choices and quell fears of negative impacts to post-disaster recovery. This could ultimately lead to improved resilience by avoiding costly delays experienced under the Adequate Housing Pilot Program.

CHAPTER III

METHODOLOGY

Introduction

To investigate claims of negative impacts to property values, a case study approach and quantitative analysis are utilized. Appraisal values for Katrina Cottage group sites (subject properties) and four nearby representative properties (comps) were gathered from each respective tax assessors' office, representing five distinct "subject groups." Selected comps include a small (less than 2,000 square feet) single-family home, a large (greater than 2,000 square feet) home, an apartment complex, and a manufactured home park. The total number of units, square footage and acreage was verified using each tax information provided by assessors and/or measurements using the assessor's online GIS application or Google Earth Pro (Google, n.d). Appraisal values were then standardized based on number of units, square footage, and acreage, then observed across subject groups and analyzed for significance.

Valuation analysis begins by observing linear relationships between community demographics obtained from the U.S. Census Bureau to identify any factors that may be driving variations among land uses across subject groups. Next, a one-way ANOVA analysis is conducted to determine differences among Katrina Cottage types by comparing modular Mississippi Cottages against units in Alabama and Louisiana. Next, linear regression charts are observed for relationships between subject property valuations and smart growth metrics, including density, walkability, and urban context. After that, land uses are analyzed according to

values per unit, square foot, and acre by observing valuation patterns across subject groups, valuations in relation to Katrina Cottages within subject groups, average valuations of land uses, and average valuations of land uses in comparison to Katrina Cottages. A one-way ANOVA is analysis is conducted to determine differences among land uses, followed by a Least Significant Difference (LSD) post-hoc analysis to determine significance differences between land uses. Finally, a direct comparison is made between Katrina Cottages within a group site and a nearby single unit "private site" Cottage.

Data Sources

Google Earth Pro (Google, n.d.) was used to identify and observe Katrina Cottage group sites and representative comparable properties and verify spatial measurements including acreage, square footage, and number of units. Appraisal values were gathered from local county/parish tax assessors' GIS applications and land roll websites. Walkability was measured using walkscore.com (Walk Score, 2021a) as a standardized metric.

Google Earth Pro

Google Earth Pro (Google, n.d) desktop was used to locate subject properties and comps, observe characteristics of surrounding communities, and verify spatial attributes of each property. Aerial, 3D, and street view imagery were used in conjunction with tax records to verify the number of units on each site. The ruler tool was used in conjunction with aerial imagery to measure acreage of properties, square footage of livable space, and radii from subject property locations.

County and Parish Tax Assessors

Property values were recorded using various county and parish tax assessors' online Geographic Information Systems (GIS) and land roll information. Sources include Harrison (Harrison County, Mississippi, 2020) and Jackson Counties (Jackson County Information Systems, GIS Division, 2020) in Mississippi, Orleans (Orleans Parish Assessor's Office & City of New Orleans, 2020) and Jefferson Parishes (Jefferson Parish Assessor's Office, 2020) in Louisiana, and Mobile County (Mobile County Revenue Commission, 2020) in Alabama. Data collected for each site included appraised land value, improvement value, and total value for fiscal year 2020. Tax assessments and taxes paid to each county or parish jurisdiction were also collected. City and school district taxes were excluded. Other information included the square footage, acreage, and number of units, when available. Data collected from local tax assessors and Google Earth were recorded in standardized tables for each subject property in Microsoft Excel.

Walkscore.com

Walk Score (Walk Score, 2021b) is a tool used by planners and researchers to analyze the walkability of properties across the United States (Figure 3.1). Walk scores were recorded for each property to analyze the relationship between walkability and value. The methodology for Walk Score is provided below:

> "Walk Score measures the walkability of any address using a patented system. For each address, Walk Score analyzes hundreds of walking routes to nearby amenities. Points are awarded based on the distance to amenities in each category. Amenities within a 5-minute walk (.25 miles) are given maximum points. A decay function is used to give points to more distant amenities, with no points given after a 30-minute walk.

Walk Score also measures pedestrian friendliness by analyzing population density and road metrics such as block length and intersection density. Data sources include Google, Factual, Great Schools, Open Street Map, the U.S. Census, Localeze, and places added by the Walk Score user community."

Walk Score®	Description
90–100	**Walker's Paradise** Daily errands do not require a car.
70–89	**Very Walkable** Most errands can be accomplished on foot.
50–69	**Somewhat Walkable** Some errands can be accomplished on foot.
25–49	**Car-Dependent** Most errands require a car.
0–24	**Car-Dependent** Almost all errands require a car.

Figure 3.1 Walk Score Walkability Classifications

Screenshot of numeric descriptors of Walk Score factors (Walk Score, 2021b).

Choosing Subject Properties

Subject properties were chosen from eight known group sites across Alabama, Louisiana, and Mississippi. Sites were selected for comparison across multiple urban contexts, densities, and design characteristics while maintaining relative proximity to one another. Chosen sites include the Cottages at Oak Park in Ocean Springs, Mississippi, the Cottages at Second Street in Pass Christian, Mississippi, the Fischer Site in New Orleans, Louisiana, Harbor Estates in Bridge City, Louisiana, and Safe Harbor in Bayou La Batre, Alabama (Figure 3.2). Group sites in Lake Charles were excluded based on distance from Starkville, Mississippi, which precluded travel to the sites, and distance from the direct impact of Hurricane Katrina. Sites in Baton Rouge were excluded because of their relative similarities to other sites chosen, including suburban context,

density, and housing type, and their relative distance from Hurricane Katrina's immediate impacts. Finally, Jackson Barracks in New Orleans was excluded based on its location within a military compound and use for military families, rather than civilians.

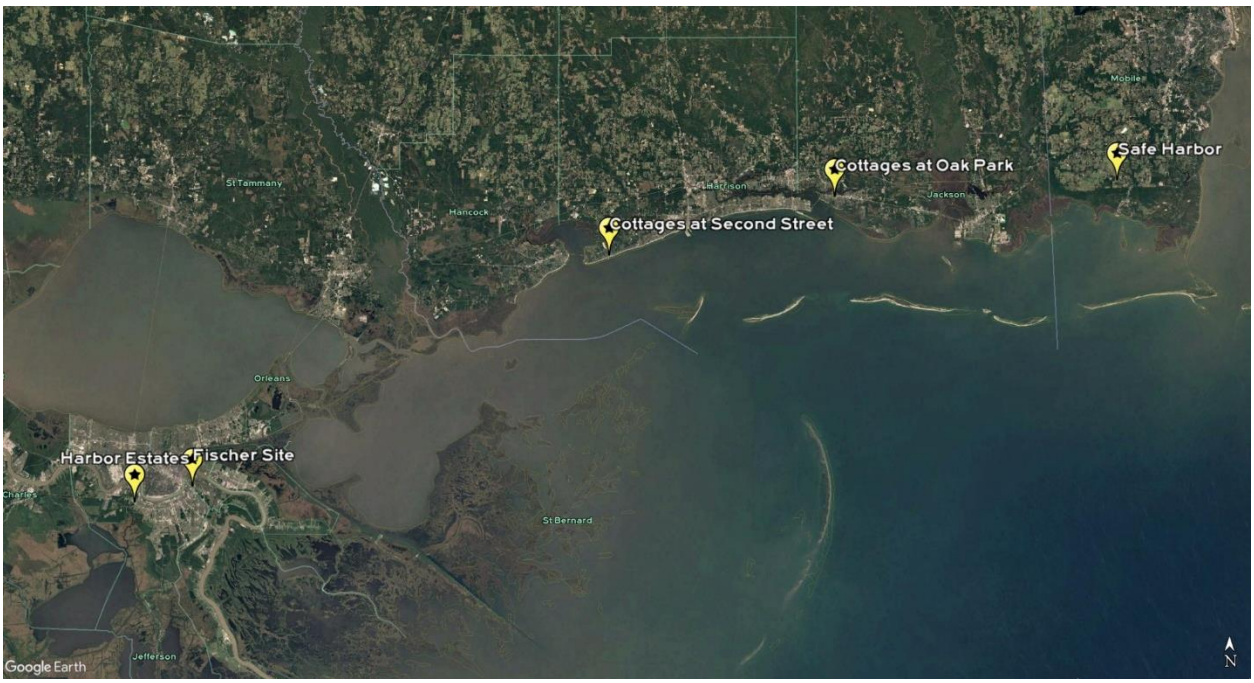


Figure 3.2 Map of Subject Properties

Map of selected Katrina Cottage group sites, including (from west to east): Harbor Estates, Bridge City, Jefferson Parish, LA; Fischer Site, New Orleans, Orleans Parish, LA; Cottages at Second Street, Pass Christian, Harrison County, MS; Cottages at Oak Park, Ocean Springs, Jackson County, MS; and, Safe Harbor, Bayou La Batre, Mobile County, AL (Google, n.d).

Cottages at Second Street

The Cottages at Second Street development is located in Pass Christian, Mississippi. It is unique among subject properties because of its particularly hazardous location and the resulting character of the community. Just one block north of the Mississippi Sound, the development is located near the epicenter of Hurricane Katrina's historic storm surge, which reached nearly thirty (30) feet at nearby Saint Louis Bay (Knabb et al., 2005). As a result, the cottages are raised

nearly ten (10) feet. This property contains forty (40) housing units on 2.82 acres of land, with a total appraised value of nearly $1.8 million.

Figure 3.3 Cottages at Second Street Subject Property Parcel Map

Parcel map depicting the vicinity of Cottages at Second Street subject property. The subject property is highlighted in blue (Harrison County, Mississippi, 2020).

Cottages at Oak Park

Though Cottage Square in Ocean Springs (Parcel ID 6123000) was the preferred choice for study, its mixed-use characteristics resulted in a commercial office (Type OF) designation by the Jackson County Tax Assessor. This parcel was therefore excluded from the study. The Cottages at Oak Park was developed as an extension of Cottage Square, replacing an old mobile home park immediately adjacent to the site. This development was divided into two parcels (Parcel ID 61230003 & 61230004). Like Cottage Square, parcel number 61230004 was classified as commercial (Type C); however, parcel number 61230003 was classified as

residential (Type RE) and was therefore selected as the representative subject property. This property includes seventeen (17) units on 1.28 acres, with a total appraised value of $831,320.

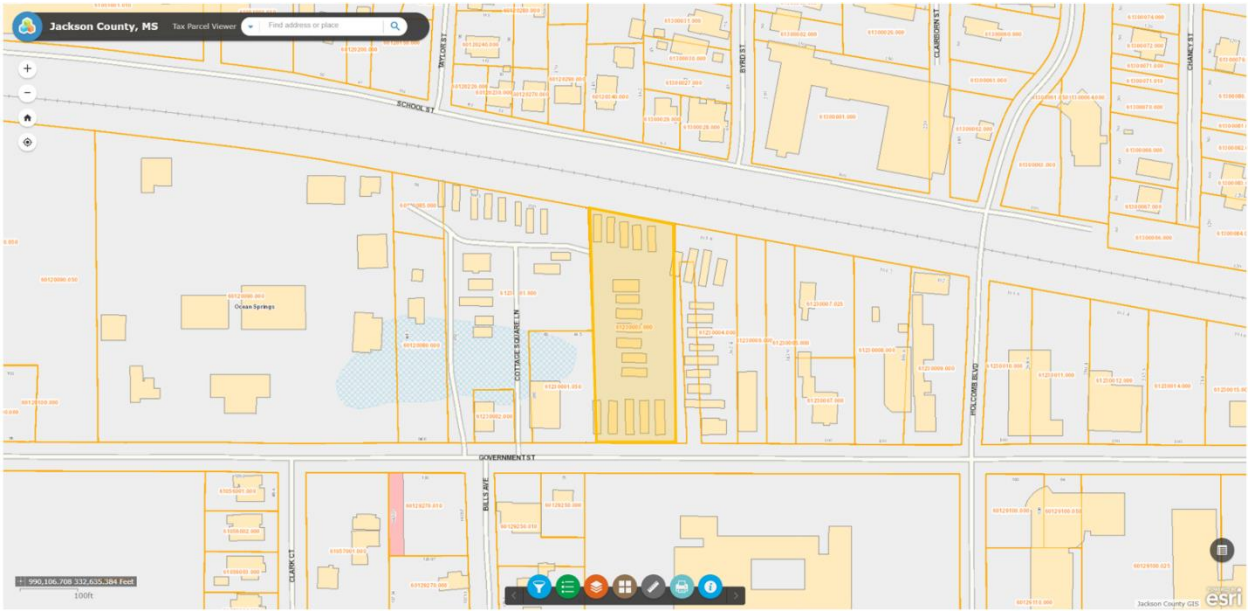


Figure 3.4 Cottages at Oak Park Subject Property Parcel Map

Parcel map depicting the vicinity of Cottages at Oak Park subject property, highlighted in yellow. Cottage Square is located on the western adjacent parcel and the second phase of Cottages at Oak Park is located on the eastern adjacent parcel (Jackson County Information Systems, GIS Division, 2020).

The Fischer Site

In Louisiana, the Fischer Site and Harbor Estates were chosen based on their contexts and valuations as private property. Although the homes in these communities were intended for private homeownership financed through a state program (Gogola & The Lens, 2012), tax records indicate the properties remain under the ownership of local housing authorities. Still, valuations appear to be in line with other privately owned comps in proximity. Unlike subject properties in Alabama and Mississippi, Cottages in Louisiana were subdivided into individual lots for ownership purposes. A comparison of tax valuations revealed a uniform valuation of

properties according to size, regardless of character or location within the development. Therefore, the subject property was randomly chosen as a representative of the development. The Fischer Site also includes duplexes and triplexes; however, these land uses were excluded from the study. The selected subject property, located at 2008 Le Boeuf Street (Tax Bill Number 513406285), includes one housing unit on 0.07 acres, appraised at $90,000 total value.

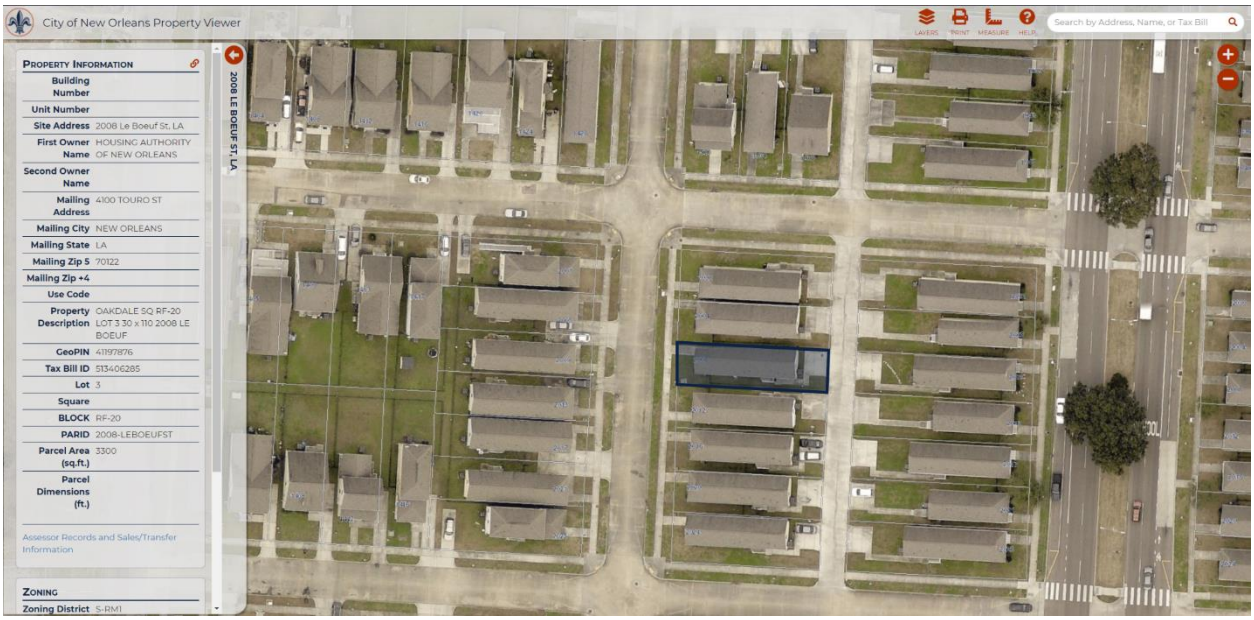


Figure 3.5 Fischer Site Subject Property Parcel Map

Parcel map depicting the vicinity of the Fischer Site subject property. The subject property is highlighted in blue (Orleans Parish Assessor's Office & City of New Orleans, 2020).

Harbor Estates

Much like the Fischer Site, properties at Harbor Estates were subdivided into individual lots that were uniformly valued according to size. Therefore, the subject property was randomly selected as a representative of the development. The property includes one housing unit on 0.12 acres of land, with a total appraised value of $92,300.

Figure 3.6 Harbor Estates Subject Property Parcel Map

Parcel map depicting the vicinity of the Fischer Site subject property. The subject property is highlighted in blue (Jefferson Parish Assessor's Office, 2020).

Safe Harbor

The Safe Harbor site in Bayou La Batre, Alabama, represents the only Katrina Cottage installation in the state. The site includes one hundred (100) modular housing units on fifty (50) acres divided into three (3) parcels on either side of Shine Road. The thirty-nine (39) acre parcel to the west of Shine Road (Key Number 1327237) was classified as manufactured housing and received zero improvement value. The property was therefore excluded from this study. However, both parcels to the east of Shine Road (Key Numbers 3729022 and 2940250) were classified as single-family dwellings with similar sizes and valuations. Records indicate the properties had been assigned no improvement value between 2011 and 2019; therefore, it may be inferred that these properties were valued as manufactured homes until the 2020 tax assessment. Parcel number 2940250 was chosen as the representative subject property for Safe Harbor. The property includes 19 homes on 5.25 acres, with a total valuation of $1.4 million.

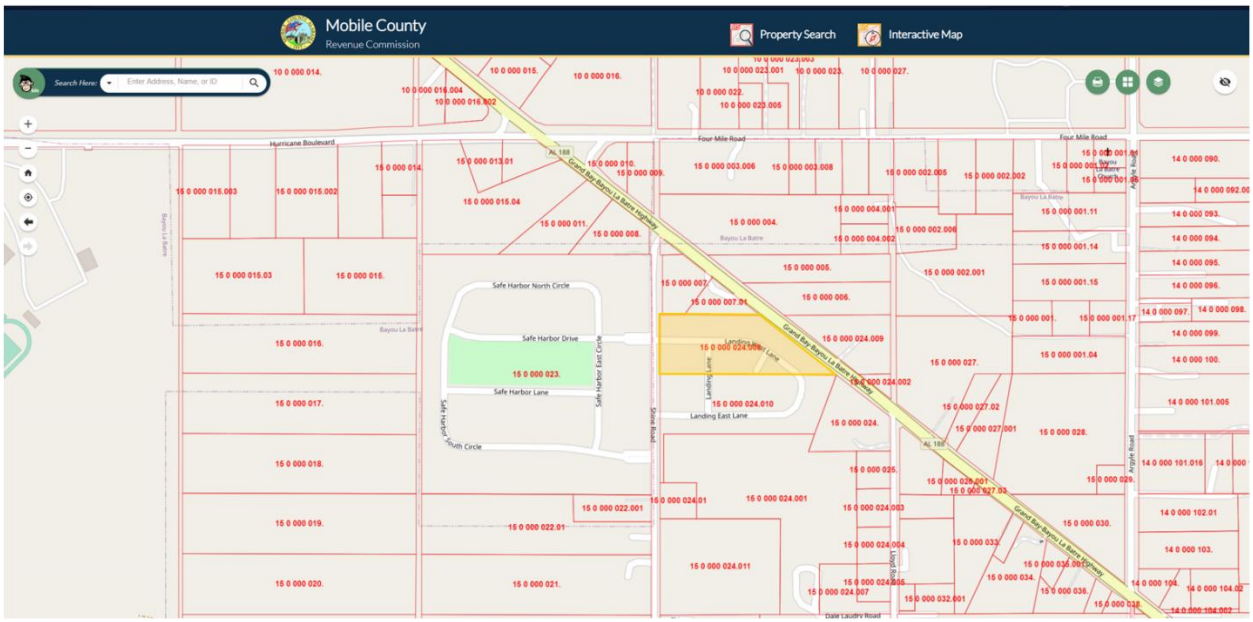


Figure 3.7 Safe Harbor Subject Property Parcel Map

Parcel map depicting the vicinity of the Safe Harbor subject property. The subject property is highlighted in yellow (Mobile County Revenue Commission, 2020).

Choosing Comparable Properties

Scope of Study

To begin, a folder is created for each subject property in Google Earth Pro. A placemark is added for each subject property at the entrance to the property. The ruler tool (circle tab) is used to measure three radii at distances of 0.25, 0.5, and 1.0 miles from the subject property placemark. Each radius is saved under the corresponding folder. Comps are chosen based on proximity to the subject property, preferably within one quarter (0.25) mile of the entrance to the site and within the same city, county/parish, and school district jurisdictions.

Assessing for Comparability

Comps are evaluated via Google Earth (Google, n.d) satellite and street view imagery to ensure their comparability with the character, condition, size, and age of other nearby properties

of the same land use classification. Tax assessment data is compared against similarly classed properties to ensure there were no apparent anomalies in the valuation. Privately owned properties are preferred over those owned by government agencies and non-profit housing authorities. However, one government-owned property – an apartment complex in New Orleans – is chosen for comparison because of its proximity to the subject property and its comparative valuation to other apartments in the parish. Selected representative properties are saved in the Google Earth folder of the corresponding subject property.

Case Studies

Case studies for each subject property are performed under the guide of Mark Francis' "A Case Study Method for Landscape Architecture" (2019). Information for each site includes a general fact sheet, a description of the context and community characteristics, a site analysis, and list of program elements. Other background information includes a description of the development process, design decisions, and limitations.

Measuring Economic Value

Economic valuation was obtained via each subject property's local tax assessor website for the fiscal year 2020. Tax appraisals were found to be consistently below the actual market rate of the properties. However, given market fluctuations and limitations on sales data, county tax assessments were deemed the most reliable and standardized source of property valuation. Tax assessments allowed for comparison of tax revenue generated by each land use. It should be noted, however, that each jurisdiction has different methods for assessing value, which limits the ability to compare properties across jurisdictions. While the methods of valuation were beyond

the scope of this research, land use comparisons were made within each jurisdiction and among the averages of each land use across jurisdictions.

Standardizing Data

To adjust for variations in land use characteristics, data was standardized to achieve continuity of results to the greatest extent practicable. Literature indicated that most residents and community leaders viewed value based on individual housing units. Therefore, value per unit was derived by dividing appraised improvement values by the number of units on each site. As expected, these values were skewed toward properties with higher square footage. To overcome this bias, values were standardized by square foot by dividing appraised improvement values by the average square footage, then multiplying the values by the number of units. Finally, values were assessed for value per acre by dividing the total appraised value by the acreage. This is a particularly important metric as coastal communities grapple with shrinking land areas in the face of increased flooding and sea level rise, which will necessitate more efficient use of land in future developments.

$$\text{Value per Unit} = \frac{\text{Appraised Improvement Value}}{\text{Number of Units}} \tag{3.1}$$

$$\text{Value per Sq Ft} = \left(\frac{\text{Appraised Improvement Value}}{\text{Average Square Footage}}\right) \times \text{Number of Units} \tag{3.2}$$

$$\text{Value per Acre} = \frac{\text{Total Appraised Value}}{\text{Acreage}} \tag{3.3}$$

Linear Relationship Analysis

Relationships were observed using scatter plot graphs produced in Microsoft Excel to observe the direction and strength of correlation between an independent variable (x) and value, the dependent variable (y). Independent variables measured along the x axis include selected design characteristics and demographic information. This study discusses observations of linear relationships based on three metrics: the direction of the line across the graph, the coefficient of determination (R^2), and the slope-intercept formula.

The direction of the relationship line provides a visual understanding of the strength of a relationship between two variables. The coefficient of determination, or R2 value, indicates the strength of the relationship between variables on a scale between zero (0) and one (1). Higher values indicate stronger relationships. In this study, the coefficient of determination provides an indication of how well the independent design or demographic variable can predict value, the dependent variable. Finally, the slope-intercept formula, written as $y = mx + b$, measures the amount of change in value (y) for each unit increase in the independent variable (x) using the slope (m) value.

Means Testing

This study employs two types of means testing to determine the significance of differences between groups of variables. SPSS Statistics is used to perform a one-way ANOVA to determine the significance of differences between two groups. SAS software is used to perform a one-way ANOVA and Least Significant Difference (LSD) post-hoc test to determine

the significance of differences between multiple groups. LSD results produced in SAS allow for direct comparison of groups that are significantly different from one another.

Limitations and Exceptions

Distance criteria for choosing representative properties could not be met in every community. Manufactured housing in particular was found to be limited in proximity to the subject properties, likely because of land use restrictions due to coastal wind hazards. In some instances, representative manufactured homes were located more than ten (10) miles away from the subject property. In rural and suburban communities, apartments were often located outside the preferred radius, though typically within two (2) miles.

Apartment units were determined using Google Earth (Google, n.d) imagery to observe doors, porches, air conditioning units, and parking spaces to ascertain the number of units in each building. The average square footage of apartment units was derived by dividing the number of units by the total square footage of the buildings, minus covered walkways and porches. For other land uses, housing unit square footage was primarily derived from tax assessment records; however, some records were incomplete. In such cases, properties and/or structures were measured with a measurement tool built into the county or parish's GIS application and verified in Google Earth. Square footage was estimated to include only livable space, minus covered parking, walkways, and porches.

Multi-unit properties like apartments and mobile home parks typically include streets, parking, and other infrastructure within the total acreage that is not reflected in the valuations. This is not the case for single-unit parcels. This has the effect of skewing per-acre valuations toward single-unit parcels. To address this discrepancy, single-unit properties were measured

from the front property line to the roadway centerline. Therefore, each property's acreage calculation reflects its share of dedicated infrastructure.

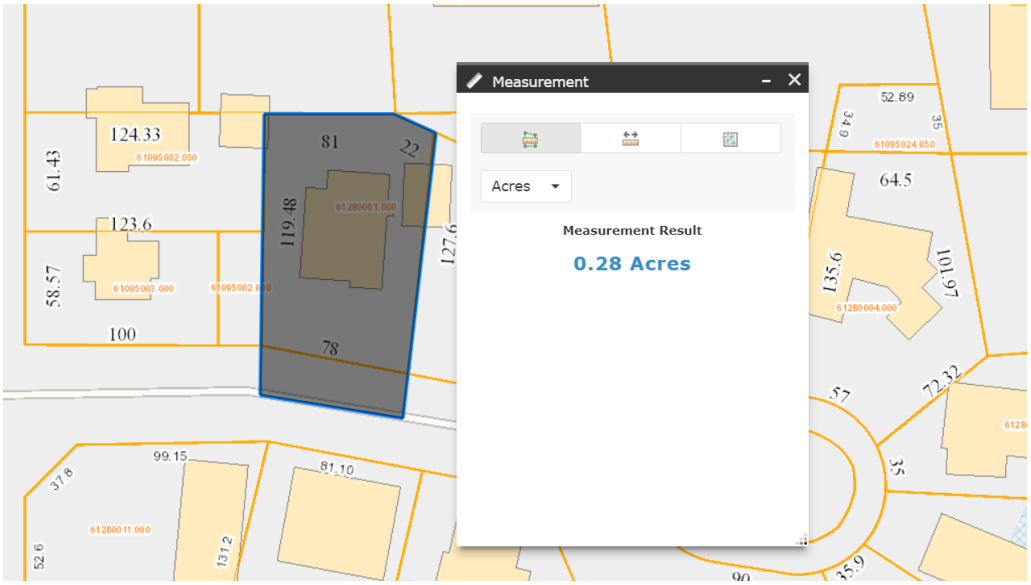


Figure 3.8 Depiction of Measurement Method of Single-Unit Lots

Screenshot of measurement method used to include public infrastructure on single unit lots. As seen above, property measurements were extended from the front property line to the centerline of the road to standardize for infrastructure included in multi-unit properties (Jackson County Information Systems, GIS Division, 2020).

CHAPTER IV

CASE STUDY RESULTS

Introduction

This chapter presents the results of case studies performed for each site. The purpose of the case study is to provide relevant context about each project and the communities in which they exist. Each case study describes the background of each project, including general characteristics and development history, design characteristics, and community context and demographics aided by maps and photographs. Finally, case studies include photos and data on representative properties surveyed from each community.

The Cottages at Oak Park

Project Background

The Cottages at Oak Park is a twenty-nine-unit development on 2.13 acres located in Ocean Springs, Mississippi (Figure 4.1). It is a mixed-income neighborhood consisting of both market rate house and rental units. The site, a former mobile home park, was acquired by a private developer in partnership with nonprofit housing groups that managed rentals and financing of units. The site was designed by architects Bruce Tolar and Ben Brown and developed by the Mississippi Emergency Management Agency with AHPP funding. The site was selected for its "historic models of walkable urbanism," and proximity to schools, parks, and Ocean Springs' historic downtown commercial district. According to Tolar and Brown (2015), the site was fully occupied within 60 days of its completion in 2011.

Figure 4.1 Google Earth 3D Aerial Image of Cottages at Oak Park

Aerial 3D image of the Cottages at Oak Park illustrating the development's context along a commercial corridor east of Downtown Ocean Springs (Google, n.d).

Table 4.2 Project Details for the Cottages at Oak Park

Project Name	Cottages at Oak Park
Location	2207 Government Street Ocean Springs, Mississippi
Ownership	Cottages at Oak Park, LLC
Occupation	Mixed-Income Owner/Rental
Construction Completed	2011
Cost	-
Size	2.13 acres
Housing Units	29
Density	13.6 units per acre
Housing Type	Modular
Average Unit Size	1200 ft^2

Detailed information on the Cottages at Oak Park (Google, n.d.; Jackson County Information Systems, GIS Division, 2020).

Project Design

The Cottages at Oak Park consists of modified modular Mississippi Cottage units, most of which are "stacked" to provide extra square footage (Figure 4.2). Homes are approximately fifteen feet wide by thirty to sixty feet deep and one-to-two-stories tall. The site is the second densest of all represented in this study, averaging 13.3 housing units per acre. Homes are set ten feet apart and range from five to twenty-five feet from the street. The development is notable for its use of pervious surfaces of green infrastructure elements to curb stormwater runoff (Figure 4.3). Moreover, large mature trees have been preserved and incorporated into the site. The primary street, Saxon Drive, is eighteen feet wide and constructed of pervious paving, rather than asphalt. Parking is accommodated behind the homes, averaging thirty-six feet in width, providing two parking spaces per unit. Sidewalks are about five feet wide and constructed of pervious paving materials, providing walkability throughout the site and out to Government Street. Decorative pedestrian lights provide subdued lighting for the neighborhood.

Figure 4.2 Cottages at Oak Park Public Interface along Government Street

Photograph illustrating the public interface of the Cottages at Oak Park along Government Street in Ocean Springs, MS (Google, n.d).

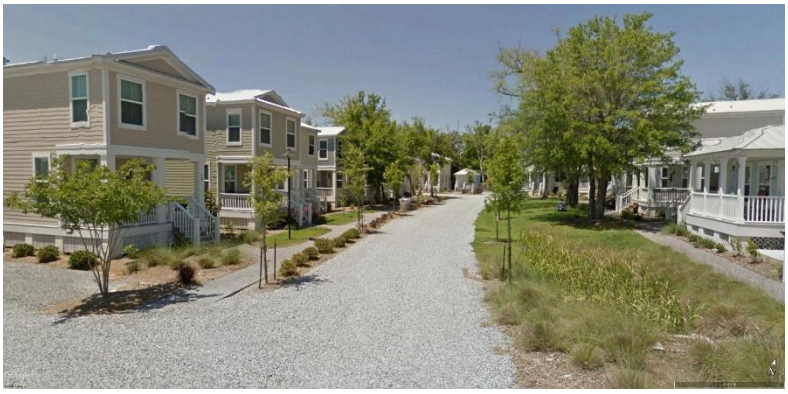


Figure 4.3 Streetscape of Saxon Drive in the Cottages at Oak Park

Street profile of Saxon Drive, the primary thru street in the Cottages at Oak Park development. Of note are the impervious materials used for streets and sidewalks, rain garden basin (bottom right), and retention of mature trees incorporated into the site. Homes in this image are separated by seventy feet from porch-to-porch (Google, n.d).

Community Context

The Cottages at Oak Park is immediately adjacent to the Cottage Square development to the west and bounded by commercial land uses on both sides and a railroad track to the north. The Oak Park Elementary School is located opposite the site on Government Street, while Ocean Springs Upper Elementary School is located one quarter mile east (Figure 4.4). Located within the T-4 "General Urban Zone" along the Rural-to-Urban Transect (Center for Applied Transect Studies, n.d.), the Cottages at Oak Park is among the more urban locations chosen for this study. The Cottages at Oak Park is the most walkable among subject properties selected for study, receiving a walk score of 62 out of 100 (Walk Score, 2021a).

Ocean Springs is a prototypical coastal retirement community. According to the American Community Survey, the town of 17,729 residents boasts a median household income of $58,713, making it the wealthiest community represented in this study. With a poverty rate at 10.2%, Ocean Springs is the only community represented herein with a poverty rate below 20%. More than 82% of residents are White, while only 6.9% of residents are Black, making it the

least diverse community studied. Ocean Springs boasts the highest rate of owner-occupied housing of those surveyed at 71%. Surprisingly, the median home value in Ocean Springs is $174,000 (2.9 times the median income), only the third highest among the five communities surveyed (U.S. Census Bureau, 2015-2019a; U.S. Census Bureau, 2015-2019b; U.S. Census Bureau, 2015-2019c).

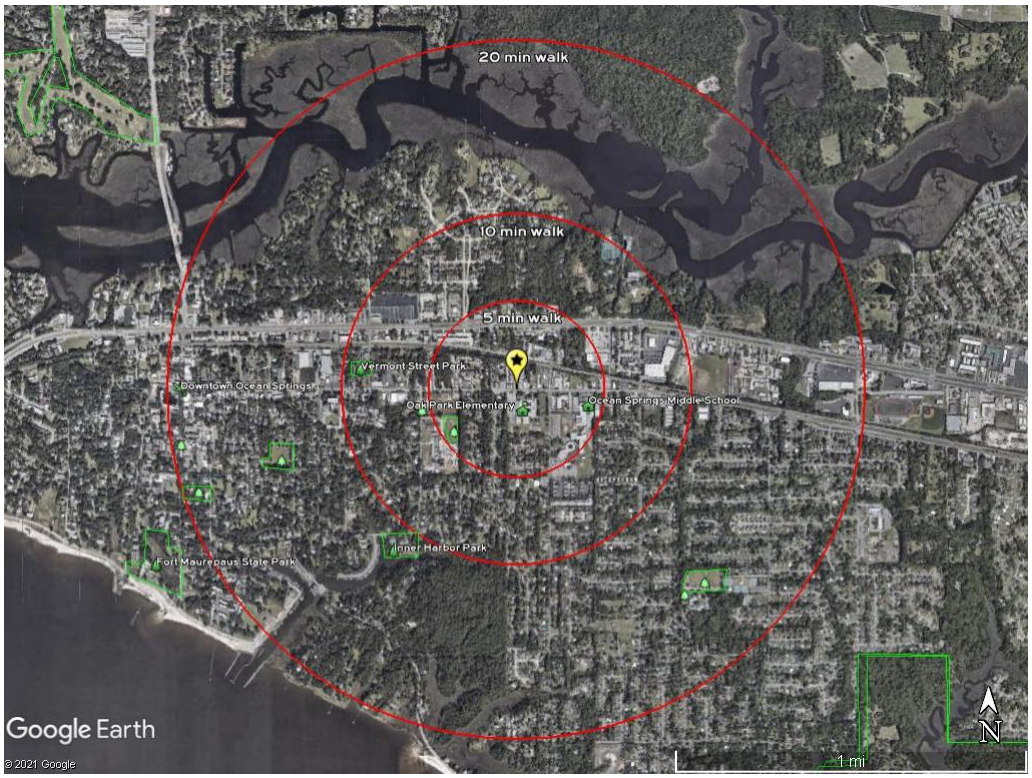


Figure 4.4 Cottages at Oak Park Vicinity Map

The vicinity map illustrates the Cottages at Oak Park's proximity to schools, parks, shopping and restaurants, and Downtown Ocean Springs. Red circles illustrate walk times based on quarter, half, and one-mile radii (Google, n.d).

Representative Comps

The following properties were selected as representative of the average character, size, and value of each respective land use in Ocean Springs, Mississippi. The Cottages at Oak Park is

divided into two parcels; each is assigned a different land use classification by the Jackson County Tax Assessor. The eastern parcel is classified as commercial and therefore excluded from this study. The residential classification of the western parcel was the basis for inclusion in this study (Figure 4.5). This parcel includes seventeen of the twenty-nine Cottages that make up the Cottages at Oak Park. All valuation data for the development herein is based on valuations obtained for this parcel.

Figure 4.5 Cottages at Oak Street Subject Property Parcel

Screenshot of the Jackson County GIS Application highlighting the parcel selected for study. This parcel comprises the western half of the Cottages at Oak Park development, including 17 of the 29 Katrina Cottages that make up the development. The eastern parcel is classified as commercial and therefore excluded from this study (Jackson County Information Systems, GIS Division, 2020).

Figure 4.6 illustrates the location of representative comps in relation to the subject property. The small single-family home comp (Figure 4.7) is a one-story, 1,509 square foot home, located on a quarter acre lot about 700 feet west of the Cottages at Oak Park at 635 Clark Avenue. The home was selected for its comparability to other small tract homes in the vicinity and its location adjacent to Government Street within sight of the subject property. The large single-family comp (Figure 4.8) is a 2,792 square foot home on 0.28 acres, located at 1 Mulberry

Place approximately 0.45 miles west of the subject property in Ocean Springs. The home was among the few large single-family homes within the preferred ½ mile radius that was not considerably close to water. Its appraisal values are comparable to other large single-family homes in the Mulberry Place subdivision.

Figure 4.9 shows the Westgate Apartments, a 90-unit apartment complex on 3.73 acres, located 0.28 miles southeast of the subject property at 2300 Westbrook Road. The property is the closest apartment complex to the subject property and was chosen for its comparative walkability to schools and parks. The Spanish Oaks Mobile Home Park (Figure 4.10) is nearly 2.5 miles east of the subject property; however, it represents the closest manufactured housing identified within Ocean Springs. Imagery suggests much of the housing is relatively new and the property appears to be well maintained. The property contains 31 mobile homes on 5.25 acres of land, located at 3630 Groveland Road in Ocean Springs. Valuation data collected for each property is presented in Table 4.3.

Figure 4.6 Map of the Cottages at Oak Park and Selected Comps in Ocean Springs, Mississippi

Aerial view facing east illustrating the location of the Cottages at Oak Park (subject property) in relation to selected comparable properties in Ocean Springs, Mississippi. The subject property is indicated by a yellow star icon. Red circles illustrate distance radii from the subject property in 0.25-, 0.5-, and 1-mile increments. Selected representative comps are indicated by red icons with a corresponding letter, including: a small single-family home (S); a large single-family home (L); an apartment complex (A); and a mobile home park (M) (Google, n.d.).

Figure 4.7 Small Single-Family Home Comp in Ocean Springs, Mississippi

Photo of 635 Clark Avenue a 1,509 square foot single-family home located 700 feet west of the Cottages at Oak Park along Government Street in Ocean Springs, Mississippi (Google, n.d).

Figure 4.8 Large Single-Family Home Comp in Ocean Springs, Mississippi

Photo of 1 Mulberry Place in Ocean Springs, Mississippi, a 2,792 square foot home located 0.45 miles west of the Cottages at Oak Park (Google, n.d).

Figure 4.9 Apartment Comp in Ocean Springs, Mississippi

Photo of Westgate Apartments, a 90-unit apartment complex located approximately 0.28 miles southeast of the Cottages at Oak Park, at 2300 Westbrook Road in Ocean Springs, Mississippi (Google, n.d).

Figure 4.10 Mobile Home Comp in Ocean Springs, Mississippi

Photo of the Spanish Oaks Mobile Home Park, a 31-unit commercial park located approximately 2.1 miles east of the Cottages at Oak Park at 3630 Groveland Road in Ocean Springs, Mississippi (Google, n.d).

Table 4.3 Valuation Data for Representative Comps in Ocean Springs, Mississippi

Description	Katrina Cottage	Small SFH	Large SFH	Apartment	Manufactured Home
Address	2207 Government St	635 Clark Ave	1 Mulberry Pl	2300 Westbrook Rd	3630 Groveland Rd
City	Ocean Springs, MS	Ocean Springs, MS	Ocean Springs, MS	Ocean Springs, MS	Ocean Springs, MS
County/Parish	Jackson	Jackson	Jackson	Jackson	Jackson
Distance (mi)	0	0.13	0.45	0.28	2.45
Units	17	1	1	90	31
Avg. Sq Ft	1200	1509	2792	1000	1000
Acres	1.28	0.25	0.28	3.73	5.25
Density (units/acre)	13.3	4.0	3.6	24.1	5.9
Walk Score	62	63	49	48	33
Tax Assessor Valuations					
Appr Land Value	$118,190	$10,920	$65,000	$205,110	$230,640
Appr Impr Value	$713,130	$78,330	$221,200	$1,492,710	$42,430
Appr Total Value	$831,320	$89,250	$286,200	$1,697,820	$273,070
Standardized Valuations					
Impr Value per Unit	$41,949	$78,330	$221,200	$16,586	$1,369
Impr Value per Sq Ft	$34.96	$51.91	$79.23	$16.59	$1.37
Land Value per Acre	$92,336	$43,680	$232,143	$54,989	$43,931
Total Value per Acre	$649,469	$357,000	$1,022,143	$455,180	$52,013

(Google, n.d., Jackson County Information Systems, GIS Division, 2020)

The Cottages at Second Street

Project Background

The Cottages at Second Street is a forty-unit development on 2.82 acres located in Pass Christian, Mississippi (Figure 4.11). It is a mixed-income neighborhood consisting of both market rate home and rental units. The site was acquired by a private developer in partnership with nonprofit housing groups that managed rentals and financing of units. The site was designed by architects Bruce Tolar and Ben Brown and developed by the Mississippi Emergency Management Agency with AHPP funding (Tolar & Brown, 2015). The development consists of Park Model (one-bedroom) and Mississippi Cottages (two- and three-bedroom) produced by the Mississippi Adequate Housing Program ranging between 432 and 1002 square feet (Harrison County, Mississippi, 2020).

Figure 4.11 Google Earth 3D Aerial Image of the Cottages at Second Street

Aerial 3D image of the Cottages at Second Street in Pass Christian, Mississippi, facing south illustrating the development's proximity to the Mississippi Sound (Google, n.d).

Table 4.4 Project Details for the Cottages at Second Street

Project Name	Cottages at Second Street
Location	215 Saucier Avenue Pass Christian, Mississippi
Ownership	Cottages at Second Street, LLC
Occupation	Mixed-Income Owner/Rental
Construction Completed	2011
Cost	-
Size	2.82 acres
Housing Units	40
Density	14.2 units per acre
Housing Type	Modular
Average Unit Size	900 ft^2

(Google, n.d.; Harrison County, Mississippi, 2020)

Project Design

The Cottages at Second Street consists of modified modular Mississippi Cottage units, most of which are "stacked" to provide extra square footage (Figure 4.14). Homes range between ten and fifteen feet wide by thirty to sixty feet deep and two-to-three-stories tall, including first level parking below the structures (Figure 4.13). Homes are set ten to fifteen feet apart and with zero setbacks from rear-access alleys. The site is the densest of all represented in this study, averaging 14.2 housing units per acre. Vehicular circulation generally follows the boundaries of the properties providing access to parking beneath the elevated homes while accommodating parallel on-street parking. Sidewalks are about five feet wide and placed at the front of homes, away from vehicular circulation, providing access throughout the site and out to Second Street and Saucier Avenue. Homes within the core of the development front a bioswale green space (Figure 4.14) approximately 45 feet wide by 280 feet long, while homes on the periphery face Second Street and Saucier Ave (Figure 4.13).

Figure 4.12 Cottages at Oak Park Public Interface along Second Street

Photograph illustrating the entrance of the Cottages at Second Street along Second Street in Pass Christian, Mississippi (Google, n.d).

Figure 4.13 Cottages at Oak Park Public Interface along Saucier Avenue

Photograph illustrating the fronting of Katrina Cottages along Saucier Avenue in Pass Christian, Mississippi (Google, n.d).

Figure 4.14 Character Image of the Cottages at Second Street

Character image of the Cottages at Second Street from Blueberry Row depicting the central green space, including bioretention basins (center) and a community garden (right). Of note is the orientation of units away from the street, which functions as an alley to gain access to a parking space beneath each structure. Pedestrian circulation is placed in front of housing away from the street (Google, n.d).

Community Context

The Cottages at Second Street is located at the northwest corner of East Second Street and Saucier Avenue, only 1,200 feet inland of the Mississippi Sound, in Pass Christian, Mississippi. Pass Christian lies near the epicenter of Hurricane Katrina's historic storm surge, which rose more than twenty-five feet above sea level at nearby Saint Louis Bay, causing total destruction several miles inland (Knabb et al., 2005). Fifteen years later, many homes have not been rebuilt in the area, as evidenced in Figure 4.15. As a result, the Cottages at Second Street is sited amongst scattered single-family homes to the west, south, and east, a catholic church to the north, and a several vacant properties on either side. Sidewalks along Second Street connect the site to the newly rebuilt Pass Christian Middle School about one half mile west and Downtown Pass Christian about 700 feet to the east (Figure 4.6). The site is a five-minute walk from the Pass Christian Beach and Harbor via sidewalks along Davis Avenue. However, the site's walk score (39) ranks third among the five subject properties (Walk Score, 2021a). The score indicates

that most trips require an automobile, as is typical of other locations within the T-3 “Suburban Zone” (Center for Applied Transect Studies, n.d.).

According to the American Community Survey, Pass Christian’s population of 5,877 is approximately 63% White and nearly 30% Black, making it the most diverse majority-White community surveyed. Data suggests a high degree of inequality within the community. The median household income of $47,599 is the second highest among the five communities surveyed, yet the poverty rate is more than 24%, also second highest. Nearly 67% of homes in Pass Christian are owner-occupied with a median home value of $183,700, or 3.8 times the median household income, making it the second least affordable community among those surveyed behind only New Orleans (U.S. Census Bureau, 2015-2019a; U.S. Census Bureau, 2015-2019b; U.S. Census Bureau, 2015-2019c).

Figure 4.15 Aerial Imagery Comparing the Cottages at Second Street Site in August 2005 to March 2019.

Google Earth historical imagery from August 2005 illustrating the total destruction of properties in Pass Christian in the aftermath of Hurricane Katrina (left) versus aerial imagery from March 2019 (right). Contemporary imagery reveals the vast amounts of land that remains vacant fifteen years after Hurricane Katrina. Several concrete slabs are all that remain of many homes that were destroyed by the storm. The yellow star icon indicates the current location of the Cottages at Second Street. The red circle indicates a quarter mile radius around the site (Google, n.d).

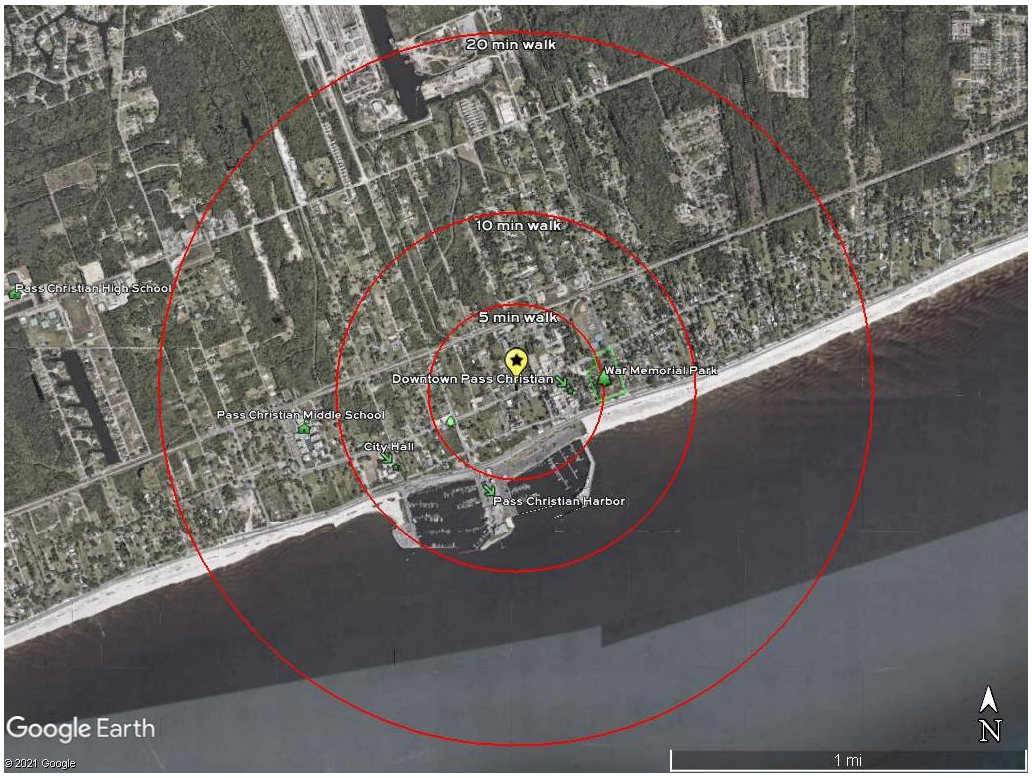


Figure 4.16 Cottages at Second Street Vicinity Map

The vicinity map illustrates the Cottages at Second Street's proximity to Downtown Pass Christian and the Pass Christian Harbor. Red circles illustrate walk times based on quarter, half, and one-mile radii (Google, n.d).

Representative Comps

Figure 4.6 illustrates selected representative properties in relation to the subject property in Pass Christian. The small single-family home comp (Figure 4.7) is a one-story 1,479 square foot home on 0.14 acres of land located at 220 Saucier Avenue, directly adjacent to the subject property. The property was chosen based on its proximity to the subject property and resemblance of the neighboring Mississippi Cottages in materiality and style. The large single-family home comp (Figure 4.8) is a 2,300 square foot home on 0.39 acres of land, located approximately 0.38 miles east of the subject property at 420 East Second Street. The home was constructed two years after Hurricane Katrina and is representative of other single-family homes

built in the immediate aftermath of the storm. This property was selected because of its relative distance to the beach and other destinations comparable to the subject property. Nearly all other large single-family homes meeting the preferred criteria are located adjacent to the beach, precluding them from the study.

The Caribbean in the Pass Apartments (Figure 4.9) is among the only apartment complexes located within Pass Christian. The apartment complex includes 100 units across thirteen buildings on 7.4 acres of land. The property is located approximately 1.5 miles northeast of the subject property at 707 East North Street. The Pecan Ridge Park (Figure 4.10) is the only mobile home park identified within twenty miles of the subject property in Harrison County. This is likely due to land use restrictions precluding manufactured homes from coastal hazard areas. The site includes 72 mobile homes on 11.1 acres of land, located 11.4 miles from the subject property at 17481 Orange Grove Road in Gulfport, Mississippi. Valuation data collected for each property is presented in Table 4.5.

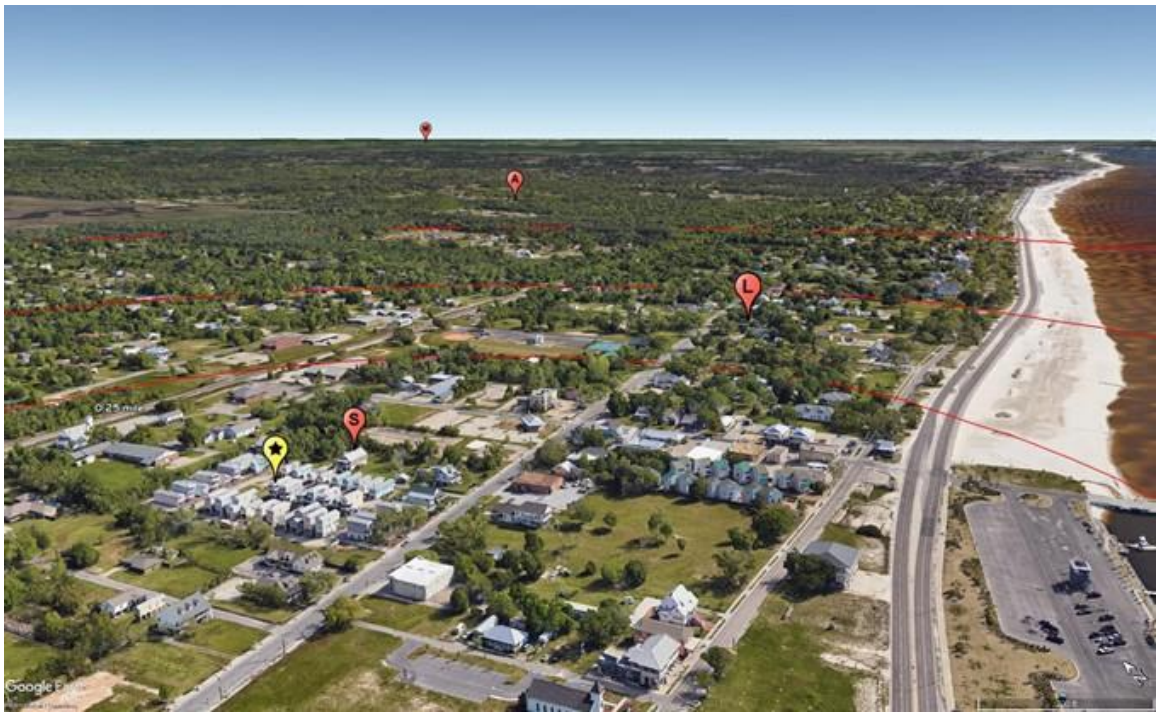


Figure 4.17 Map of the Cottages at Second Street and Selected Comps in Pass Christian, Mississippi

Aerial view facing northeast illustrating the location of the Cottages at Second Street (subject property) in relation to selected comparable properties and the Mississippi Sound (bottom) in Pass Christian, Mississippi. The subject property is indicated by a yellow star icon. Red circles illustrate distance from the subject property in 0.25-, 0.5-, and 1-mile radii. Selected representative comps are indicated by red icons with a corresponding letter, including: a small single-family home (S); a large single-family home (L); an apartment complex (A); and a stand-alone Park Model (one-bedroom) Katrina Cottage used for direct comparison (K). The representative mobile home park in Gulfport (M) is not shown on this map (Google, n.d.).

Figure 4.18 Small Single-Family Home Comp in Pass Christian, Mississippi

Photo of 220 Saucier Avenue, a 1,479 square foot single-family home located immediately adjacent to the Cottages at Second Street in Pass Christian, Mississippi (Google, n.d).

Figure 4.19 Large Single-Family Home Comp in Pass Christian, Mississippi

Photo of 420 East Second Street, a 2,300 square foot single-family home located 0.39 miles east of the Cottages at Second Street in Pass Christian, Mississippi (Google, n.d).

Figure 4.20 Apartment Comp in Pass Christian, Mississippi

Photo of The Caribbean in the Pass Apartments, a 100-unit apartment complex located 1.5 miles northeast of the Cottages at Second Street at 707 East North Street in Pass Christian, Mississippi (Google, n.d).

Figure 4.21 Manufactured Home Comp in Gulfport, Mississippi

Photo of the Pecan Ridge Park, a 72-unit commercial home park located 11.1 miles northeast of the Cottages at Second Street at 17481 Orange Grove Road in Gulfport, Mississippi (Google, n.d).

Table 4.5 Valuation Data for Representative Comps in Pass Christian, Mississippi

Description	Katrina Cottage	Small SFH	Large SFH	Apartment	Manufactured Home
Address	215 Saucier Ave	220 Saucier Ave	420 E 2nd St	707 E North St	17481 Orange Grove Rd
City	Pass Christian, MS	Pass Christian, MS	Pass Christian, MS	Pass Christian, MS	Gulfport, MS
County/Parish	Harrison County	Harrison County	Harrison County	Harrison County	Harrison County
Distance (mi)	0	0.1	0.1	1.5	11.4
Units	40	1	1	100	72
Avg. Sq Ft	900	1479	2300	1000	1350
Acres	2.82	0.14	0.39	7.4	11.1
Density (units/acre)	14.2	7.1	2.6	13.5	6.5
Walk Score	41	41	34	5	7
Tax Assessor Valuations					
Appr Land Value	$76,282	$14,663	$28,525	$76,590	$105,528
Appr Impr Value	$1,700,075	$109,227	$122,426	$2,823,575	$210,093
Appr Total Value	$1,776,357	$123,890	$150,951	$2,900,165	$315,621
Standardized Valuations					
Impr Value per Unit	$42,502	$109,227	$122,426	$28,236	$2,918
Impr Value per Sq Ft	$47.22	$73.85	$53.23	$28.24	$2.16
Land Value per Acre	$27,050	$104,736	$73,141	$10,350	$9,507
Total Value per Acre	$629,914	$884,929	$387,054	$391,914	$28,434

(Google, n.d.; Harrison County, Mississippi, 2020)

The Fischer Site

Project Background

The William J. Fischer Housing Development (Fischer Site) is a nineteen acre, 127-unit community on the West Bank in New Orleans. The site is composed of rental and owner-occupied housing managed by the Housing Authority of New Orleans (Homeland Security, 2011, p. 23). The development is located on the former site of the "Fischer Projects," a series of high-rise public housing projects constructed in 1964 that became notorious for drugs and violent crime. The buildings east of L.B. Landry Avenue were razed in 2004 under a HUD program that sought to replace the multistory buildings with low-to-moderate-income homes available to renters and owners (Arizona Daily Sun, 2004). Historical imagery reveals the street network on the eastern half of the site had been constructed, along with a few homes by the time Hurricane Katrina struck in 2005 (Figure 4.23). According to the Housing Authority of New Orleans (n.d.), sitework was completed in 2008 with HOPE VI funding at a cost of $26 million. The project replaced 1,002 units with just 326 units, 201 of which are publicly subsidized.

Figure 4.22 Google Earth 3D Aerial Image of the Fischer Site

Aerial 3D image of the Fischer Site in New Orleans, Louisiana, illustrating the development's proximity to the Mississippi River and Downtown New Orleans (top) (Google, n.d).

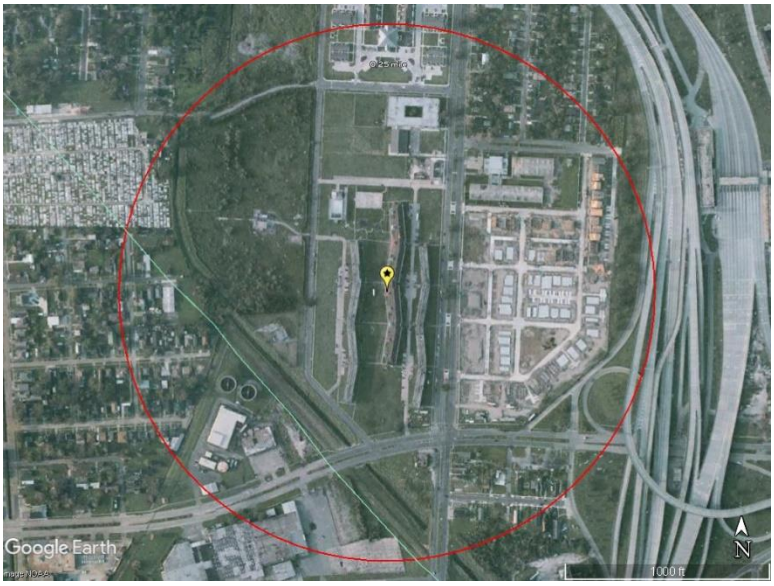


Figure 4.23 Historical Imagery of the Fischer Site in August 2005

Historical imagery reveals construction had begun on low-income housing east of L.B. Landry Avenue when Hurricane Katrina struck in 2005. High rise apartments west of L.B. Landry Avenue remained after the storm. This suggests that planned housing under construction was replaced by the manufactured Katrina Cottages in the aftermath. Notably, homes west of L.B. Landry Avenue are all single-family, versus the multi-family dwellings to the east (Google, n.d.).

The Fischer Site Development includes single-family and multi-family duplexes, triplexes, and fourplexes. However, only the single-family homes along and west of L.B. Landry Avenue are Louisiana Katrina Cottages (Figure 4.24). According to Gogola and The Lens (2012), these owner-occupied homes were financed through the New Orleans Redevelopment Authority (NORA) at market-rate prices ranging between $72,000 and $110,000 (Gogola & The Lens, 2012). Unlike group sites in Mississippi and Alabama, the Fischer Site is subdivided with each Cottage given its own valuation. Valuations are equal for each variation of Cottage; therefore, values presented in Table 4.6 are derived from one single-family home selected as a representative for the development.

Figure 4.24 Fischer Site Katrina Cottage Development

Google Earth imagery outlining the 124 Louisiana Katrina Cottages at the Fischer Site in red (Google, n.d).

Table 4.6 Project Details for the Fischer Site

Project Name	The Fischer Site
Location	2008 Le Boeuf Street New Orleans, Louisiana
Ownership	Housing Authority of New Orleans
Occupation	Rentals and Owner-Occupied
Construction Completed	2011
Cost	-
Size	19 acres
Housing Units	127
Density	6.7 units per acre
Housing Type	Kit
Average Unit Size	1500 ft^2

(Google, n.d.; Orleans Parish Assessor's Office & City of New Orleans, 2020).

Project Design

The Fischer Site is laid out on an urban grid pattern with blocks generally 350 feet long. Streets are twenty-six feet wide and constructed of concrete and lined with five-foot concrete sidewalks separated by six feet of turf (Figure 4.25). Sidewalks include accessible curb ramps and provide connectivity to nearby schools and parks to the north of the site via bike lanes, bus routes, and sidewalks along L.B. Landry Avenue (Figure 4.26). Eighteen-foot-wide alleys provide access to two concrete parking spaces behind some homes, while front-access driveways are provided for others in favor of back yards. Stormwater is managed with traditional curb and gutter and drop inlets that carry water to a nearby ditch that is pumped into the Mississippi River. Green infrastructure is not evident on site. Homes are set back thirty feet from the street and five-to-fifteen-feet from one another at an average density of 10 lots per acre. The Fischer Site exhibits the highest degree of variation in housing styles of all sites surveyed, as the site includes a variety of kit homes detailed in literature (Figure 4.27).

Figure 4.25 Typical Street Section within the Fischer Site

Image of Le Boeuf Street lined with decorative lighting and sidewalks. Front-access parking is provided to homes on the left while rear-access parking is provided behind homes on the right (Google, n.d.).

Figure 4.26 Multimodal Access along L.B. Landry Avenue

Image of L.B. Landry Avenue lined by Louisiana Cottages. L.B. Landry Avenue is a busy street that provides access to the Algiers Neighborhood to the north via sidewalk, bike lanes, and bus routes. This image shows a bus stop within the dedicated bike lane approaching the school zone at Fischer Elementary School (Google, n.d).

Figure 4.27 Variations of Louisiana Cottages on Hero Boulevard

Image of three variations of Louisiana Cottages along Hero Boulevard within the Fischer Site Development. Rear-access parking can be observed behind homes on the right (Google, n.d).

Community Context

The Fischer Site is located in an undesirable area of New Orleans, bound by a water treatment plant, a radio tower, and fallow unkempt land to the west (Figure 4.28) and the elevated Westbank Expressway to the east and north. Moreover, its location along the "west bank" of the Mississippi River makes it generally isolated from the City of New Orleans, proper. The subject property is within walking distance of William J Fischer Elementary School and L.B. Landry High School; however, access to retail services requires public transportation provided along L.B. Landry Avenue (Figure 4.29). Its walk score of 52 is second highest among sites surveyed (Walk Score, 2021a), which is indicative of its location in the T-5 "Urban Core Zone" along the Rural-to-Urban Transect, the most urban of all sites surveyed (Center for Applied Transect Studies, n.d.).

According to the American Community Survey (ACS), the population within the development is largely impoverished. While New Orleans proper boasts a median household income of $41,604, second lowest among communities in this study, tract-level data indicates a median income of just $12,721 within the Fischer Site Development. More than half of all housing in New Orleans is renter-occupied, likely due to the affordability of housing within the city. The median home value in New Orleans is $231,500, more than 5.5 times the median household income, making it the least affordable community represented in this study (U.S. Census Bureau, 2015-2019a; U.S. Census Bureau, 2015-2019b; U.S. Census Bureau, 2015-2019c).

Figure 4.28 Unkempt Property Adjacent to the Fischer Site

The photo depicts the Fischer Site's proximity to a radio tower surrounded by barbed wire fencing, unkempt grass, and furniture dumped along the roadside. The elevated Westbank Expressway that surrounds the site can be seen in the distance (Hinton, 2021).

Figure 4.29 Fischer Site Development Vicinity Map

The vicinity map illustrates the Fischer Site's proximity to schools, parks, the Mississippi River, and the Westbank Expressway. Red circles illustrate walk times based on quarter, half, and one-mile radii (Google, n.d.).

Representative Comps

The following properties were selected as representative of the average character, size, and value of each respective land use near the Fischer Site. Sites selected for comparison are similarly situated within the bounds of the Westbank Expressway and the city limits of New Orleans, except for the manufactured housing comp located in New Orleans East (Figure 4.30). Figure 4.31 depicts the subject property selected as representative of the Fischer Site Development. The single-story Louisiana Cottage is 1,500 square feet sited on a 0.1-acre lot at 2008 Le Boeuf Street (Figure 4.32).

The small single-family home in Figure 4.33 is similarly sized at 1,532 square feet on a 0.19-acre lot located 0.3 miles north of the subject property at 1906 Bodenger Boulevard in New Orleans. The large single-family home in Figure 4.34 is a 2,457 square foot home occupying 0.3 acres about one half mile northwest of the subject property. The Fischer Senior Village (Figure 4.53) is a 66-unit gated apartment complex on 10.17 acres of land at 1400 Semmes Street. The site, located 0.2 miles north of the subject property, is part of the overall Fischer Site Development and likewise owned by the Housing Authority of New Orleans. Finally, the Pelican Mobile Home Estate (Figure 4.36) represents the only mobile home park identified within the City of New Orleans. The site is located 6.1 miles northeast of the subject property at 7701 Chef Menteur Highway in New Orleans East. It is comprised of 71 mobile homes on 6.7 acres averaging about 1300 square feet per unit. Valuation data collected for each property is presented in Table 4.7.

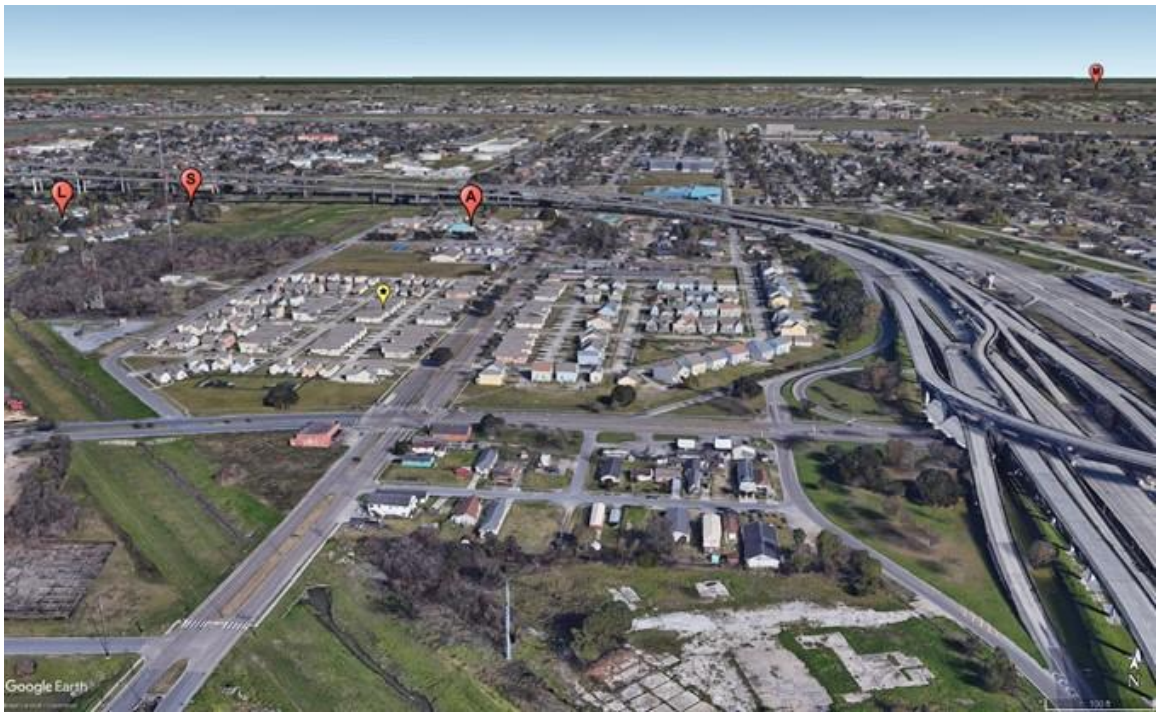


Figure 4.30 Map of the Fischer Site and Selected Comps in New Orleans, Louisiana

Aerial view facing north illustrating the location of the Fischer Site (subject property) in relation to selected comparable properties, the Mississippi River (left to right), and Downtown New Orleans (left). The subject property is indicated by a yellow star icon. Red circles illustrate distance radii from the subject property in 0.25-, 0.5-, and 1-mile increments. Selected representative comps are indicated by red icons with a corresponding letter, including: a small single-family home (S); a large single-family home (L); an apartment complex (A); and a mobile home park (M) (Google, n.d).

Figure 4.31 The Fischer Site Representative Cottage in New Orleans, Louisiana

Photo of 2008 Le Boeuf Street, a 1,500 square foot Louisiana Cottage within the Fischer Site Development of New Orleans (Google, n.d). This cottage is the Fischer Site subject property representing all Louisiana Cottages in the development.

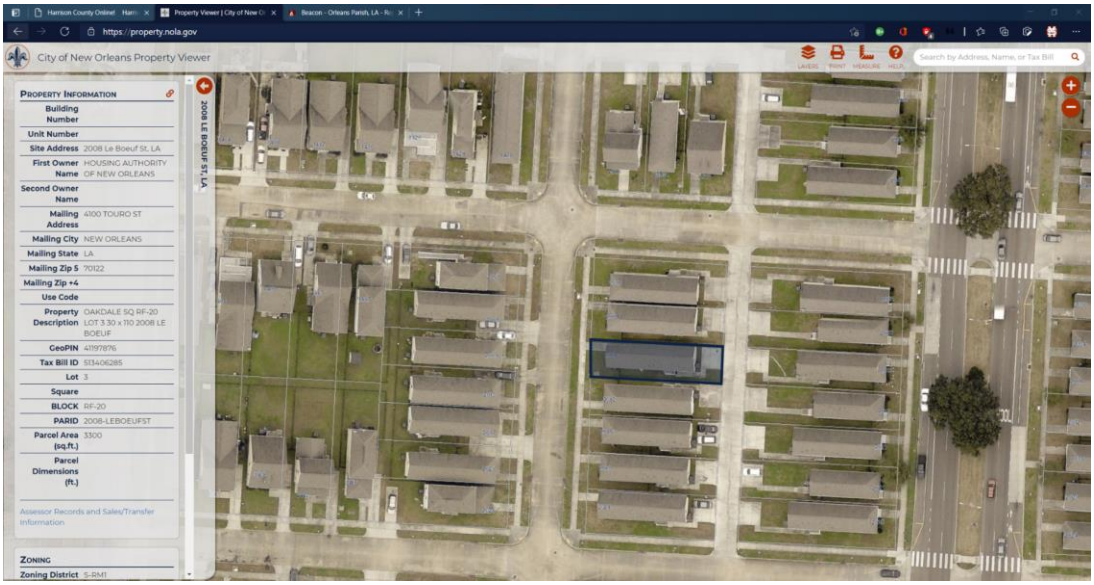


Figure 4.32 Parcel Map of Fischer Site Representative Cottage

Screenshot of parcel map obtained from the City of New Orleans Property Viewer of the representative Louisiana Cottage selected for study at the Fischer Site (Orleans Parish Assessor's Office & City of New Orleans, 2020).

Figure 4.33 Small Single-Family Home Comp in New Orleans, Louisiana

Photo of 1906 Bodenger Boulevard, a 1,562 square foot single-family home on 0.19 acres located 0.3 miles north of the subject property in New Orleans, Louisiana (Google, n.d).

Figure 4.34 Large Single-Family Home Comp in New Orleans, Louisiana

Photo of 650 Ricks Place, a 2,457 square foot single-family home on 0.3 acres located one half mile northwest of the subject property in New Orleans, Louisiana (Google, n.d).

Figure 4.35 Apartment Comp in New Orleans, Louisiana

Photo of the Fischer Senior Village, a 66-unit apartment complex on 10.17 acres located 0.2 miles north of the subject property at 1400 Semmes Street in New Orleans, Louisiana (Google, n.d).

Figure 4.36 Mobile Home Comp in New Orleans, Louisiana

Photo of the Pelican Mobile Home Estate, a 71-unit mobile home park occupying 6.7 acres approximately 6.1 miles northeast of the subject property at 7701 Chef Menteur Highway in New Orleans, Louisiana (Google, n.d).

Table 4.7 Valuation Data for Subject Properties in New Orleans, Louisiana

Description	Katrina Cottage	Small SFH	Large SFH	Apartment	Manufactured Home
Address	2008 Le Boeuf St	1906 Bodenger Blvd	650 Ricks Pl	1400 Semmes St	7701 Chef Menteur Hwy
City	New Orleans, LA	New Orleans, LA	New Orleans, LA	New Orleans, LA	New Orleans, LA
County/Parish	Orleans Parish	Orleans Parish	Orleans Parish	Orleans Parish	Orleans Parish
Distance (mi)	0	0.3	0.5	0.2	6.1
Units	1	1	1	66	71
Avg. Sq Ft	1500	1562	2457	1056	1306
Acres	0.1	0.19	0.3	10.17	6.7
Density (units/acre)	10.0	5.3	3.3	6.5	10.6
Walk Score	52	35	40	36	39
Tax Assessor Valuations					
Appr Land Value	$6,600	$18,800	$31,500	$886,000	$498,000
Appr Impr Value	$83,400	$77,900	$95,100	$2,966,300	$45,700
Appr Total Value	$90,000	$96,700	$126,600	$3,852,300	$543,700
Standardized Valuations					
Impr Value per Unit	$83,400	$77,900	$95,100	$44,944	$644
Impr Value per Sq Ft	$55.60	$49.87	$38.71	$42.56	$0.49
Land Value per Acre	$66,000	$98,947	$105,000	$87,119	$74,328
Total Value per Acre	$900,000	$508,947	$422,000	$378,791	$81,149

(Google, n.d.; Orleans Parish Assessor's Office & City of New Orleans, 2020)

Harbor Estates

Project Background

Harbor Estates is a twenty-seven-unit development occupying 4.35 acres in Bridge City, Louisiana (Figure 4.37). The site was purchased from a neighboring church to provide rental housing for senior citizens over fifty-five years of age (Homeland Security, 2011, p. 23). The site was developed under the Louisiana Housing Program using AHPP funding and completed in 2011 at a projected cost of $3.4 million (Natural Disaster Housing Reconstruction Committee, 2010, p. 17). Like the Fischer Site, the Harbor Estates development is subdivided with cottages receiving similar valuations based on size. Valuations for Harbor Estates are based on the selected representative property located at 7820 Robert Davison Drive (Figure 4.42).

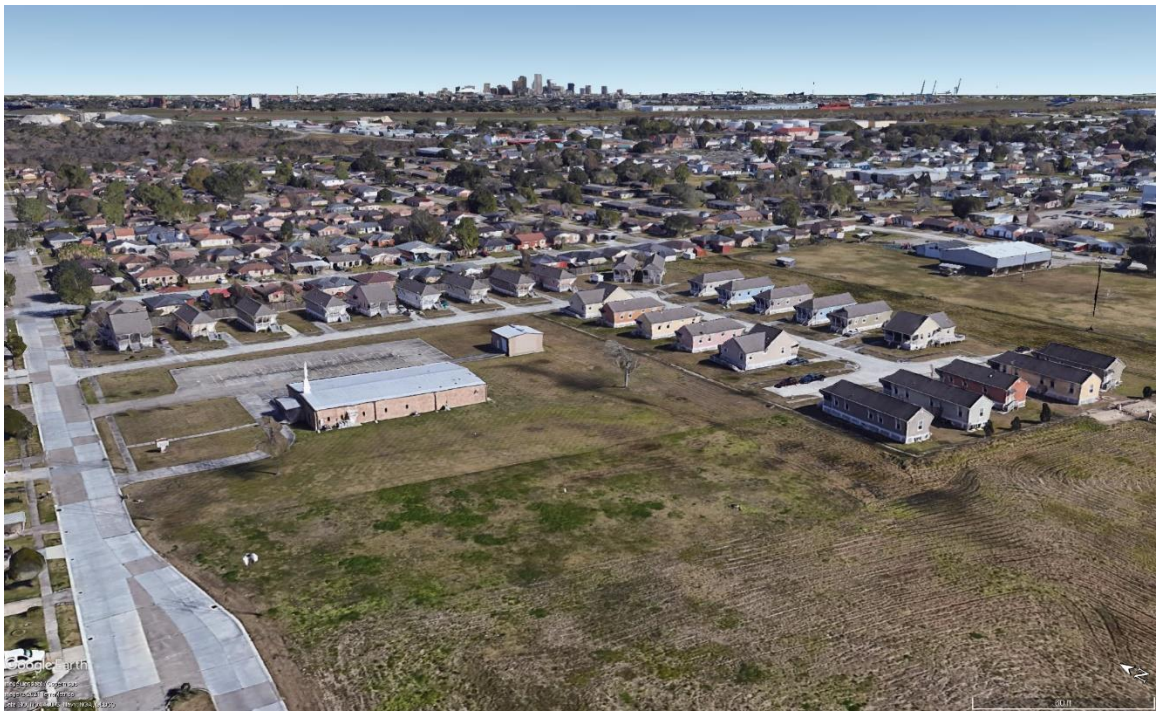


Figure 4.37 Google Earth 3D Aerial Image of the Harbor Estates

Aerial 3D image of the Harbor Estates in Bridge City, Louisiana, illustrating the development's proximity to the Mississippi River and Downtown New Orleans (top) (Google, n.d).

Table 4.8 Project Details for the Harbor Estates

Project Name	Harbor Estates
Location	7820 Robert Davison Drive Bridge City, Louisiana
Ownership	GCHP-Westwego, LLC
Occupation	Rentals (age 55+)
Construction Completed	2011
Cost	-
Size	4.35 acres
Housing Units	27
Density	6.2 units per acre
Housing Type	Kit
Average Unit Size	900 ft^2

(Google, n.d., Jefferson Parish Assessor's Office, 2020)

Project Design

Harbor Estates is a typical suburban-style neighborhood consisting of three streets that terminate at the south end of the development. Streets are twenty-six feet wide constructed of concrete featuring curb and gutter. The site includes four-foot-wide concrete sidewalks separated from the street by seven feet of turf. Sidewalks provide connectivity to nearby neighborhoods and a bus stop along the Westbank Expressway, though schools, parks, and retail are inaccessible by foot. Homes are set back thirty feet from the street and twenty-to-twenty-five feet from one another. The neighborhood density is approximately 6.2 units per acre, similar to nearby neighborhoods. Standard bucket lighting is provided.

Figure 4.38 Street View of Harbor Estates

Louisiana Cottages along Harold Roussell Drive in the Harbor Estates development in Bridge City, Louisiana (Google, n.d).

Community Context

Harbor Estates is located in Bridge City, Louisiana on the far western outskirts of New Orleans near the end of the Westbank Expressway. The site is bound by small single-family homes to the north and west, a church to the south and west, sports fields to the east, and a motel to the south. Nearby land uses include a large mobile home park, apartments, sprawling single-family neighborhoods, and fast-food restaurants. Heavy industrial facilities are located along the Mississippi River nearby. Harbor Estates is located in the T-3 “Sub-Urban Zone” along the Rural-to-Urban Transect (Center for Applied Transect Studies, n.d.). The site is walkable to nearby neighborhoods and transit stops but requires use of automobiles access daily needs. Its walk score is 39 (Walk Score, 2021a). Bridge City, Louisiana is the poorest community of those surveyed. More than 26% of its 6,602 residents are below the poverty level. The median household income is just $31,711 about $10,000 lower than the next lowest community surveyed. The community is relatively diverse. Its racial makeup includes nearly 47% Black, 40% White, and more than 10% of the population claiming another race. Still, nearly 60% of all homes in Bridge City are owner-occupied compared to 41% rentals. The median home value is

$95,500, about three times the median income (U.S. Census Bureau, 2015-2019a; U.S. Census Bureau, 2015-2019b; U.S. Census Bureau, 2015-2019c).

Figure 4.39 Harbor Estates Vicinity Map

The vicinity map illustrates the Fischer Site's proximity to schools, parks, the Mississippi River, and the Westbank Expressway. Red circles illustrate walk times based on quarter-, half-, and one-mile radii (Google, n.d).

Representative Comps

The following properties were selected as representative of the average character, size, and value of each respective land use within one mile of the Harbor Estates (Figure 4.40). Figure 4.41 shows the subject property selected as representative of the Harbor Estates development. The property, located at 7820 Robert Davison Drive, is a 900 square foot Louisiana Cottage occupying 0.14 acres of land (Figure 4.42). The small single-family comp (Figure 4.43) is a 1,522 square foot home on 0.15 acres located 250 feet north of the subject property at 7828 Angela Street. The home is similar to other tract homes in the neighboring subdivision. The large single-family home comp (Figure 4.44) is a 2,205 square foot home occupying 0.18 acres of land

approximately 0.73 miles west of the subject property at 905 North Claiborne Parkway. It is among the only homes greater than 2,000 square feet located within one mile of the subject property. The Beechgrove Apartments (Figure 4.45) include 248 apartment units on 15.1 acres of land 0.35 miles west of the subject property. Located at 965 Beechgrove Boulevard, these represent the closest of three apartment complexes nearby. Finally, the mobile home comp (Figure 4.46) is a 1270 square foot trailer on 0.13 acres located approximately one quarter mile from the subject property at 106 Plum Street. Valuation data collected for each property is presented in Table 4.9.

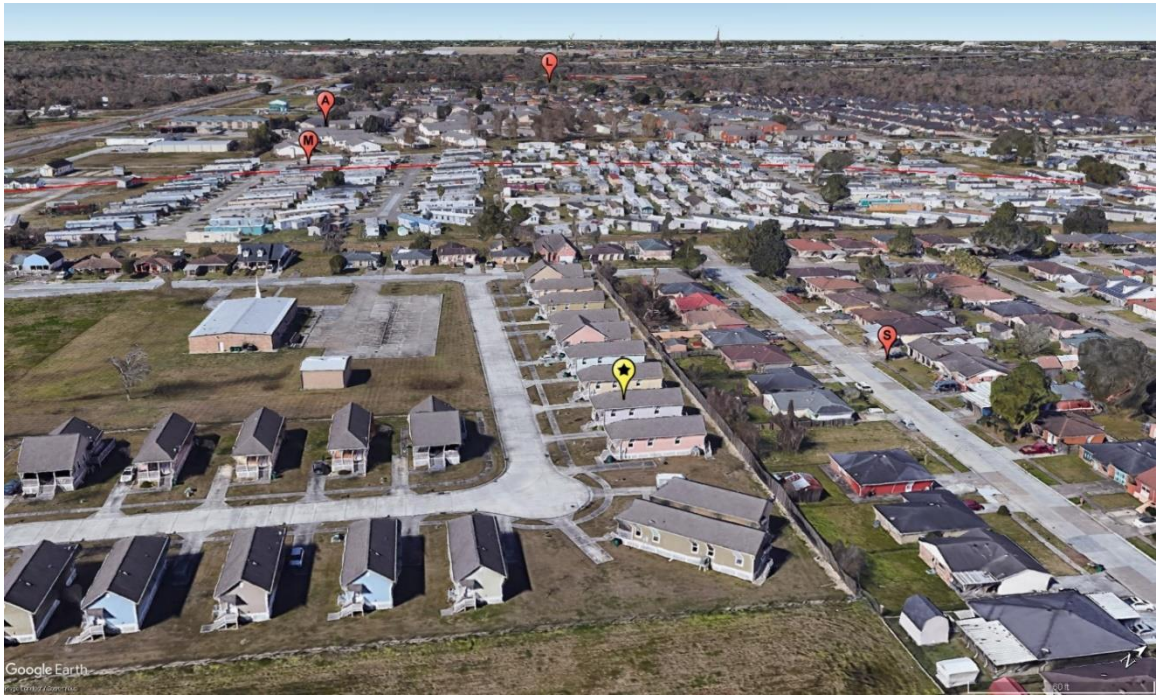


Figure 4.40 Map of the Harbor Estates and Selected Comps in Bridge City, Louisiana

Aerial view facing west illustrating the location of the Harbor Estates, subject property, 7820 Robert Davison Drive, in relation to selected comparable properties in Bridge City, Louisiana. The subject property is indicated by a yellow star icon. Red circles illustrate distance radii from the subject property at 0.25-, 0.5-, and 1-mile increments. Selected representative comps are indicated by red icons with a corresponding letter, including: a small single-family home (S); a large single-family home (L); an apartment complex (A); and a mobile home park (M) (Google, n.d.).

Figure 4.41 Harbor Estates Representative Cottage in Bridge City, Louisiana

Photo of 7820 Robert Davison Drive (right), a 900 square foot Louisiana Cottage within the Harbor Estates Development of Bridge City, Louisiana (Google, n.d.). This cottage is the Harbor Estates subject property representing all Louisiana Cottages in the development.

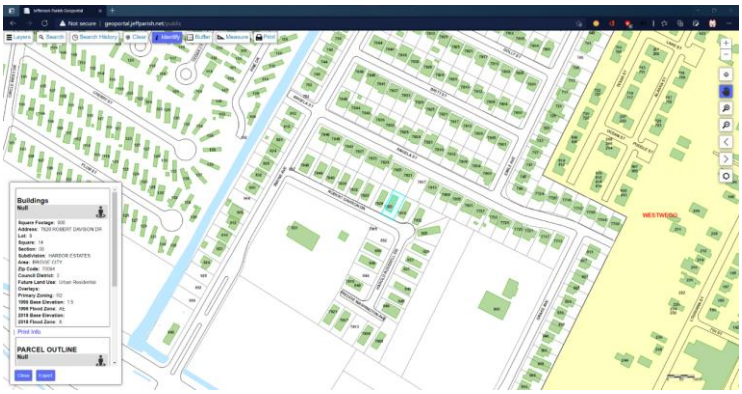


Figure 4.42 Parcel Map of Fischer Site Representative Cottage

Screenshot of parcel map obtained from the Jefferson Parish Geoportal of the representative Louisiana Cottage selected for study at the Harbor Estates Development (Jefferson Parish Assessor's Office, 2020).

Figure 4.43 Small Single-Family Home Comp in Bridge City, Louisiana

Photo of 7828 Angela Street, a 1,522 square foot single-family home located less than 250 feet north of the subject property in Bridge City, Louisiana (Google, n.d.).

Figure 4.44 Large Single-Family Home Comp in Bridge City, Louisiana

Photo of 905 North Claiborne Parkway, a 2,205 square foot single-family home located 0.73 miles west of the subject property in Bridge City, Louisiana (Google, n.d.).

Figure 4.45 Apartment Comp in Bridge City, Louisiana

Photo of the Beechgrove Apartments, a 248-unit apartment complex located 0.5 miles west of the subject property at 965 Beechgrove Boulevard in Bridge City, Louisiana (Google, n.d.).

Figure 4.46 Mobile Home Comp in Bridge City, Louisiana

Photo of 106 Plum Street, a 1,270 square foot mobile home located 0.25 miles west of the subject property in Bridge City, Louisiana (Google, n.d.).

Table 4.9 Valuation Data for Subject Properties in Bridge City, Louisiana

Description	Katrina Cottage	Small SFH	Large SFH	Apartment	Manufactured Home
Address	7820 Robert Davison Dr	7828 Angela St	905 N Claiborne Pkwy	965 Beechgrove Blvd	106 Plum St
City	Bridge City, LA	Bridge City, LA	Bridge City, LA	Bridge City, LA	Bridge City, LA
County/Parish	Jefferson Parish	Jefferson Parish	Jefferson Parish	Jefferson Parish	Jefferson Parish
Distance (mi)	0	0.3	0.6	0.5	0.25
Units	1	1	1	248	1
Avg. Sq Ft	900	1522	2205	1000	1270
Acres	0.14	0.15	0.18	15.1	0.13
Density (units/acre)	7.1	6.7	5.6	16.4	7.7
Walk Score	39	39	21	33	39
Tax Assessor Valuations					
Appr Land Value	$17,100	$17,100	$19,600	$789,300	$100
Appr Impr Value	$75,200	$56,800	$62,700	$10,206,300	$22,900
Appr Total Value	$92,300	$73,900	$82,300	$10,995,600	$23,000
Standardized Valuations					
Impr Value per Unit	$75,200	$56,800	$62,700	$41,154	$22,900
Impr Value per Sq Ft	$83.56	$37.32	$28.44	$41.15	$18.03
Land Value per Acre	$122,143	$114,000	$108,889	$52,272	$769
Total Value per Acre	$659,286	$492,667	$457,222	$728,185	$176,923

(Google, n.d.; Jefferson Parish Assessor's Office, 2020)

Safe Harbor

Project Background

Safe Harbor is a one-hundred-unit development on fifty acres on the outskirts of Bayou La Batre, Alabama (Figure 4.47). The City of Bayou La Batre, the sole grantee of the Alabama Pilot Program, was awarded $15.67 million on December 22, 2006, for construction of 194 modular units between April 30, 2007, and April 29, 2011. The city contracted construction of modular units to a manufacturer in Florida. The proposal included 820 square foot one bedroom "single-wide" units and "double-wide" units ranging from two to four bedrooms up to 1,360 square feet. The site was chosen for its location at more than eighty feet above sea level (Homeland Security, 2011, pp. 6-10).

The City contracted with construction firms on infrastructure and other improvements using $2 million Community Development Block Grant funds to partially fund construction. While land acquisition cost less than $650,000, infrastructure costs were around $3.7 million. Much of the infrastructure costs were due to highway improvements required by the Alabama Department of Transportation which cost about $2 million. Handicap accessible ramps that cost $13,577 per unit, causing further cost overruns. Ultimately, the project produced only 100 units at a total cost of $180,000 per unit (Homeland Security, 2011, pp. 6-10).

Figure 4.47 Google Earth 3D Aerial Image of Harbor Estates

Aerial 3D image of the Safe Harbor development in Bayou La Batre, Alabama, illustrating the development's rural context and proximity to the Mississippi Sound (top left background) (Google, n.d.).

Table 4.10 Project Details for the Safe Harbor

Project Name	Safe Harbor
Location	12131 Safe Harbor Circle East Bayou La Batre, Alabama
Ownership	Bayou La Batre Housing Authority
Occupation	Owner and Renter
Construction Completed	2009
Cost	-
Size	50 acres
Housing Units	100
Density	2.0 units per acre
Housing Type	Modular
Average Unit Size	1318 ft^2

(Google, n.d.; Homeland Security, 2011, pp. 6-10; Mobile County Revenue Commission, 2020)

Project Design

Safe Harbor is the most rural of all sites selected for this study. Likewise, it is the least dense development, averaging only 2.0 units per acre. However, a significant portion of the site remains undeveloped as fewer units were ultimately produced. Analysis of the subject property (Figure 4.50) suggests an average of 3.3 units per acre on the fully developed parcel, which includes nineteen homes on 5.75 acres (Figure 4.45). The site was developed under Mobile County Subdivision Regulations and is generally suburban in nature. Streets are twenty-six feet wide and constructed of asphalt with concrete roll curbs and drop inlets. Streets are lined with five-foot-wide concrete sidewalks set five feet off the curbs. Homes are setback forty feet from the curb and approximately twenty-five feet from one another. Few mature trees exist on-site, though some landscaping has been provided.

Figure 4.48 Street View of the Safe Harbor Subject Property

Picture of the subject property illustrating the character of the “double-wide” modular units and the suburban characteristics of the neighborhood (Google, n.d.).

Community Context

Safe Harbor is located about three miles north of Bayou La Batre proper in a rural area surrounded by scattered single-family homes, woodlands, and open fields. Located in the T-2

"Rural Zone" along the Rural-to-Urban Transect (Center for Applied Transect Studies, n.d.), Safe Harbor is the most rural of all sites surveyed. Its walk score of zero (0) is indicative of residents' need for automotive transportation to access basic services (Walk Score, 2021a). Though a new high school is located less than one mile away, it is only accessible by a busy highway without pedestrian accommodations. No public transportation is available.

Bayou La Batre is a small fishing village near the Mississippi Sound with a population of 2,543. The town is nearly 70% White, 10% Black, and 17% Asian. More than 23% of the population is below the poverty line. The median household income is $44,554, third highest among communities surveyed. Nearly 60% of homes in Bayou La Batre are owner-occupied, with a median home value of just $75,200, or 1.6 times the median income, making it the most affordable community surveyed. It should be noted however, that homes outside of Bayou La Batre proper, including those surveyed herein, are generally more valuable than those in town (U.S. Census Bureau, 2015-2019a; U.S. Census Bureau, 2015-2019b; U.S. Census Bureau, 2015-2019c).

Representative Comps

The following properties were selected as representative of the average character, size, and value of each respective land use near the Safe Harbor subject property (Figure 4.49). Figure 4.47 shows the subject property selected as representative of the Harbor Estates development. The property, located at along Safe Harbor Circle East, includes nineteen modular Katrina Cottages on 5.75 acres of land adjacent to Alabama Highway 188 (Figure 4.50). The small single-family comp (Figure 4.51) is a 1,937 square foot home on 0.47 acres located 0.8 miles southeast of the subject property at 12397 Ilene Court. The home is similar to other tract homes in the neighboring subdivision. The large single-family home comp (Figure 4.52) is a 2,382

square foot home on 3.91 acres of land approximately 0.3 miles south of the subject property at 12251 Shine Road. It is representative of many ranch style homes on large parcels in southern Mobile County. The Gulf Breeze Apartments (Figure 4.53) include ten apartment units averaging 1000 square feet on 4.41 acres of land 3.36 miles south of the subject property at 8635 Bryant Avenue. Finally, the Pala Verde Mobile Home Park (Figure 4.54) includes forty manufactured homes on eleven acres approximately 13.85 miles northeast of the subject property at 3525 Demetropolis Road in Mobile. Valuation data collected for each property is presented in Table 4.11.

Figure 4.49 Map of Safe Harbor and Selected Comps in Bayou La Batre, Alabama

Aerial view facing east illustrating the location of Safe Harbor (subject property) in relation to selected comparable properties, the town of Bayou La Batre (right), and Mobile Bay (top). The subject property is indicated by a yellow star icon. Red circles illustrate distance radii from the subject property in 0.25-, 0.5-, and 1-mile increments. Selected representative comps are indicated by red icons with a corresponding letter, including: a small single-family home (S); a large single-family home (L); an apartment complex (A); and a mobile home park (M) (Google, n.d.).

Figure 4.50 Safe Harbor Subject Property in Bayou La Batre, Alabama

Screenshot of Mobile County Revenue Commission GIS Application indicating the subject property selected for study. This property, highlighted in yellow, includes 19 homes on 5.75 acres in rural Mobile County (Mobile County Revenue Commission, 2020). The large parcel to the left was omitted for its classification as "manufactured housing".

Figure 4.51 Small Single-Family Home Comp in Bayou La Batre, Alabama

Photo of 12397 Ilene Court, a 1,937 square foot single-family home located 0.9 miles southeast of the subject property in Bayou La Batre, Alabama (Google, n.d.).

Figure 4.52 Large Single-Family Home Comp in Bayou La Batre, Alabama

Photo of 12251 Shine Road, a 2,382 square foot single-family home located 0.3 miles south of the subject property in Bayou La Batre, Alabama (Google, n.d.).

Figure 4.53 Apartment Comp in Bayou La Batre, Alabama

Photo of the Gulf Breeze Apartments, a ten-unit apartment complex located 3.45 miles southeast of the subject property at 8635 Bryant Avenue in Bayou La Batre, Alabama (Google, n.d.).

Figure 4.54 Mobile Home Comp in Mobile, Alabama

Photo of the Pala Verde mobile Home and RV Park, a forty-unit commercial park located 14 miles northeast of the subject property at 3525 Demetropolis Road in Mobile, Alabama (Google, n.d.).

Table 4.11 Valuation Data for Representative Comps in Bayou La Batre, Alabama

Description	Katrina Cottage	Small SFH	Large SFH	Apartment	Manufactured Home
Address	12131 Safe Harbor Circle E	12397 Ilene Ct	12251 Shine Rd	8635 Bryant Ave	3525 Demetropolis Rd
City	Bayou La Batre, AL	Irvington, AL	Irvington, AL	Bayou La Batre, AL	Mobile, AL
County/Parish	Mobile County	Mobile County	Mobile County	Mobile County	Mobile County
Distance (mi)	0	0.9	0.3	3.45	13.85
Units	19	1	1	10	40
Avg. Sq Ft	1318	1937	2382	1000	1200
Acres	5.75	0.47	3.91	4.14	11
Density (units/acre)	3.3	2.1	0.3	2.4	3.6
Walk Score	0	1	1	35	32
Tax Assessor Valuations					
Appr Land Value	$34,500	$16,000	$34,400	$1,185,800	$149,200
Appr Impr Value	$1,371,700	$138,500	$212,100	$33,300	$581,300
Appr Total Value	$1,406,200	$154,500	$246,500	$390,500	$574,000
Standardized Valuations					
Impr Value per Unit	$72,195	$138,500	$212,100	$3,330	$14,533
Impr Value per Sq Ft	$54.77	$71.50	$89.04	$3.33	$12.11
Land Value per Acre	$6,000	$34,043	$8,798	$286,425	$13,564
Total Value per Acre	$244,557	$328,723	$63,043	$94,324	$52,182

(Google, n.d.; Mobile County Revenue Commission, 2020)

CHAPTER V

ANALYSIS RESULTS

Introduction

This chapter discusses the results of standardized appraisal data displayed in the previous chapter. The chapter begins by discussing discrepancies in valuation, particularly among Mississippi Cottages and those in Alabama and Louisiana, and tests hypotheses regarding the role of design and community demographics in determining valuation outcomes. Next, standardized values are analyzed by land use category and across each subject group (subject properties and comps within a community). Finally, the chapter discusses observations of linear relationships between subject property (Katrina Cottage group site) valuations and smart growth metrics, including density, walkability, and urban context.

Discrepancies in Valuation

Initial observation of appraisal values noted a considerable discrepancy between the value of Katrina Cottages in the Cottages at Oak Park and the Cottages at Second Street. Table 5.1 lists standardized values for the subject properties, including improvement value per unit, improvement value per square foot, and total value per acre. This table suggests that cottage units in Mississippi are worth just over half as much as those in Alabama and Louisiana. One commonality between the Cottages at Oak Park and the Cottages at Second Street is the inclusion of MAHP "Mississippi Cottages." Literature notes that these modular designs were heavily criticized for resembling manufactured homes, suggesting that design may play a role in

their market valuation today. Furthermore, case study analyses note that both subject properties are sited within relatively wealthy communities, as compared to those in Alabama and Louisiana. Thus, local demographics may play a role in valuation of Mississippi Cottages. This section describes the results of hypotheses tests conducted to determine the significance of unit design and local demographics in determining valuation outcomes.

Table 5.1 Standardized Data for Katrina Cottage Group Sites

Subject Properties	Cottage Type	Improvement Value per Unit	Improvement Value per Square Foot	Total Value per Acre
Cottages at Oak Park	Miss. Cottage	$41,949	$34.96	$649,469
Cottages at Second Street	Miss. Cottage	$42,502	$47.22	$629,914
Fischer Site	Ala./La. Cottage	$83,400	$55.60	$900,000
Harbor Estates	Ala./La. Cottage	$75,200	$83.56	$659,286
Safe Harbor	Ala./La. Cottage	$72,195	$54.77	$244,557

Mississippi Cottages vs. Alabama & Louisiana Cottages

Before proceeding with further analysis, it is important to understand the differences that exist, if any, between Mississippi Cottages and those in Alabama and Louisiana. Table 5.2 lists the average valuations of Mississippi Cottages in comparison to other Katrina Cottages in Alabama and Louisiana. On average, Mississippi Cottages are valued at $42,225 each, while Cottages in Alabama and Louisiana are valued at an average $76,932 each, a difference of $34,706 per unit. Likewise, Mississippi Cottages are valued at $41.09 per square foot, versus $64.64 per square foot for other cottages – a total difference of $23.55 per square foot. Finally, Mississippi Cottages average $639,691 per acre. Those in Alabama and Louisiana average $601,281 per acre, a difference of $38,411. On average, Mississippi Cottages are worth 45% less

per unit and 36% less per square foot than those in Alabama and Louisiana. Conversely, Mississippi Cottages are worth approximately 6% more per acre than other Katrina Cottages; however, this is largely influenced by higher densities in Mississippi.

Table 5.2 Comparison of Average Standardized Value between Mississippi Cottages and Other Cottages in Louisiana and Alabama.

Cottage Type	Average Value per Unit	Average Value per Sq Ft	Average Value per Acre
Mississippi Cottages	$42,225	$41.09	$639,691
Ala. & La. Cottages	$76,932	$64.64	$601,281
Difference in Value	-$34,706	-$23.55	$38,411
Percent Difference	-45.11%	-36.43%	6.39%

Results indicate that Mississippi Cottages are worth $34,706 (-45%) less than other cottages, or $23.55 (-36%) less per square foot that Katrina Cottages in Louisiana and Alabama. Mississippi Cottages are worth $38,411 (6%) more per acre than other cottages.

An independent sample t-test was conducted to understand the statistical significance, if any, between Mississippi Cottages and those in Alabama and Louisiana. Value per unit, value per square foot, and value per acre were set as dependent variables and Cottage type as the dependent variable. The null hypothesis assumes there is no statistical difference Mississippi Cottages and other Cottages. The research hypothesis assumes that Mississippi Cottages are less valuable than other Cottages per unit and square foot. Table 5.3 lists the results of the one-tailed t-tests using a 95% confidence interval ($\alpha = 0.05$). Results show that t-scores obtained for value per unit fall within the critical range, while value per square foot and value per acre do not.

Based on these results, the null hypothesis that there is no statistical difference between Mississippi Cottages and other Cottage units is rejected. However, the null hypothesis that there is no statistical difference between Mississippi Cottages and other Cottages per square foot and per acre valuation is accepted. However, it should be noted that these results should not be

interpreted as conclusive evidence that Mississippi Cottages are less valuable than other Katrina Cottages. The small sample size (n = 5) and variation between group sizes (Mississippi Cottages: n = 2; Other Cottages: n = 3) mean that results are weak and unbalanced. Still, results indicate that further study is needed to understand the significance of design and construction methodologies in valuation outcomes.

Table 5.3 Results of One-Tailed Independent Sample t-Test of Significance in Valuation Differences between Mississippi Cottages and Other Katrina Cottages

Valuation Metric	Mississippi Cottage Mean	Alabama & Louisiana Mean	Sig.	df	t (obtained)
Value per Unit	$42,225	$76,932	0.004	3	-8.019
Value per Square Foot	$41.09	$64.64	0.169	3	-1.806
Value per Acre	$639,691	$601,281	0.886	3	0.155

Results suggest with 95% confidence that Mississippi Cottages are worth less than other Katrina Cottages. However, there is no statistical difference between the groups when standardized by size.

These results suggest that Mississippi Cottages are worth less than Katrina Cottages in Alabama and Louisiana, though there is no statistically significant difference between Mississippi Cottages and other Cottages when standardized by size. Nevertheless, value per unit is perhaps the most important metric to consider, as it is used to determine the total value of the subject property. Thus, it should be assumed that appraisal results for Mississippi Cottages are negatively skewed by abnormally low valuations. Furthermore, higher valuations per acre among Mississippi sites suggests that higher land values play a role in offsetting the low value of Cottage units. This further supports the idea that community demographics may play a role in valuation outcomes.

Understanding the Relationship between Demographics and Value

While Katrina Cottages in Mississippi are valued significantly less than those in Alabama and Louisiana, case studies suggest the subject properties are located within more wealthy communities. Based on this observation, local demographic information was gathered from the American Community Survey to understand the relationship, if any, between demographics and valuations (Table 5.4). Because of the significant difference between Mississippi Cottages and those in Alabama and Louisiana and the resulting effect on total value, value per square foot is used as the independent variable against the dependent demographic variables.

Table 5.4 Community Demographics Among Subject Groups

Subject Group	Median Household Income	Median Home Value
Cottages at Oak Park Ocean Springs, MS	$58,713	$174,000
Cottages at Second Street Pass Christian, MS	$47,599	$183,700
Fischer Site New Orleans, LA	$41,604	$231,500
Harbor Estates Bridge City, LA	$31,711	$95,500
Safe Harbor Bayou La Batre, AL	$44,554	$75,200

2019 American Community Survey 5-year Estimates Data Profiles based on place (city) in which subject properties are located (U.S. Census Bureau, 2015-2019a; U.S. Census Bureau, 2015-2019b; U.S. Census Bureau, 2015-2019c).

The following charts illustrate the relationship between the median household income of each subject group and valuations across each land use category. Figure 5.1 illustrates a moderate-to-strong negative relationship between median household income and improvement values of Katrina Cottages. In other words, as median income rises, the value of Katrina Cottages falls. The coefficient of determination (R^2) suggests that nearly 60% of variation in Katrina

Cottage values can be explained by the local median income. Furthermore, the slope of the linear equation suggests that every $1,000 increase in median household income results in a $1.40 reduction in value per square foot among Katrina Cottages. This negative relationship is similar to that observed among apartments and manufactured homes. Conversely, Figure 5.1 suggests a strong positive relationship between median household income and single-family homes. This suggests that Katrina Cottages are less valuable in high-income communities.

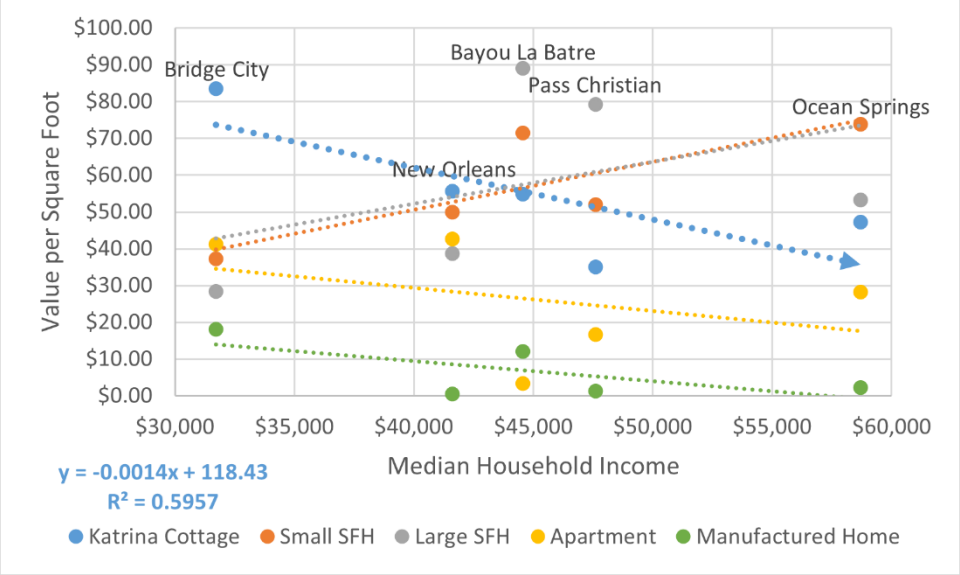


Figure 5.1 Scatter Plot Illustrating Relationship between Median Household Income and Improvement Value per Square Foot by Land Use across Subject Groups

(U.S. Census Bureau, 2015-2019a; U.S. Census Bureau, 2015-2019b; U.S. Census Bureau, 2015-2019c)

A similar pattern can be observed when comparing Katrina Cottage valuations against the median home value within communities, though to a lesser degree. Figure 5.2 illustrates the negative relationship between median home values and improvement value per square foot among Katrina Cottages. However, the coefficient of determination suggests that median home value within a community is a weak predictor of value per square foot among single family

homes and Katrina Cottages compared to median income, accounting for less than 26% of variability about the mean in each respective category. The slope of the linear equation suggests that value drops by only ten cents per square foot for every $1,000 increase in median home value within a community. Interestingly, the graph suggests little correlation between single-family home value per square foot and median home values within a community. Conversely, median home value is a strong predictor (79%) of value among manufactured homes, which show a negative relationship in between median home values and value per square foot.

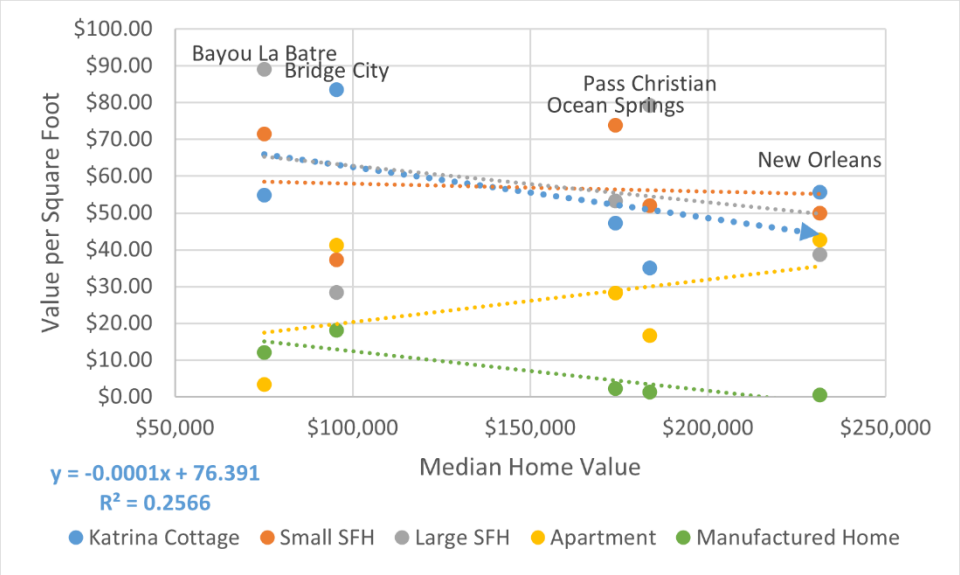


Figure 5.2 Scatter Plot Illustrating Relationship between Median Property Value and Improvement Value per Square Foot by Land Use across Subject Groups

(U.S. Census Bureau, 2015-2019a; U.S. Census Bureau, 2015-2019b; U.S. Census Bureau, 2015-2019c)

Observations of linear relationships between community demographics suggests that median household income is a key predictor or value among Katrina Cottages. This negative relationship mirrors apartments and manufactured housing, suggesting that Katrina Cottages are less successful in wealthier communities. Conversely, Katrina Cottages may be more effective at

creating long-term value in low-income communities. Though it is unclear to what extent design plays on lower valuations in high-income communities, it is likely that both design and demographics play a role in valuations; however, more research is needed to ascertain the effect of each on market valuations.

Land Use Valuation Analysis

An analysis of standardized valuations was performed for each Katrina Cottage group site (subject property) and four representative land use comps within the same communities (subject groups) as described in the methodology. Subject groups include the representative Katrina Cottage site, a large single-family comp, a small single-family comp, an apartment comp, and a manufactured home comp. Subject group comparisons are made between communities in which they reside using Tables 4.3, 4.5, 4.7, 4.9, and 4.11. Based on previous evidence of correlation between income and value, subject groups are organized by median household income from low to high. Subject groups include Bridge City, Louisiana (Harbor Estates), New Orleans, Louisiana (Fischer Site), Bayou La Batre, Alabama (Safe Harbor), Pass Christian, Mississippi (Cottages at Second Street), and Ocean Springs, Mississippi (Cottages at Oak Park).

Value per Unit

Unit values are an important metric for comparison; however, it should be noted that this valuation method is skewed to favor larger residential units. Figure 5.3 illustrates the relationship between the average improvement value per unit and the average square footage per unit by land use type. The dotted line indicates a positive relationship between average square footage and value. The slope of the linear regression equation suggests that each additional square foot represents an increase of approximately $84.66 in value per unit. The coefficient of

determination (R^2) indicates that 81% of the variation in the data can be explained by the relationship between square footage and improvement value per unit. In other words, larger homes are likely to be valued more per unit than smaller residential units, simply by virtue of size.

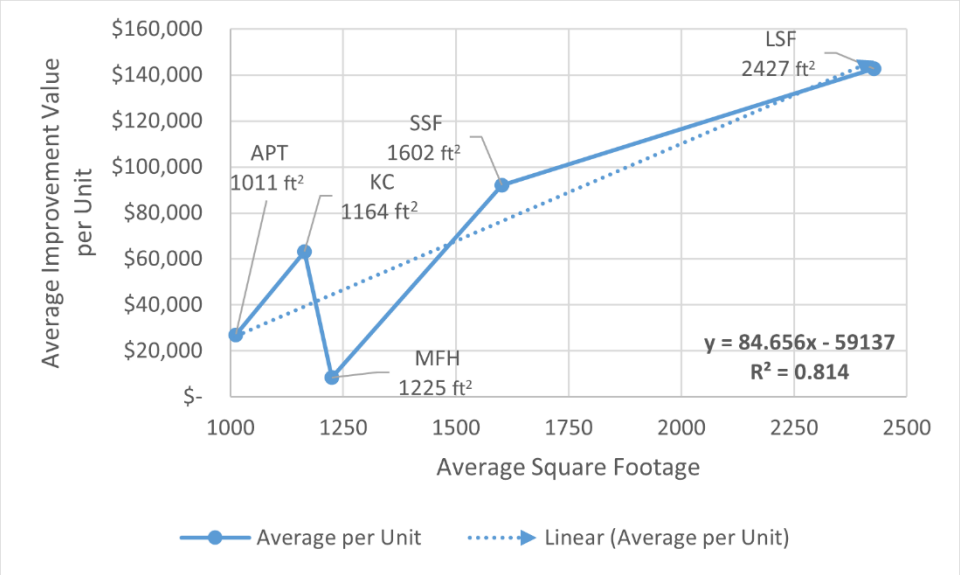


Figure 5.3 Chart Illustrating the Relationship between Average Square Footage and Average Value per Unit by Land Use Category

KC: Katrina Cottage; LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

Figure 5.4 illustrates the average appraised improvement value per unit of each land use category, while Figure 5.5 illustrates the difference in values relative to Katrina Cottages, which average $63,049 per unit. Averaging 2,427 square feet, large single-family homes are unsurprisingly the most valuable land use on average at $142,705 per unit. Large homes are approximately 108% larger than Katrina Cottages (1,164 square feet), yet are valued 126%, or $79,656, higher. Similarly, small single-family homes are approximately 37% larger (1,602 square feet) than Katrina Cottages on average but are valued 46% higher, averaging $92,151 per

unit. Apartment units are valued far less at $26,850 per unit, about $37,000 (-46%) less than Katrina Cottages. Manufactured homes average only $8,473 per unit, making them more than 87% less valuable than Katrina Cottages. Overall, Katrina Cottages are the third-most valuable land use per unit on average, ranking ahead of apartments and manufactured homes.

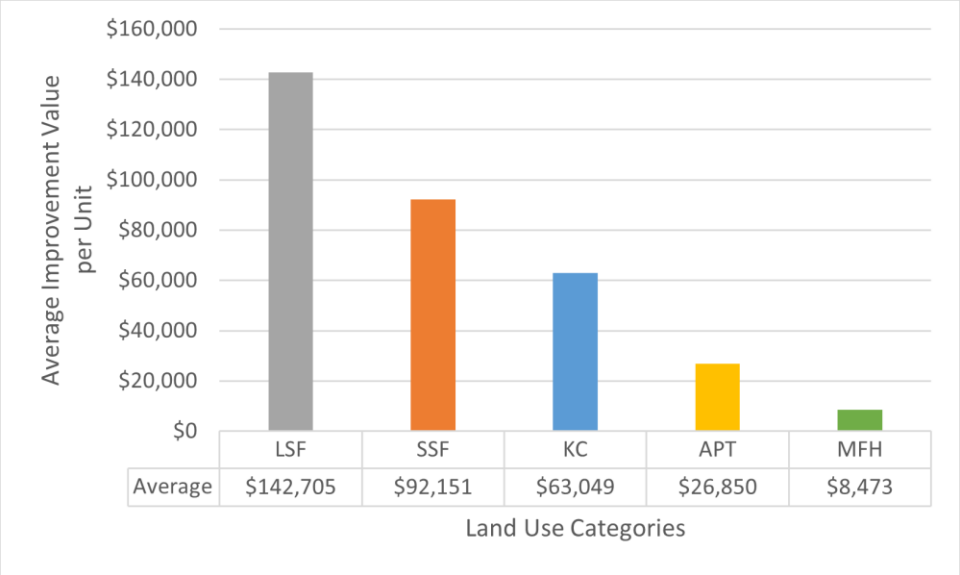


Figure 5.4 Chart Illustrating the Average Improvement Value per Unit by Land Use Category

KC: Katrina Cottage; LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

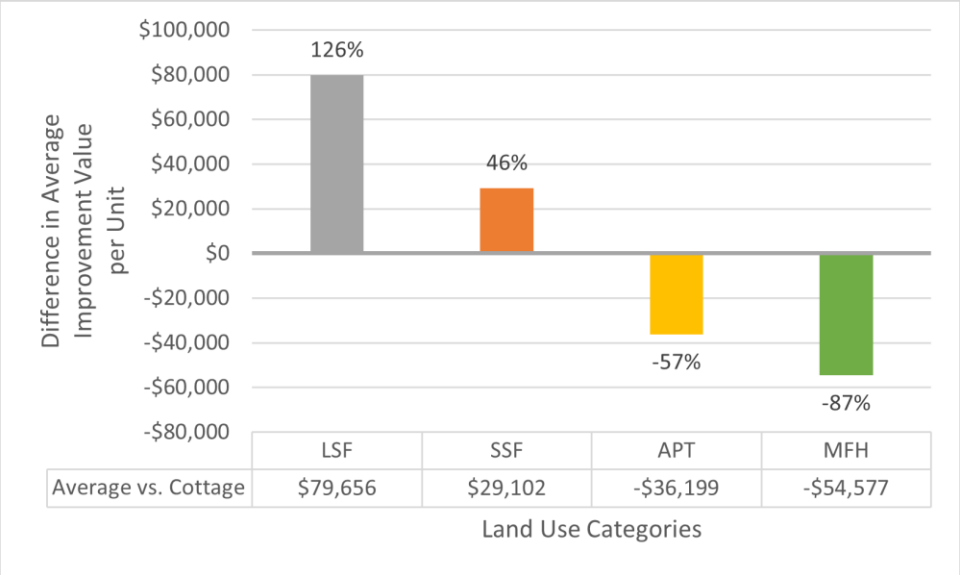


Figure 5.5 Chart Illustrating the Difference in Average Improvement Value per Unit by Land Use in Relation to the Average Katrina Cottage Value per Unit

LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

To determine the significance of differences between land uses, if any, a one-way between-subjects ANOVA was performed. The null hypothesis stated that there is no statistically significant difference between unit values of different land uses. Land use categories were set as the independent variable and improvement value per unit as the dependent variable. Results of the ANOVA refuted the null hypothesis, showing a significant difference between land use categories and total value per unit, $F(4,20) = 10.48$, $p = <.0001$. Thus, the null hypothesis was rejected. The results of a Least Significant Difference post-hoc analysis (Table 5.5) revealed that large single-family homes are valued significantly more per unit than Katrina Cottages, small single-family homes, apartments, and manufactured homes. Importantly, there is no statistical difference between Katrina Cottages and small single-family homes. Likewise, there is no

statistical difference between Katrina Cottages and apartment units. Most importantly, Katrina Cottages are valued significantly higher than manufactured homes.

Table 5.5 Results of LSD Post-Hoc Analysis of Valuation per Unit of Land Use Categories

Land Use	*F*	N	Mean	SD	t Grouping			
Large Single-Family	10.48	5	$142,705	982.256	A			
Small Single-Family	10.48	5	$92,151	31951.619		B		
Katrina Cottages	10.48	5	$63,049	19447.6768		B	C	
Apartments	10.48	5	$26,850	17265.9951			C	D
Manufactured Homes	10.48	5	$8,473	9842.256				D

Means that do not share a letter are statistically different. Results derived with 90% Confidence.

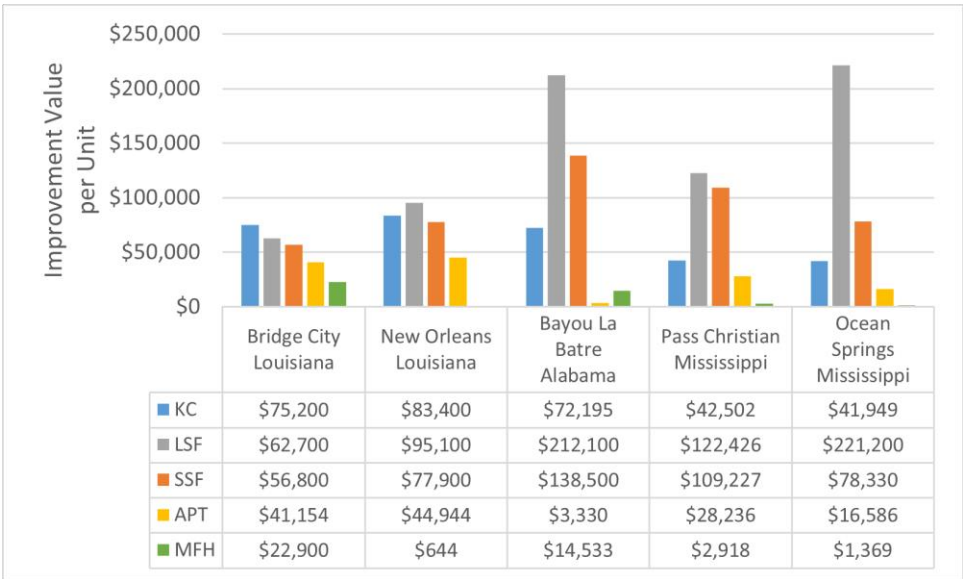
Figure 5.6 illustrates the appraised improvement value per unit for each subject property and comp across subject groups, while Figure 5.7 illustrates the difference in values of comps against the corresponding Katrina Cottage within each subject group. As expected, large single-family homes are valued disproportionately higher than other residential units. However, this is not the case among the subject groups in Bridge City and New Orleans, Louisiana, where valuations are more evenly distributed. In Bridge City, the representative Katrina Cottage is valued higher than all other representative properties, including a large single-family home that is about 1,300 square feet larger. While the reasons for this are unknown, this result was consistent among all large single-family representatives considered for inclusion and was therefore deemed valid.

As noted previously, market valuations of Katrina Cottages in communities with higher median household incomes are generally lower while large single-family homes are valued disproportionately higher in these communities on the right-hand side of the charts. The difference in valuation is greatest in Ocean Springs and Bayou La Batre where the large single-

family comps are valued $179,251 and $139,905 more than Katrina Cottages, respectively. The greatest difference between Katrina Cottages and comparably sized small single-family homes is found in Pass Christian and Bayou La Batre where small single-family homes are valued about $66,000 more per unit than Katrina Cottages. However, in New Orleans and Bridge City, Louisiana, Katrina Cottages rank favorably against all land use categories, ranking second and first among all land uses, respectively. Katrina Cottages rank third among representative land uses in Bayou La Batre, Pass Christian, and Ocean Springs. When averaged across subject groups, Katrina Cottages receive an average ranking of 2.4 out of the five representative land uses in improvement value per unit (Table 5.6).

Table 5.6 Katrina Cottage Ranking Among Land Uses in Value per Unit by Subject Group

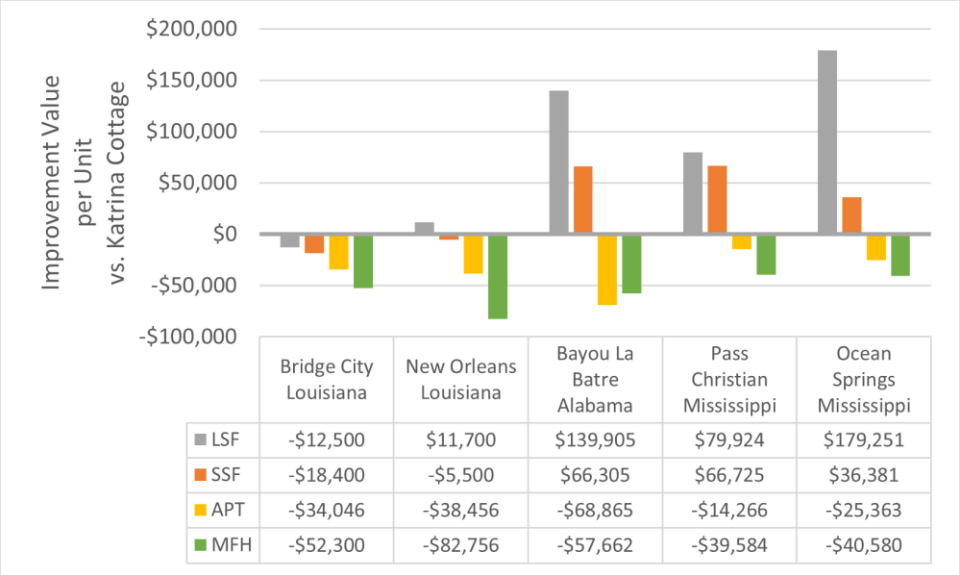
Subject Group	Ranking (out of 5)
Bridge City, LA	1
New Orleans, LA	2
Bayou La Batre, AL	3
Pass Christian, MS	3
Ocean Springs, MS	3
Average Among Subject Groups	2.4



	Bridge City Louisiana	New Orleans Louisiana	Bayou La Batre Alabama	Pass Christian Mississippi	Ocean Springs Mississippi
KC	$75,200	$83,400	$72,195	$42,502	$41,949
LSF	$62,700	$95,100	$212,100	$122,426	$221,200
SSF	$56,800	$77,900	$138,500	$109,227	$78,330
APT	$41,154	$44,944	$3,330	$28,236	$16,586
MFH	$22,900	$644	$14,533	$2,918	$1,369

Figure 5.6 Chart Illustrating Improvement Value per Unit of Residential Land Uses across Subject Groups

KC: Katrina Cottage; LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.



	Bridge City Louisiana	New Orleans Louisiana	Bayou La Batre Alabama	Pass Christian Mississippi	Ocean Springs Mississippi
LSF	-$12,500	$11,700	$139,905	$79,924	$179,251
SSF	-$18,400	-$5,500	$66,305	$66,725	$36,381
APT	-$34,046	-$38,456	-$68,865	-$14,266	-$25,363
MFH	-$52,300	-$82,756	-$57,662	-$39,584	-$40,580

Figure 5.7 Chart Illustrating Difference in Improvement Value per Unit from Corresponding Katrina Cottage by Subject Group

LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

Value per Square Foot

Figure 5.8 illustrates the relationship between the average value per square foot and the average square footage of each land use category. The dashed line indicates a positive relationship between value per square foot and square footage. However, the slope of the linear regression equation implies that each additional square foot represents only a $0.02 increase in value per square foot. Moreover, the coefficient of determination suggests that only 30% of the variation in value per square foot can be explained by square footage. In other words, the relationship between square footage and improvement value per square foot is weak in comparison to value per unit. Therefore, valuations per square foot may be viewed as a more viable representation of value across land use categories than value per unit.

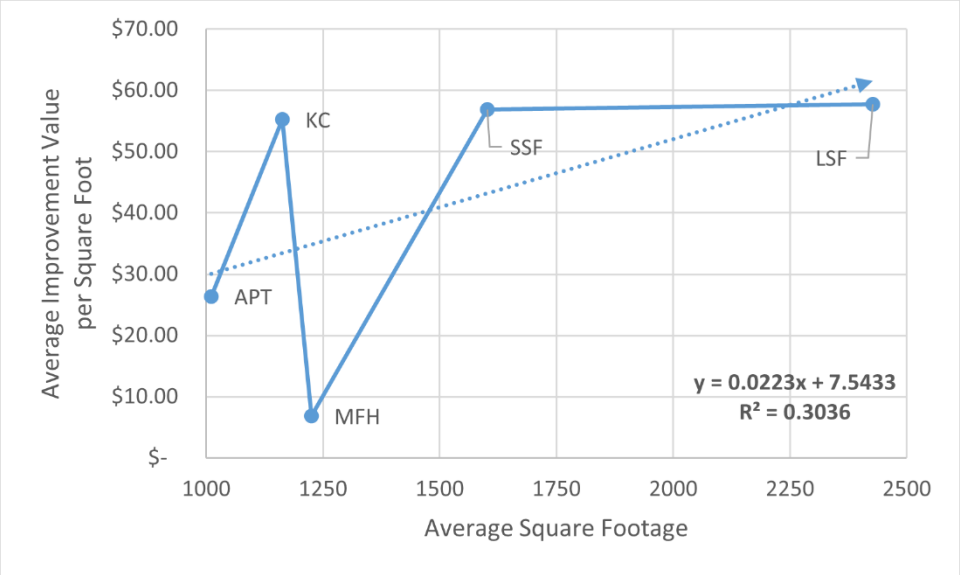


Figure 5.8 Chart Illustrating the Relationship between Average Square Footage and Average Value per Square Foot by Land Use Category

KC: Katrina Cottage; LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

Figure 5.9 illustrates the average value of land uses per square foot, while Figure 5.10 illustrates values as compared to the average value of Katrina Cottages, at $55.22 per square foot. Averaged across subject groups, Katrina Cottages are remarkably similar to large and small single-family homes, which average $57.73 and $56.89 per square foot, respectively. Large single-family comps average only $2.51/ft^2 (+5%) more than the Cottages while small single-family comps are valued only $1.67/ft^2 (+3%) more than Katrina Cottages on average. By contrast, apartment comps average $26.37 per square foot less than half as much as Katrina Cottages. Manufactured homes average only $6.83 per square foot, 88% less than Cottages. Katrina Cottages rank third among all land use categories on average, though the difference between Cottages and single-family homes is relatively minor.

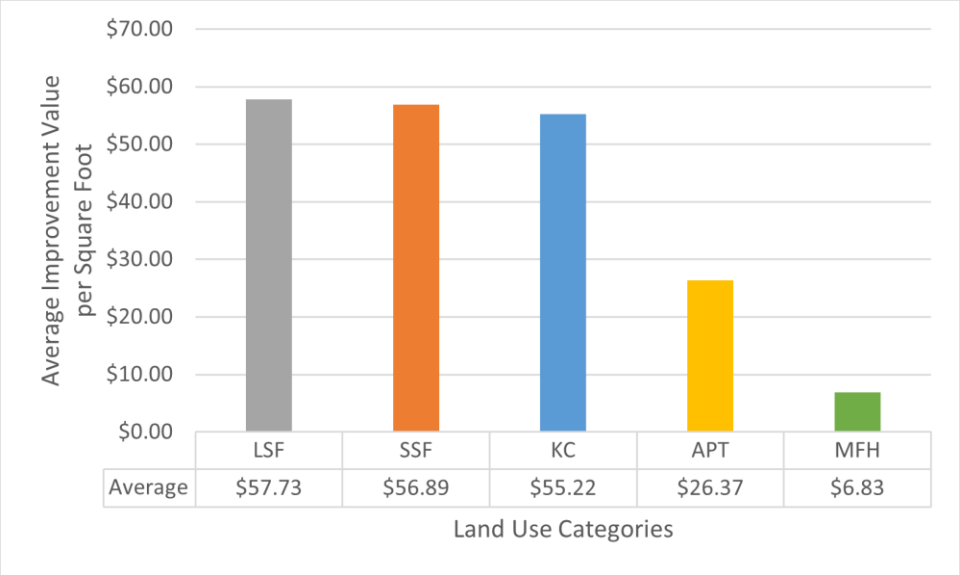


Figure 5.9 Chart Illustrating the Average Improvement Value per Square Foot by Land Use Category

KC: Katrina Cottage; LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

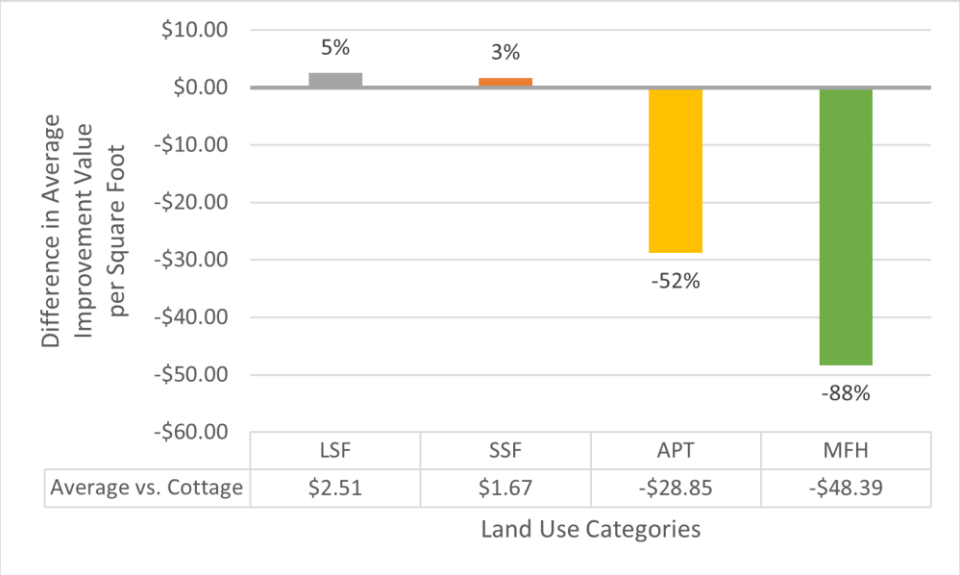


Figure 5.10 Chart Illustrating the Difference in Average Improvement Value per Square Foot by Land Use in Relation to the Average Katrina Cottage Value per Unit

LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

To determine the significance of differences between land uses, if any, a one-way between-subjects ANOVA was performed. The null hypothesis stated that there is no statistically significant difference between square footage valuations among different land uses. Land use categories were set as the independent variable and improvement value per unit as the dependent variable. Results of the ANOVA refuted the null hypothesis, showing a significant difference between land use categories and total value per square foot, $F(4,20) = 8.42$, $p = .0004$. Thus, the null hypothesis was rejected. The results of a Least Significant Difference post-hoc analysis (Table 5.7) reveals no statistical difference between large single-family homes, small single-family homes, and Katrina Cottages. Furthermore, apartments are valued significantly less than single-family homes and Katrina Cottages, while manufactured homes are valued significantly less per square foot than all other land uses.

Table 5.7 Results of LSD Post-Hoc Analysis of Valuation per Square Foot of Land Use Categories

Land Use	*F*	N	Mean	SD	t Grouping		
Large Single-Family	8.42	5	$57.73	25.8963	A		
Small Single-Family	8.42	5	$56.89	15.4771	A		
Katrina Cottages	8.42	5	$55.22	17.8744	A		
Apartments	8.42	5	$26.41	16.6683		B	
Manufactured Homes	8.42	5	$6.83	7.8284			C

Means that do not share a letter are statistically different. Results derived with 90% Confidence.

Figure 5.11 illustrates the appraised improvement value per square foot for each land use across subject groups, while Figure 5.12 illustrates the difference in values of representative land uses and the corresponding Katrina Cottage within each subject group. Figure 5.11 illustrates a more equitable distribution of value among land uses across subject groups. Observing land use values per square foot, the disproportionate valuations of large single-family homes is greatly reduced. Katrina Cottages represent the highest valued land use in both Bridge City and New Orleans, Louisiana. Surprisingly, Katrina Cottages in Bridge City represent the second-highest valued property of all 25 properties. Its value of $83.56/ ft^2 is more than twice as high as the neighboring apartment comp at $41.15/$ft^2$, which ranks second in its subject group. Bridge City Katrina Cottages are directly comparable to the large single-family home comps in Ocean Springs and Bayou La Batre.

Value differences of single-family homes from left to right reflect the relationship between median income and value. This difference is most pronounced in Bridge City, where the average square foot of a Katrina Cottage is worth $55.12 more per square foot than the representative large single-family home. Among the subject groups, Katrina Cottages rank as the third most valuable land use per square foot within Bayou La Batre, Pass Christian, and Ocean

Springs, while ranking first in New Orleans and Bridge City. Katrina Cottages receive an average ranking of 2.2 across subject groups in improvement value per square foot (Table 5.8).

Table 5.8 Katrina Cottage Ranking Among Land Uses in Value per Square Foot by Subject Group

Subject Group	Ranking (out of 5)
Bridge City, LA	1
New Orleans, LA	1
Bayou La Batre, AL	3
Pass Christian, MS	3
Ocean Springs, MS	3
Average Among Subject Groups	2.2

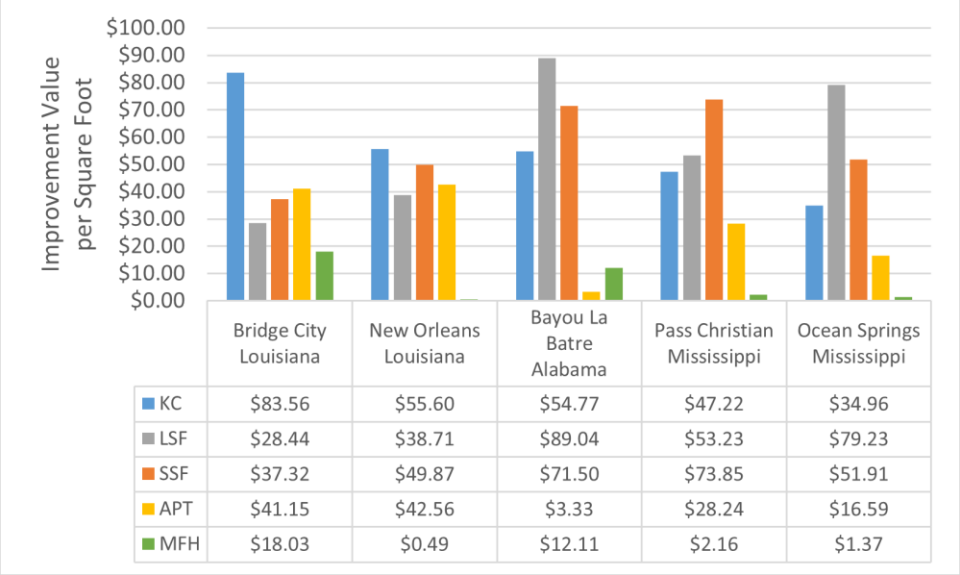


Figure 5.11 Chart Illustrating Improvement Value per Square Foot across Subject Groups

KC: Katrina Cottage; LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

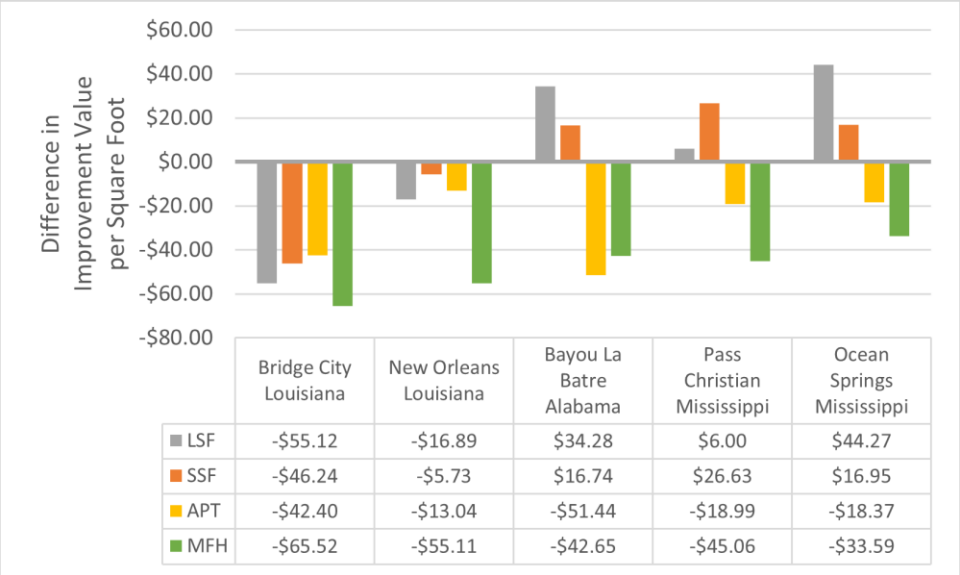


Figure 5.12 Chart Illustrating Difference in Improvement Value per Square Foot from Corresponding Katrina Cottage by Subject Group

LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

Value per Acre

Climate change poses significant risks to coastal communities in the form of sea level rise and increased flood risk, which threatens to shrink or otherwise limit the finite amount of available land suitable for development. Therefore, values standardized by acreage offer a measure of land efficiency. While it may be presumed that total value per acre is a reflection of density, Figure 5.13 illustrates a very weak relationship between the average total value per acre and the average density of each land use category. The coefficient of determination suggests that only 2% of the variation in the total value per acre can be predicted by density. This value rises only to 3%, when excluding manufactured homes as an outlier. Thus, total value per acre, as presented in this section, is not a direct result of density.

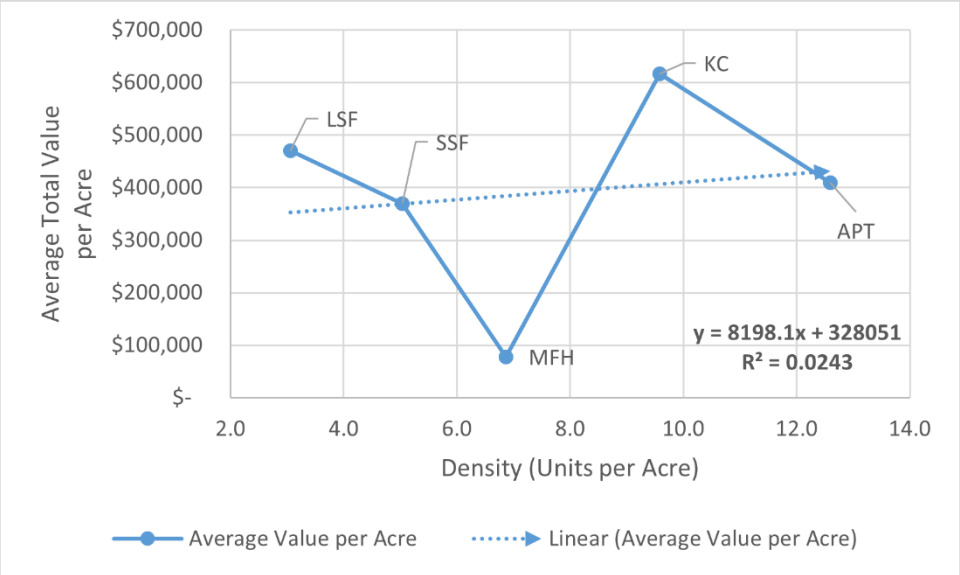


Figure 5.13 Chart Illustrating the Relationship between Average Density and Average Value per Acre by Land Use Category

KC: Katrina Cottage; LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

Figure 5.14 illustrates the average value per acre of each land use category, while Figure 5.15 illustrates average values compared against the average value of Katrina Cottage sites at $616,645. Standardized by value per acre, Katrina Cottage group sites rank first among all land use types, averaging $616,645 per acre. By comparison, large single-family home comps are valued at an average of $470,292 per acre, or $146,352 (-24%) less than Katrina Cottages. Small single-family home comps average $369,943 per acre, or $246,702 (-40%) less than Katrina Cottage developments. Apartment comps are slightly more valuable than small single-family homes on average, at $409,679 per acre or $206,966 (-34%) less than Cottages. Manufactured homes average only $78,140 per acre, or $538,505 (-88%) less than Katrina Cottages.

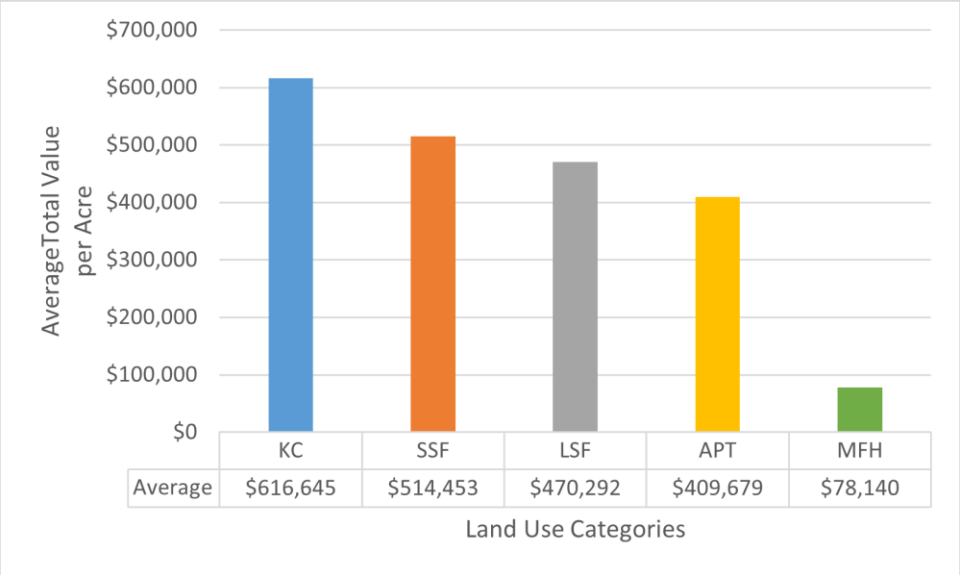


Figure 5.14 Chart Illustrating the Average Total Value per Acre by Land Use Category

KC: Katrina Cottage; LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

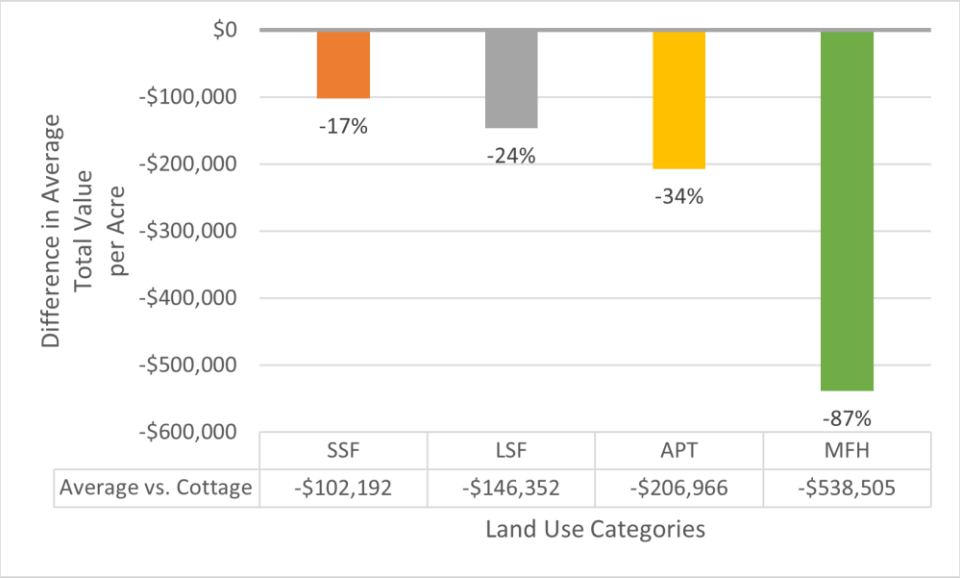


Figure 5.15 Chart Illustrating the Difference in Average Total Value per Acre by Land Use in Relation to the Average Katrina Cottage Value per Unit

LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

To determine the significance of differences between land uses, if any, a one-way between-subjects ANOVA was performed. The null hypothesis stated that there is no statistically significant difference between valuations per acre between different land uses. Land use categories were set as the independent variable and improvement value per unit as the dependent variable. Results of the ANOVA refuted the null hypothesis, showing a significant difference between land use categories and total value per acre, $F(4,20) = 3.74$, $p = .0198$. Thus, the null hypothesis was rejected. The results of a Least Significant Difference post-hoc analysis revealed no statistically significance in total value per acre between Katrina Cottages, small single-family homes, large single-family homes, and apartments. However, a statistically significant difference exists between manufactured homes and all other land uses (Table 5.9).

Table 5.9 Results of LSD Post-Hoc Analysis of Valuation per Acre of Land Use Categories

Land Use	*F*	N	Mean	SD	t Grouping
Katrina Cottages	3.74	5	$616,645	235484.220	A
Small Single-Family	3.74	5	$514,453	221948.470	A
Large Single-Family	3.74	5	$470,292	346346.207	A
Apartments	3.74	5	$409,679	225961.752	A
Manufactured Homes	3.74	5	$78,140	58297.2116	B

Means that do not share a letter are statistically different. Results derived with 90% Confidence.

Figure 5.16 illustrates the appraised total value (improvement value and land value) by land use type across subject groups, while Figure 5.17 illustrates values as compared with the corresponding Katrina Cottage within each group. Standardizing by acreage yields varying results across subject groups. For instance, the most valuable land-use category in Pass Christian is the small single-family home, while the large single-family home in Ocean Springs is valued significantly higher than all other land uses. In New Orleans, the Katrina Cottage represents the

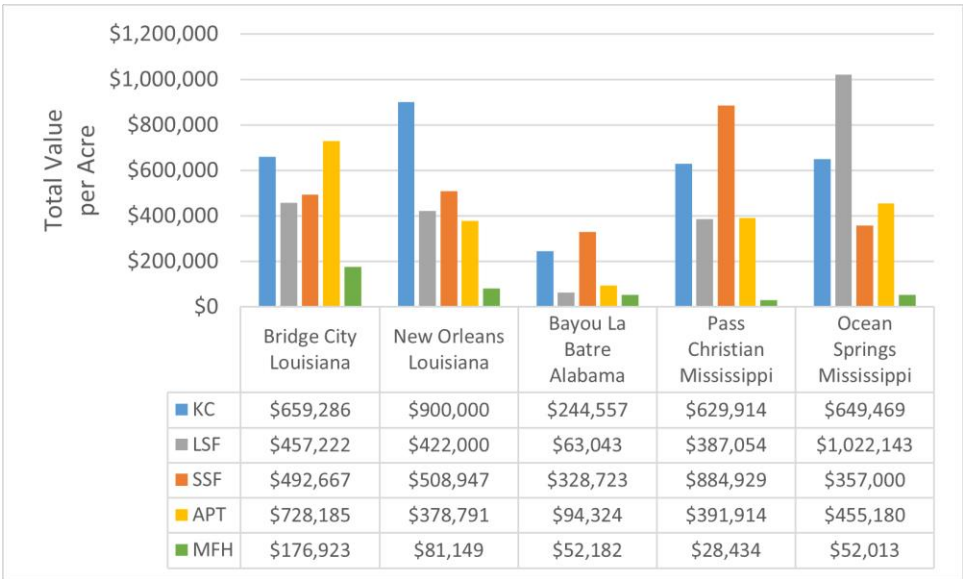
greatest value per acre among land uses, while apartments claim the top ranking in Bridge City. In Bayou La Batre, the small single-family home represents the highest total value per acre, followed by the Katrina Cottages.

Overall, Katrina Cottages rank as the second-most valuable land use in four of the five subject groups, while raking first in New Orleans. Among the comps that rank higher than Katrina Cottages, the largest discrepancies can be found in Pass Christian and Ocean Springs. In Pass Christian, the small single-family home comp is valued $255,015 higher per acre than Katrina Cottages, while the large single-family home in Ocean Springs is valued $372,674 more per acre. In New Orleans, Katrina Cottages in the Fischer Development are worth significantly more than all other land uses per acre.

Surprisingly, Katrina Cottages in Bridge City are comparatively similar to other land uses when standardized by acre. In fact, value per acre is the only metric by which Katrina Cottages do not rank as the most valuable land use in Bridge City. In Bayou La Batre, valuations per acre range from $84,167 higher (small single-family home) to $192,375 lower (manufactured homes) than Cottage at Safe Harbor per acre. Averaged across all subject groups, Katrina Cottages receive an average ranking of 1.8 out of five in total value per acre (Table 5.10).

Table 5.10 Katrina Cottage Ranking Among Land Uses in Value per Acre by Subject Group

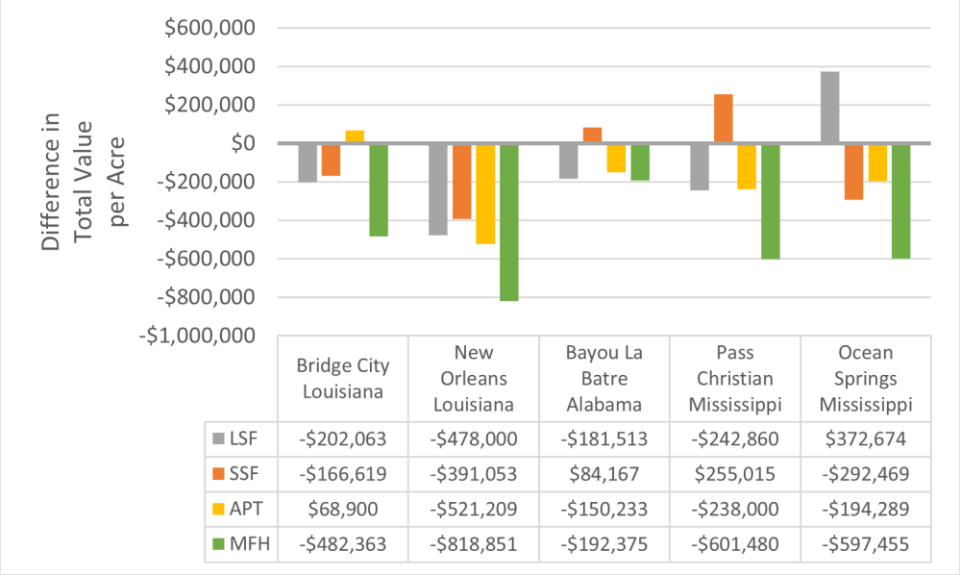
Subject Group	Ranking (out of 5)
Bridge City, LA	2
New Orleans, LA	1
Bayou La Batre, AL	2
Pass Christian, MS	2
Ocean Springs, MS	2
Average Among Subject Groups	1.8



	Bridge City Louisiana	New Orleans Louisiana	Bayou La Batre Alabama	Pass Christian Mississippi	Ocean Springs Mississippi
KC	$659,286	$900,000	$244,557	$629,914	$649,469
LSF	$457,222	$422,000	$63,043	$387,054	$1,022,143
SSF	$492,667	$508,947	$328,723	$884,929	$357,000
APT	$728,185	$378,791	$94,324	$391,914	$455,180
MFH	$176,923	$81,149	$52,182	$28,434	$52,013

Figure 5.16 Chart Illustrating Total Value per Acre across Subject Groups

KC: Katrina Cottage; LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.



	Bridge City Louisiana	New Orleans Louisiana	Bayou La Batre Alabama	Pass Christian Mississippi	Ocean Springs Mississippi
LSF	-$202,063	-$478,000	-$181,513	-$242,860	$372,674
SSF	-$166,619	-$391,053	$84,167	$255,015	-$292,469
APT	$68,900	-$521,209	-$150,233	-$238,000	-$194,289
MFH	-$482,363	-$818,851	-$192,375	-$601,480	-$597,455

Figure 5.17 Chart Illustrating Difference in Total Value per Acre from Corresponding Katrina Cottage by Subject Group

LSF: Large Single-Family Comp; SSF: Small Single-Family Comp; APT: Apartment Comp; MFH: Manufactured Home Comp.

Smart Growth Analysis

Smart growth, as described by the EPA and endorsed by FEMA, promotes dense infill development within walkable, urban communities; thus, density, walkability, and urban context are key measurements of smart growth policies. This section analyzes the linear relationships between selected elements of smart growth policies and subject property values per acre across communities. Table 5.11 lists the valuations and characteristics of subject properties gathered from local tax assessors. Table 5.12 lists the values used for the following smart growth analyses, including total value per acre, density, walk scores, and location along the rural-to-urban transect.

Table 5.11 Raw Data for Katrina Cottage Group Sites

Subject Properties	Units	Acreage	Avg Sq Ft	Land Value	Improvement Value	Total Value
Cottages at Oak Park	17	1.28	1200	$118,190	$713,130	$831,320
Cottages at Second Street	40	2.82	900	$76,282	$1,700,075	$1,776,357
Fischer Site	1	0.10	1500	$6,600	$83,400	$90,000
Harbor Estates	1	0.14	900	$17,100	$75,200	$92,300
Safe Harbor	19	3.30	1318	$34,500	$1,371,700	$1,406,200

(Harrison County, Mississippi, 2020; Jackson County Information Systems, GIS Division, 2020; Orleans Parish Assessor's Office & City of New Orleans, 2020; Jefferson Parish Assessor's Office, 2020; and Mobile County Revenue Commission, 2020)

Table 5.12 Smart Growth Metrics for Katrina Cottage Group Sites

Subject Properties	Total Value per Acre	Density	Walk Score (1-100)	Urban Transect (1-6)
Cottages at Oak Park	$649,469	13.3	62	4
Cottages at Second Street	$629,914	14.2	41	3
Fischer Site	$900,000	10.0	52	5
Harbor Estates	$659,286	7.1	39	3
Safe Harbor	$244,557	3.3	0	2

(Walk Score, 2021a; Center for Applied Transect Studies, n.d.)

Density and Value

Figure 5.18 illustrates the relationship between density, or housing units per acre, and total value per acre among subject properties. Value per acre is the sum of the land value and the improvement value – including homes occupying the property – divided by the total acreage of the property; thus, total value per acre is a reflection of density. Therefore, one would expect a strong linear relationship between density and the total value per acre. However, this is not necessarily the case among the selected subject properties. While a strong linear relationship can be observed among the less dense properties on the left side of the chart, the Cottages at Oak Park and Cottages at Second Street do not follow the linear progression.

As a result, the coefficient of determination suggests that density determines only 36% of variability in total value per acre. However, removing the Mississippi properties as outliers yields a coefficient of 99.5%. As previously demonstrated, these discrepancies are likely owing to some combination of community demographics and Cottage Design. Still, a positive relationship is evident and likely stronger than is represented in the charts that follow.

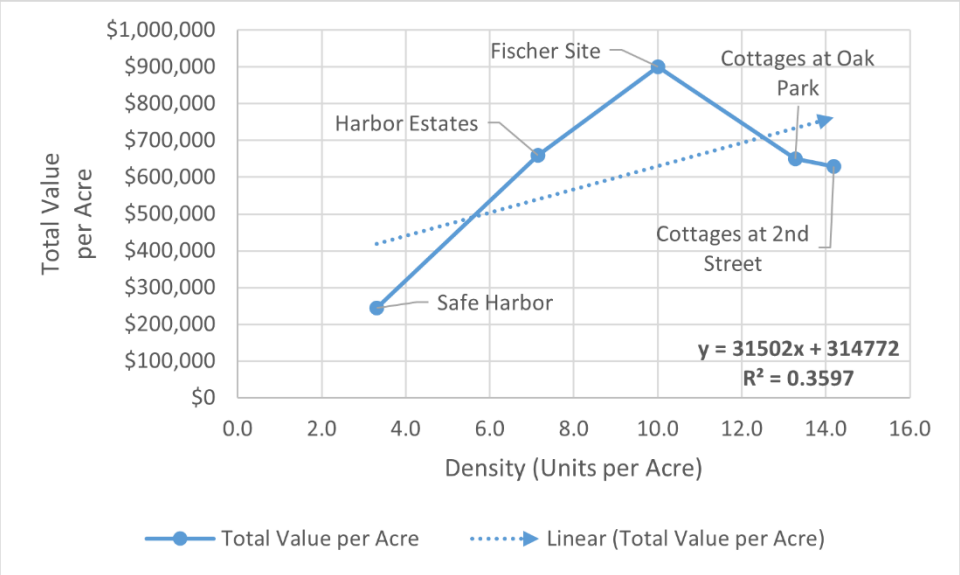


Figure 5.18 Chart Illustrating the Relationship between Density and Total Value per Acre among Katrina Cottage Group Sites

Walkability and Value

Figure 5.19 illustrates the relationship between walkability – measured using walk scores derived from WalkScore.com (Walk Score, 2021a) – and total value per acre among subject properties. The dotted line indicates a strong positive relationship between walkability and value per acre. The slope of the linear regression suggests that total value per acre increases by $8537.20 for every unit increase in walkability. Finally, the coefficient of determination suggests that 73% of the variability in valuation per acre can be explained by the relationship between walkability and value per acre, despite lower valuations among subject properties in Mississippi. While density plays a significant role in walkability, this result implies that density alone may be a less reliable predictor of value. Therefore, dense developments within a walkable environment may provide greater long-term value than dense developments in less walkable environments.

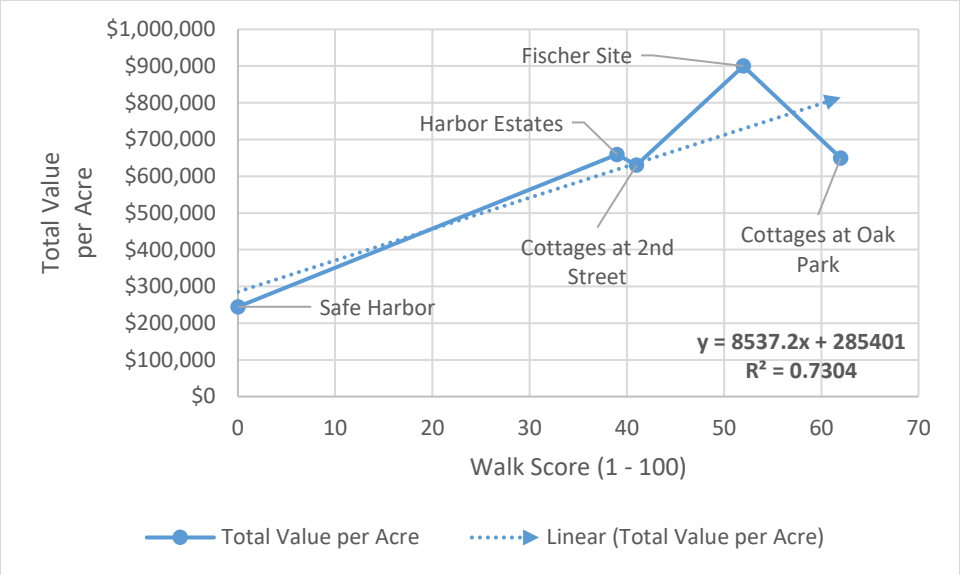


Figure 5.19 Chart Illustrating the Relationship Between Total Value per Acre and Walkability among Katrina Cottage Group Sites

Urban Context and Value

Figure 5.20 illustrates the relationship between urban context – measured using the Rural-to-Urban Transect (Center for Applied Transect Studies, n.d.) – against total value per acre among Katrina Cottage sites. The dotted line indicates a strong positive relationship between urban context and value per acre. The slope of the linear regression equation suggests that total value increases by $186,850 per acre for each unit of increase along the urban transect. Finally, the coefficient of determination suggests that urban context explains about 82% of variability in total value per acre. Therefore, locations that are more urban in nature may be best suited for successful disaster housing projects.

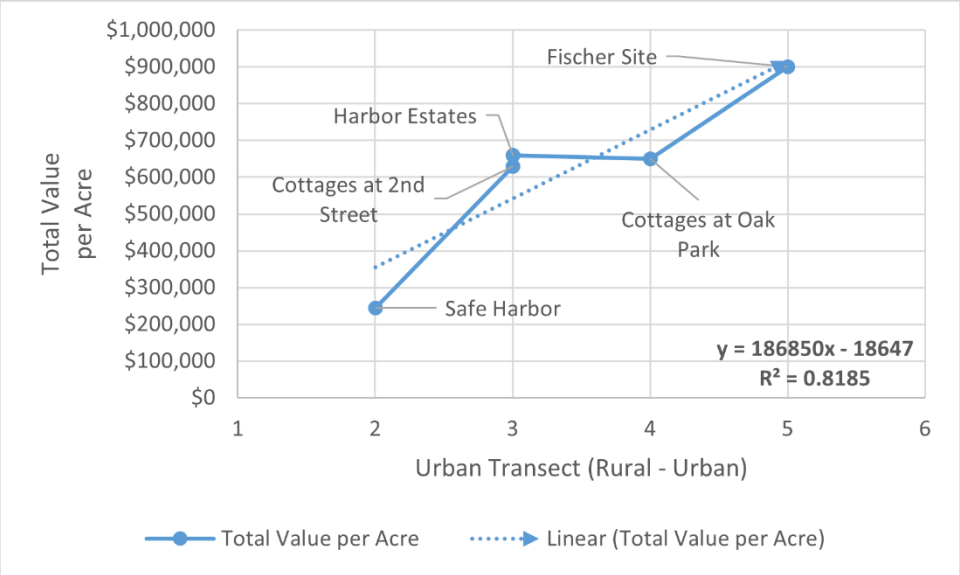


Figure 5.20 Chart Illustrating the Relationship between Total Value per Acre and Urban Context among Katrina Cottage Group Sites

Observation of linear relationships above indicates a positive relationship between total value per acre and smart growth metrics. Importantly, the data suggests that density alone is not a reliable predictor of total value per acre. Rather, the charts illustrate a much stronger relationship between walkability and urban context. Thus, dense developments in rural or suburban contexts may be less likely to yield higher value per acre than those within walkable, urban contexts. This data supports FEMA's endorsement of smart growth policies that promote disaster housing development on infill sites near community centers.

CHAPTER VI

DISCUSSION & CONCLUSIONS

Introduction

This chapter discusses the results of the study. It should be noted that this study was not designed to provide definitive results. Rather, the study was designed to provide a reasonable comparison of residential land uses across multiple jurisdictions to observe patterns and derive questions for future research. The results of this study reveal several patterns and offer evidence of significant differences across land use types based on standardized metrics. Ultimately, these results provide clues and anecdotal patterns that will aid planners and designers in understanding how prefabricated disaster housing performs against other land uses over time and the conditions which contribute to successful projects.

Katrina Cottages and Manufactured Housing

Among the many takeaways from this study, perhaps the most important is the distinction between Katrina Cottages and manufactured mobile homes. Given the overwhelming opposition to Katrina Cottages on the Mississippi Coast, it is important that this study provide convincing evidence to answer the question: are Katrina Cottages just mobile homes with siding and a porch? Or are Katrina Cottages a viable disaster housing option capable of improving the lives of disaster victims and their communities? The answer to these questions is nuanced and depends on the perspective one is willing to take. However, this study provides statistical evidence that

Katrina Cottages are *not* "mobile homes." Instead, results indicate that Cottages are more valuable than manufactured mobile homes by every metric assessed.

Results go beyond this initial question, however, by demonstrating no significant difference between Katrina Cottages and single-family homes, particularly when standardized by square footage. These findings are important, as they largely dispel the fear expressed by Katrina Cottage opponents who feared negative long-term impacts to property values. This is significant for future disaster housing programs, as it suggests that prefabricated disaster housing can provide the same long-term benefits as traditional on-site construction in less time and at lower costs. Still, lower valuations of Mississippi Cottages highlight the importance of design and context in the overall success of permanent disaster housing.

Design and Context Matter

Mississippi Cottages

Results indicate that Mississippi Cottages are less valuable than Katrina Cottages in Alabama and Louisiana, although this evidence was not necessarily corroborated when standardized by size. Still, this suggests that residents' objections to Mississippi Cottages were not entirely unfounded. Design choices made by the Mississippi Emergency Management Agency, while practical, ultimately fueled opposition and hampered implementation of the Mississippi Adequate Housing Program. Moreover, these decisions produced housing is significantly less valuable than that of neighboring states. While the shotgun style of Mississippi Cottages resembled the traditional Gulf Coast aesthetic, its detailing was lacking and invited criticism. Moreover, the style and size of Mississippi Cottages was not conducive to modern, large-lot neighborhoods in affluent areas of the Mississippi Coast. This underscores the need for design professionals to be involved in the development of disaster housing.

Local Demographics

Local demographics, particularly median household income within a community, also appears to play an important role in valuation outcomes. Figures 5.1 and 5.2 illustrate the strong negative relationship between median household income and improvement values of Katrina Cottages, particularly when standardized by square foot. This is an important finding, as it suggests that lower-income communities stand to benefit the most from a permanent post-disaster housing option. Likewise, it may substantiate concerns expressed by residents on the Mississippi Coast, as market valuations in those communities are lowest among subject groups. Even so, the continued expansion of Cottage Square (Brown, 2021) and construction of new housing adjacent to the Cottages at Second Street suggests that Mississippi Cottages have not been detrimental to their communities as opponents feared. Moreover, higher per acre valuations in Mississippi indicate that the combination of density and location within walkable, urban communities largely offsets the lower valuations of Mississippi Cottages.

Better Together

Results of this study support the notion that disaster housing is best suited in groups, though results indicate that design and context play an important role in the overall success of disaster housing communities. Observed relationships between walkability, urban context, and site design give credence to smart growth principles endorsed by FEMA and the EPA, and corroborate FEMA's National Disaster Housing Strategy, which contends that clusters of housing within walking distance of community assets provides the greatest value to communities. These results indicate that Katrina Cottages could offer coastal communities an efficient land use model as buildable land becomes more scarce in the age of climate change.

Implications for Disaster Housing

Balancing Design and Efficiency

While literature details the many challenges of implementing a long-term disaster housing program, results suggest that group sites developed under the Adequate Housing Pilot Program could be a viable model for future programs. Most importantly, the results demonstrate the importance of design and context – and therefore planners and designers – in the success of permanent housing programs in the future. Ultimately, long-term disaster housing must balance efficiency with an understanding of the local environments for which the housing is intended. Acknowledging local attitudes toward low-income housing, particularly manufactured housing, is key to developing successful housing alternatives in the future. Furthermore, an understanding of the site and surrounding community should influence design decisions to provide a cohesive look that fits into the local aesthetic. Traditional design aesthetic, like that of the Louisiana Cottages, may have invited less criticism in Mississippi and allowed for more successful implementation of group sites, which could have provided greater efficiencies and more long-term value to their communities.

Understanding Place and Purpose

Understanding the true value of Katrina Cottages requires understanding the purpose for which they were created. That purpose is different from one place to the next. In New Orleans, for example, Katrina Cottages have created a source of comfort and stability to low-income families within an attractive community. Perhaps more importantly, they have provided a potential source of wealth that can be passed on and shared with their loved ones. Conversely, Katrina Cottages in Pass Christian, Mississippi, have provided affordable, dignified homes for

low-income residents in a desirable, yet unaffordable community that might otherwise be unobtainable, while also creating an asset for the surrounding community that continues to grow.

Those planning for post-disaster housing should consider the purpose and duration of long-term disaster housing sites based on the needs identified within their communities. Not every disaster housing site will necessarily remain residential over the long-term. Sites like Anchor Square in Pascagoula, Mississippi, demonstrate the ability to convert disaster housing into commercial space as recovery progresses. Designers at the Mississippi Renewal Forum envisioned Katrina Cottages as transitioning to "mother-in-law apartments" or "Accessory Dwelling Units" (ADUs) that could add income potential to residential properties or provide separate spaces for relatives. Ultimately, the ability to utilize small disaster housing for permanent use requires communities to consider zoning and development regulations that accommodate these uses.

Federal Disaster Reform: Putting the Pieces Together

The existence of funding through FEMA's BRIC grant program offers adequate funding for communities to properly plan for future disaster housing sites and establish standards, procedures, and timelines that will mitigate opposition and speed the process. BRIC's emphasis on community resilience and the demonstrated need for affordable housing to sustain community recovery suggests that disaster housing should be considered within the context of infrastructure. The program's goal of funding projects that deliver "multiple benefits" to "community lifelines" implies that communities should consider how post-disaster housing – and affordable housing in general – may fit into project applications. For instance, literature indicates that government-owned properties with pre-existing utilities provide the greatest opportunity for quick

implementation of disaster housing. Therefore, communities utilizing BRIC funding for projects like stormwater parks may consider incorporating disaster housing sites into project designs.

Incorporating beneficial housing projects may allow communities to leverage other federal funds, including Community Development Block Grants and HUD funding, to maximize the potential of future green infrastructure projects. Combining disaster housing with green infrastructure projects provides communities the opportunity to envision public spaces that not only provide recreational and environmental value, but social value that improves community resilience and stems population loss after storms. These projects could allow communities to weather future events with the confidence of knowing that residents can remain within their communities and support redevelopment and business recovery.

This study demonstrates the ability to transform properties as small as two acres into economic boons for communities in recovery. It further demonstrates the value of locating permanent housing within walkable, urban environments. As a result, cities may consider identifying government-owned land near community centers, such as parking lots and defunct or otherwise vacant properties, as future disaster housing sites. For instance, underutilized parking lots present the opportunity to reduce vulnerability to flooding by replacing pervious surfaces with impervious green infrastructure that is equipped to accommodate future post-disaster housing. Locating residents near community centers would have the added benefit of providing labor and customers for small businesses struggling to recover. As FEMA suggests, these developments could act as a catalyst for further development of commercial and residential areas after a catastrophic event.

Implications for Landscape Architecture

The results of this study underscore the importance of *place* and the value of design in creating successful long-term disaster housing. While this study is heavily focused on topics of planning and architecture, it carries significant implications for the landscape architecture profession. Landscape architects employ an understanding of the social and environmental processes that make up the "genus loci," or "sense of place," that makes each community unique. This place-based design method is a centerpiece of the smart growth principles driving modern federal housing endeavors. Thus, landscape architects are equipped to address the bigger picture of *place* in determining the location, character, and programming of post-disaster housing communities in delivering multiple benefits to communities writ large.

Ultimately, post-disaster recovery is a complex task carried out by numerous entities, groups, and professionals, of which planners and designers play a vital role. As noted by Evans-Cowley and Kitchen (2011), dueling interests and lack of coordination between these groups can threaten recovery efforts. However, landscape architects are uniquely positioned as mediators, due to the significant overlap in skills shared with planners, architects, and civil engineers. Thus, they play a synergetic role between various planning and design professionals. Landscape architects are therefore crucial to achieving more successful and cohesive outcomes in post-disaster recovery and future resilience.

Final Thoughts

The accelerating costs of climate change, exacerbated by widening inequalities in American society, necessitate a federal disaster housing program that is nimble and responsive to the needs of individuals and communities. Fortunately, disaster housing reforms in the years since Hurricane Katrina have laid the foundation for such a program to exist. However, the onus

is now on individuals and communities to articulate their needs before disaster strikes. The key to successful, adequate disaster housing in the years ahead lies in planning for opportunities to maximize the social benefits of green infrastructure and leveraging community assets to ensure resilience for all members of society. Results of this study demonstrate the efficacy of prefabricated housing in delivering value to five distinct communities recovering from catastrophic disaster. Furthermore, the study disproves the perceptions equating Katrina Cottages to manufactured housing and provides further evidence of equivalence to single-family homes. These results will aid planners and designers in dispelling concerns and developing a viable long-term housing strategy for communities across the country.

Limitations

Limitations of this study include the small sample size and variations in sampling methods due to discrepancies in data provided by tax assessors. For instance, some tax assessors did not provide square footage and/or acreage of parcels, resulting in digital measurements using GIS applications. Discrepancies in land use classifications, particularly in Jackson and Mobile Counties, limited the ability to study group sites as a whole. Additionally, differences in subdivisions of land, particularly between group sites in Louisiana and those in Alabama and Mississippi, led to discrepancies in calculations. These discrepancies were addressed to the greatest extent practicable, as detailed in the methodology. However, per-unit valuations among all properties would have allowed for more effective evaluation.

While appraisal values in all three states are purportedly based on market value, lack of detailed information on the factors contributing to valuations limits the study. For instance, unknown factors like recent renovations and improvements that are not documented in tax appraisal records may influence appraisal values. Moreover, an inspector’s ability to survey the

inside of a property may also affect that property's valuation. The small sample size used in this study may amplify small differences between representative properties.

Future Research

Future research would benefit from a larger sample size. Furthermore, it may benefit researchers to understand the difference in sales values versus tax appraisal values as appraisals appear to be lower than sales prices observed on real estate websites. While the use of real estate websites is limited, particularly among non-single-family properties, data obtained directly from realtors may provide insights that are not available in this study.

Results indicate a need for further examination of the role that home design plays in valuation over time. Future research would ideally compare Louisiana and Mississippi Cottages within the same communities to account for variations that may affect results. Literature suggests such comparisons may be possible. For example, Louisiana Cottages were marketed and sold through Lowe's Home Improvement during the early 2010s, at least one of which was constructed in Pass Christian, Mississippi (Figure 2.23). Likewise, surplus Mississippi Cottages were auctioned in Louisiana and distributed across the country. Future studies may find opportunities to compare Louisiana and Mississippi Cottages within the same communities to draw more accurate conclusions regarding design and value. Understanding the impact of construction methodology on design and resulting values could aid emergency managers and planners in identifying the proper suppliers of future disaster housing.

It is also possible to compare Katrina Cottages and other prefabricated housing in areas outside of the Katrina damage zone. Hundreds of Mississippi Cottages, for instance, were auctioned and distributed across the country. One early example includes an affordable housing development in Buena Vista, Colorado. Mississippi Cottages have been established in various

contexts ranging from impoverished communities in the Mississippi Delta to the resort community of Seaside, Florida. Research in these locations may provide broader insight into the role of design and demographics in determination of value.

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