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Assessment of Redefining Florida’s Coastal High Hazard Area
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Prepared for the Florida Hurricane Alliance

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LIST OF ACRONYMS

CHHA – Coastal High Hazard Area
Old CHHA – CHHA defined as the evacuation zone for a category 1 hurricane
New CHHA – CHHA defined by HB 1359 as the area below the SLOSH for a category 1 storm
CRA – Community Redevelopment Agency
DEP – Florida Department of Environmental Protection
DNR – Florida Department of Natural Resources
DRI – Development of Regional Impact
EAR – Evaluation and Appraisal Report
DCA – Florida Department of Community Affairs
FLUM – Future Land Use Map
GIS – Geographic Information System
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map
HES – Hurricane Evacuation Study
LCP – Local Comprehensive Plan
LOS – Level of Service
SLOSH – Sea, Lake and Overland Surge from Hurricanes
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EXECUTIVE SUMMARY

Inherent in the continued efforts toward resiliency of U.S. coastal communities is a series of overlapping dilemmas: asset accumulation, exposure, vulnerability, safety, development regulations, property rights, political lobbying, and growth management. Land development regulations and mitigation initiatives are re-crafted in an attempt to improve community resiliency—that is the ability of communities to prepare, withstand, and recover from hazard events—without unduly hampering localities’ desire to capture economic growth and meet development demand.

This report examines how the 2006 legislative change to Coastal High Hazard Area (CHHA) policies introduced by HB 1359 (referred throughout as New CHHA), changed the CHHA boundaries and may impact resiliency and land development in Florida’s coastal communities. Although the research contained within is based on Florida’s three Treasure Coast counties, we believe that the methodology, issues raised, and conclusions could be applicable to other areas of the state and should be assessed.

The findings show that the new definition based on the SLOSH (Sea, Lake and Overland Surge from Hurricanes) model for a category 1 hurricane redefines the spatial geography of the zone in ways that may compromise resiliency.

- It would remove CHHA regulations from some of the most vulnerable coastal lands, specifically coastal areas adjacent to the ocean, with the evacuation zone, but situated at higher base elevations.
- It adds land that is zoned for conservation or recreation use and which is already protected from imprudent development by its zoning designations and wetland regulations.
- And, the land use and built age analysis suggests that the change in boundaries might kindle redevelopment activity of “soft-sites,” as several key parcels and desirable neighborhoods will become eligible for upzoning reconsideration.
We believe a “New CHHA” regulation (see page 3 for the specific language) ought to be reexamined prior to implementation and revised once again based on a reconsideration of the purpose and objectives of the CHHA. This may include expanding the objectives of the CHHA policy from managing coastal development density in order to maintain evacuation capacity to a more comprehensive goal of planning the built environment in order to create optimal resiliency in terms of safety to human life and preservation of property, prosperity, and community. In reconsidering the CHHA regulations, the latter policy framework would be based on an inclusive and precise statement of coastal risk it is addressing. Once these factors are clearly defined, the CHHA boundaries must be tied to and advance these goals and objectives.

Under the New CHHA policy, each locality needs to assess the impact on forthcoming land planning decisions by the public and private sectors, and they must review how the CHHA is referenced throughout their Local Comprehensive Plans (LCPs) and other public policy documents. The new geography defined by this statute may not be compatible with objectives of the policies in which it is referenced. Moreover, the New CHHA boundaries and policies, which may encourage additional asset accumulation at the coast, may not be supportive of planners’ and policymakers’ desire to proactively address adaptation to climate change, particularly sea level rise. Planning for climate change impacts has emerged as a pressing state concern, as evidenced by Governor Crist’s July 2007 Summit on Climate Change and the establishment of the Action Team on Energy and Climate Change in August 2007.

Finally, we note that identifying the best policy mechanisms for balancing asset exposure and economic expansion is difficult. This is why work of the former Coastal High Hazard Study Committee was critically important and should be furthered. With additional time and resources, the committee’s diverse participants, supporting experts, and staff of the Florida Department of Community Affairs (DCA) and Florida Department of Environmental Protection (DEP) would be able to carefully consider scientific assessment and alternatives in order to generate a sophisticated and valid policy solution. Some of this work is underway as this report goes to press.
As policymakers address coastal development and preservation issues against the backdrop of increased coastal storm activity, sea level rise, beach erosion, water supply and quality issues, etc., it is time to reassess the efficacy of the current complex web of multi-agency regulations. Today's framework allows for overlapping review and oversight, but also engenders gaps and implementation complexities. The time has come to holistically consider the environmental, hazard mitigation, land use, and economic development issues related to coastal planning. The various regulations pertaining to the Coastal Construction Control Line, the Coastal High Hazard Area, the Hazard Vulnerability Zone, and the Coastal Building Zone, along with the broader planning goals and policies embedded in coastal municipalities' and counties' Local Comprehensive Plans, as well as beach management projects, need to be synergistically organized. This does not imply that we desire uniformity throughout the state. Rather, in terms of the Coastal High Hazard Area, it should be broadened to embrace diverse aspects of natural hazard mitigation. It may be defined at a regional scale through a coastal sector plan that reflects variability of local geo-morphology and socio-political linkages among neighboring jurisdictions.
I. INTRODUCTION

Revisiting and Revising the Coastal High Hazard Area

In response to the impacts of the 2004 and 2005 hurricane seasons in Florida, and with the need to bolster the state’s hazard mitigation activities, Governor Bush’s Executive Order Number 05-178 established a Coastal High Hazard Study Committee. The committee was tasked with researching and assessing the efficacy of the state’s Coastal High Hazard Area (CHHA) in reducing vulnerability to coastal storms while allowing reasonable coastal development and redevelopment. The creation of the committee came on the heels of protracted debates about: 1) how the statutory definition of the Coastal High Hazard Area defines vulnerable geography; and, 2) the impacts and fairness of the regulation on coastal communities.

The committee, comprised of diverse stakeholders, including local officials, industry experts, environmental groups, and state agency representatives, was charged with “evaluating and making recommendations concerning issues of importance to coastal resources.” Specifically, they were asked to study and recommend:

- ecologically sound actions to protect and conserve resources of high natural or habitat value that are necessary to minimize the vulnerability of coastal communities, such as barrier island, beaches and dunes, coastal shorelines, and coastal wetland and flood plains;
- methods, including use of land use planning and development standards, for balancing the risks to people, property, public health, and the environment in vulnerable areas with the need for economic growth, and;
- cost-effective methods for mitigating hazards to ensure public safety.
In February 2006, after a five-month process, the committee produced a report that included Section I entitled, “Recommendation for 2006 Legislative Session Action,” and Section II entitled, “Policy Considerations Requiring Further Evaluation and Assessment.” The recommendation focused on initiatives to acquire additional information needed to make more accurate assessments of the coastal geography and evacuation capabilities. Section II included a variety of topics pertaining to coastal vulnerability that “required additional analysis” before policy recommendations could be developed. Section II presents a discussion of the limitations of current CHHA policy and the idea of separating the CHHA boundary definition from the evacuation zones. The need for localities to have flexible zoning is acknowledged, but the report falls far short of outlining or endorsing a specific set of recommendations to address the CHHA challenges. Moreover, the committee believed that revisions to the CHHA required further analysis.

The report was released at the beginning of the 2006 Florida Legislative Session, a time when legislators were eager to address issues pertaining to hazards resiliency. Reflecting some of the issues discussed by the committee, Senator Charlie Clary of Florida’s Panhandle area and Representative Holly Benson of District 3 in Escambia and Santa Rosa counties introduced the Hazard Mitigation for Coastal Redevelopment bill, HB 1359 (and SB 2060i). The bill, which addressed the permitting processes for coastal armoring projects, onsite sewage treatment, and the expiration of a pilot coastal development project, also introduced levels of service thresholds for out-of-county hurricane evacuation and a revision of the Coastal High Hazard Area definition and regulatory provisions. Reflecting some of the issues raised in Section II of the CHHA committee report, but also influenced by the concerns of a powerful constituent interest, the bill included a provision that changed the statutory definition of the Coastal High Hazard Area from the category 1 hurricane evacuation zone to “the area below the category 1 storm surge line as established by the Sea, Lake and Overland Surges from Hurricanes (SLOSH) computerized storm surge model.” The SLOSH model combines topographic and bathymetric data with hurricane models to delineate land areas that are prone to storm surge inundation. (See Appendix A for an explanation of the SLOSH model.)
The bill also provided specific ways in which comprehensive plan amendments could be evaluated and deemed to comply with the provisions of 9J-5.012(3)b(6), which instructs localities “to direct population concentrations away from known or predicted coastal high-hazard areas” and 9J-5.012(3)b(7) to “maintain or reduce hurricane evacuation times.” The bill identifies a 12-hour hurricane evacuation time to shelter and a 16-hour out-of-county evacuation criterion for a category 5 storm. It also allows developers to mitigate the impact of additional population concentration by contributing resources toward hurricane shelter provision and evacuation. The bill requires localities to “memorialize” the mitigation agreement, but it does not specify concurrency between the mitigation measures and the new project.

**Framing Research Issues**

The adoption of House Bill 1359 into law in June 2006, raised questions and concerns among land use planners, hazard mitigation specialists, and public officials. The best approach to retool Florida’s coastal high hazard area regulations had eluded consensus among the members of the Coastal High Hazard Study Committee, and the...
implications of the new geographical delineations and development guidelines put forth by HB 1359 had not been studied empirically by any state agency. Moreover, the provision of specific evacuation time criteria against which to assess development project impacts and the ability to offset impacts through monetary payment, land contribution, or other resource provision raise complex implementation challenges — some of which are touched upon in this report and further described in DCA Technical Report 2007-3 Coastal High Hazard Areas. Yet, the overarching issues of how the legislative change impacts coastal resiliency had not been examined. Does it foster land development that promotes economic revitalization or imprudent construction? Will it impact areas differently?

The focus of this report is to assess the impact of the new boundary definition for the CHHA. Although this was but one component of the revised CHHA policies, this avenue of analysis leads us to examine the salient issue of the degree to which HB 1359 reverses CHHA policy that for years has discouraged additional density levels beyond those adopted in the LCPs in coastal areas. This fundamental shift in coastal land use and hazard mitigation policy requires deliberate consideration, especially in light of recent hurricane experience that resulted in billions of dollars in property damage and crises within the insurance markets. The policy case study also raises serious questions about the role of science and planning analysis in the policy formulation process. Lessons learned from this empirical assessment of policy legislation ought to inform policymakers and agency staff as they take on the challenges of developing policy and regulation regarding environmental and economic development planning regarding climate change.

Part II of this report provides a brief summary of the CHHA regulations, criticisms raised by opponents, and the controversy that spurred its re-examination.

This research is drawn from a review of state legislative language, discussions with current and former DCA staff, and a review of the proceedings of the state-appointed committee that recently examined the Coastal High Hazard Area regulations in 2005 and 2006.
Part III summarizes the GIS methodology and the qualitative data used in the assessment of the impact of the new boundary delineations (i.e., “Old CHHA” boundary versus New CHHA boundary) in the three Treasure Coast counties of Martin, St. Lucie, and Indian River. These counties (see Maps 1a-c) were selected for analysis because they have experienced rapid growth in the last two decades and are expected to experience additional development pressure in the coming years. The development history of the three counties provides examples of older coastal cities and villages focused on redevelopment and attempts to control sprawl in the inland western portion of the counties. The counties' geography, including the presence of three major rivers and the location of the coastal ridge, introduces features worthy of additional analysis.

Part IV of the report presents findings followed by the research conclusions, which frame the analysis in the context of maintaining and improving community resiliency to hurricanes and in terms of its potential to encourage additional land development. Specifically, it examines how the land use and building age of the inventory impacted by the boundary are significant factors for analysis.

Part V presents a discussion of the evolving CHHA policy framework, why we believe HB 1359 represents a change in policy direction, and questions the adoption of the SLOSH category 1 criterion. It describes some of the complexities of implementing the new policies and highlights how the Tampa Bay Regional Planning Council has assessed and addressed the state’s new policy. Finally, some key recommendations are detailed in Part VI.
II. BACKGROUND

Florida’s landmark 1985 Growth Management Act was heralded as one of the nation’s most proactive and comprehensive planning mandates. Recognized for requiring concurrency between land development, public services, and infrastructure, the legislation was also one of the nation’s first to require localities to address the mitigation of natural hazards in land planning. Specifically, the Coastal Management section (163.3178(2)d, FS) requires that Local Comprehensive Plans include a component containing principles for hazard mitigation and protection of human life against the effects of natural disasters. Throughout Florida, land uses and development density were to be planned in accordance with the ability to evacuate the coastal population in the event of impending disaster.

The statute also directed localities to designate a “coastal high hazard area” (CHHA). Florida administrative rule 9J-5(3)(b)5 directed localities to “limit public expenditures that subsidize development permitted in the coastal high hazard areas subsequent to the element’s adoption” except for restoration or enhancement of natural resources. The rule also mandated that localities “direct population concentrations away from known or predicted coastal high hazard areas.” The effect was not to directly restrict private development along the coast, but to use restrictions on public investment as a way to discourage or cap future development potential in vulnerable coastal areas.

The rational of directing population growth and infrastructure investment away from vulnerable areas appears obvious, yet these policies would prove to cause unanticipated conflicts with other growth and economic development goals. Moreover, localities’ implementation of these state rules varied considerably and thus compromised the intended outcome of limiting coastal asset accumulation. To understand why this seemingly rational approach to hazard mitigation is fraught with conflict, one has to understand: 1) how this policy objective was manifested in the
Local Comprehensive Plans; 2) how the policy language evolved over time; and 3) how the policy objectives function in the context of Florida’s rapid population and economic growth.

**Evolution of CHHA Boundary Definitions**

**Post 1985:** When localities prepared the first LCPs in compliance with the 1985 Growth Management Act, they did not begin with a blank slate. Rather, their vision of the future, as manifested in the Future Land Use Maps (FLUM), was shaped in part by the pre-existing development, the goals and objectives of previous plans, and the policy goals of the state, as represented in both statute and incentive programs. As communities were at different stages of development and redevelopment, while anticipating different levels of real estate demand and growth, each locality adopted zoning appropriate to the communities’ unique characteristics. Generally speaking, higher density residential zoning designations on the FLUM corresponded to areas with pre-existing dense development patterns. Localities with less intense development, or those that did not seek to achieve urban densities, adopted largely residential uses at lower densities. To some degree, planners justified the codification of existing development patterns into the FLUM because adopting zoning different from the existing built environment would create a large class of non-conforming uses.

With regard to coastal land and specifically with respect to the CHHA, preexisting development patterns, projected population growth, and infrastructure capacity and demand were also balanced with goals to protect natural resources and ensure adequate evacuation. Significant resources were invested in developing regional Hurricane Evacuation Studies (HES), which assessed the evacuation capacity of existing bridge and road infrastructure and the estimated clearance times for evacuating population from different-sized coastal zones. Because 380.27, FS, prevented the state from funding additional infrastructure in the barrier islands, HES findings became one of the primary measures by which localities determined maximum population densities and future coastal area land uses. Thus, the evacuation clearance times became a threshold measure of coastal density and development potential.
In addition, the 9J-5 administrative rule prevented localities from encouraging additional development in the CHHA. In the mid-1980s, when the statute was first enacted, the CHHA boundary was to be based on a compilation of several factors including historical experience of previous storm damage. The original definition applied to LCPs is as follows (except that DNR was replaced by DEP):

“Coastal high hazard areas” (also “high-hazard coastal areas”) means areas designated by local government pursuant to Paragraph 163.3178 (2) (h), Florida Statutes, and includes areas which have historically experienced destruction or severe damage, or are scientifically predicted to experience destruction or severe damage, from storm surge, waves, erosion, or other manifestations of rapidly moving or storm driven water.

These areas shall include all areas within the local government’s jurisdiction where public facilities have been damaged or undermined by coastal storms, Federal Emergency Management Agency designated V zones, areas seaward of the coastal construction control line established by the Florida Department of Environmental Protection pursuant to Chapter 161, Florida Statutes, and inlets which are not structurally controlled. The evacuation zone for a category 1 hurricane as established in the regional hurricane evacuation study applicable to the local government.iv

In the late 1980s, when many Florida communities had not yet experienced intense development pressure, the low-density zoning designations met many community expectations and needs. Small coastal towns typically adopted future zoning that was intended to preserve the then-current scale of development and maintain the existing quality of life. Larger cities, such as Miami, which had anticipated urban growth and commercial activities, had planned for the denser development patterns that exist today. Over the coming decades, the development needs and goals of localities would change, and the constraints imposed by the CHHA would prove controversial.

Post 1994: In 1992, Hurricane Andrew, a category 4 hurricane, blew through South Florida killing 23 people, destroying 117,000 homes, and causing $25 billion (1992 USD) in damage throughout the region.v Billed as the most costly hurricane in history at the time, Hurricane Andrew revealed the multifaceted vulnerabilities of South Florida’s coastal communities and incited public support for better building code
standards and development practices. The local public policy response was swift and included the development of the Miami-Dade County building code. At the state level, one outcome was re-examination and revision of the state’s coastal high hazard area definition.

In 1994, the definition of the CHHA was changed. Whereas in the past, localities could designate an area based on a variety of measures or data, “Coastal high hazard areas” (also "high-hazard coastal areas") was redefined as “the evacuation zone for a category 1 hurricane as established in the regional hurricane evacuation study applicable to the local government.” The new language shifted the emphasis of the regulatory delineation from a composite of several measures based on scientific analysis of likely damage and documented historical incidence of areas of damage, to a significantly different geographic boundary based on emergency management criteria for evacuation. In consultation with local public officials, DCA adopted the “category 1 hurricane evacuation zone” because it sought to create conformity among jurisdictions and ensure that the CHHA zone reflected a reasonably prudent measure of coastal risk. The category 1 hurricane evacuation zone was acknowledged by emergency managers, public officials, and the public as the coastal area with sufficient hazard risk that it must be evacuated for even the weakest hurricane storm. The implications of this choice on other planning objectives were not thoroughly considered.

The way in which the new definition changed the boundary of the CHHA on the ground depended on how the locality had documented the CHHA originally. In some communities, the change was insignificant, as the evacuation areas coincided with places already identified as most vulnerable. Elsewhere, the category 1 evacuation zone (identified by emergency managers for evacuation based on road access and population densities), was larger than the geographic areas communities had previously identified as vulnerable. Hence, the area which was now subject to the CHHA policies of limited public investment and density caps was more expansive.
Factors Influencing Coastal Zoning and Non-Parity among Localities

Communities that were largely built-out and stable, or had adopted zoning that accommodated higher levels of future growth, did not view the limitations posed by the administrative rule 9J-5 as constraining economic growth. Rather, the regulations could be seen as preserving neighborhood stability and directing development toward inland areas perceived as safer. However, some communities that had adopted zoning for low intensity uses and low construction densities felt that the limitations hindered adaptation to changing demands, land values, and growth. As state policy was to prevent asset accumulation beyond the density and intensity of an approved LCP’s Future Land Use Element, DCA generally did not approve plan amendment changes that increased development densities within the CHHA zone. Additionally, localities were somewhat limited in their ability to invest public funds in the expansion of infrastructure and facilities if these upgrades could encourage additional development.

The constraints posed by the regulations were particularly burdensome for coastal communities located largely, if not entirely, within the category 1 hurricane evacuation zone, in addition to older urban areas that sought to revitalize. Small communities geographically constrained within the CHHA cannot direct new development elsewhere and capture its property tax revenue base. To encourage reinvestment in depressed markets, planners in some older communities need flexibility in zoning density and land use, along with public subsidy in infrastructure and public improvements. To the extent that CHHA regulations prohibited these activities, reinvestment in older coastal areas was hindered. The CHHA regulations could be viewed as freezing development density in time.
Conflict in Initiatives and Policies

In the intervening years, Florida’s coastal communities have experienced steady growth. Housing and commercial development aimed at accommodating the burgeoning population initially spread inland, gradually moving north from South Florida to the Treasure Coast. As communities spread to natural and legislated growth boundaries, such as Everglades National Park, anti-sprawl efforts soon focused on redirecting construction to established urban service areas and revitalizing existing urban areas. In 1995, a 42-member Governor's Commission for a Sustainable South Florida and the South Florida Regional Planning Council advanced the Eastward Ho! initiative, a plan to revitalize South Florida’s older communities through infill development and redevelopment. As the name implies, this initiative aimed at directing the population growth back toward the coast.

While the Eastward Ho! initiative was not directed at the Treasure Coast, the principles of compact and higher density development have been adopted by the Treasure Coast Regional Planning Council in an effort to efficiently accommodate the housing and accompanying commercial development needed for the projected population growth in the region. County and municipal planners throughout much of the Treasure Coast have sought to balance development demand with agricultural and open space conservation by steering development eastward and focusing on revitalizing the region’s historic cities and towns. Martin County, for example, has endured bitter battles over the 5- and 20-acre minimum parcel size intended to promote development within the urban service boundary. The westerly growth of Port St. Lucie through annexation has been criticized by some leaders as promoting inefficient sprawl. The renaissance of Stuart and Fort Pierce is partially attributable to concerted public reinvestment in older coastal areas, despite their vulnerability to coastal storms. Today, five of the Community Redevelopment Districts on the Treasure Coast are partially or entirely located in areas that fall within the Coastal High Hazard Area. Incentives provided by the Community Development Authority (CRA) to invest in the redevelopment of coastal urban areas run counter to the intent of hazard mitigation principles aimed at limiting coastal asset accumulation.
Likewise, the state regards ‘Water Dependent and Water Related Uses’ as an economic development priority for many Florida coastal communities. A 2005 study estimated that the recreational boating industry generates $18.4 billion dollars of economic activity in the state.\textsuperscript{vi} One of the problems faced by owners of marinas and boatyards is rising property values, which encourage the conversion of ‘marine work uses,’ such as shipment, boat repair, and marinas, into residential or private use. In order to support the vitality of the region’s marine industries, governments are asked to approve development measures that offset the cost of coastal land, high insurance, and operating costs. These allowances are permitted within the CHHA, whereas other types of public expenditures are not, encouraging investment in waterfront assets. In 2005, the state statutes were amended to require localities to address access to the water in their local comprehensive planning documents, thus encouraging a more holistic approach to waterfront redevelopment and planning. The exemption of public investment in water-related and water dependent uses within the CHHA is indicative of the trade-offs between promoting economic development and water access and policies intended to minimize the impact of severe coastal storms.

The difficulty in balancing trade-offs between current benefits and future potential losses will become increasingly apparent as planners and communities confront challenges posed by sea level rise and climate change. While the intermittence of hurricane disasters makes it easier to choose policies that favor economic interests of current stakeholders (whether these are property owners or politicians, who don’t want to make unpopular policy decisions), the seeming inevitability of damage or loss due to climate change impacts makes short-term choices less desirable. Now more than ever, to ‘plan’ for hazards and coastal development means to frame land development and redevelopment decisions in a long-term perspective – one that advances resiliency against catastrophic I storm events and slow, long-term hazards posed by climate variability. As the CHHA policies are reassessed, they must be synchronized with objectives that will advance adaptability to climate change issues.
III. Methodology Overview

The change of CHHA boundaries—first from a locally defined area of risk to a uniform statewide definition based on emergency management criteria of the category 1 evacuation zone, and then to the current definition based on the area below the category 1 storm surge line established by SLOSH vii—has implications for planning, growth management, and hazard mitigation.

Old CHHA Definition

**Martin County:** Atlantic Ocean west to the Intracoastal Waterway; all mobile and manufactured home parcels; areas within a half mile of Indian River, N. and S. forks of St. Lucie River, and Loxahatchee River.

**St. Lucie County:** Entire Barrier Island, category 1 storm surge defined by SLOSH; all mobile home parks.

**Indian River County:** Entire barrier island; same western boundary as the current CHHA; no rivers.

At the time the legislation was introduced and under consideration, concerns were raised that the new definition would encourage additional development in coastal areas. A spur in new construction would compound the hazard vulnerability issues already attributed to a concentration of economic assets at the shore line. Opponents raised issues about the ability to evacuate the population, increased traffic congestion, environmental impacts, and the indirect costs of insuring and protecting additional development that may result. Speculation regarding the impacts of changing the CHHA prompted us to ask: “How does the legislative change impact coastal resiliency? Does it foster land development that promotes economic revitalization or impudent construction? Will it impact areas differently?” We also believe it was important to reflect on what this policy framework offers Floridians in terms of evolving hazard concerns of sea level rise and planning for climate change adaptation.
To review the impact of changing the CHHA definition, we mapped old and new geographic delineations for three Treasure Coast counties (Indian River, St. Lucie, and Martin), and compared the amount of land and number of parcels for each. It is important to understand the difference between tax parcels and land acres. While acreage quantifies the size of land parcels, tax parcels captures the number of improved real estate assets on a certain parcel of land. Thus, in the case of a condominium building, one will find many tax parcels correlated to a particular acreage. We have also tabulated the assessed value of the affected tax parcels and include these figures as a reference of economic assets at stake.

Throughout this report we note that the net difference between the Old CHHA and the New CHHA is only one descriptive parameter. The net parcel and acreage figures must be understood in context of the number and specific location of land parcels added and removed from the CHHA designation. The detailed level of analysis reveals the most interesting and profound impacts of the legislative change. The study methodology is found in Appendix B; supplementary data tables are presented in Appendix C.

The initial analysis of differences in size and geographic coverage resulting from changing the CHHA was conducted using an 8-mile study area, which encompasses all the land parcels impacted by the new definition. To hone in on the impact of the change on coastal resiliency and land development, the study area was subsequently reduced to the 3 miles nearest the ocean. This area excludes the inland riverine parcels, but better reflects the coastal areas subject to the highest wind-zones and threats posed by the open waters of the Atlantic Ocean, its bays and inlets. Within the smaller geography, we map, quantify, and compare the land use characteristics of the parcels and the year built of the structure on the parcels. The underlying assumptions for this part of the analysis are: 1) older properties located in areas of high real estate demand are more likely to be redeveloped with new and possibly greater development densities; and 2) certain types of land uses are more easily redeveloped.
IV. RESEARCH RESULTS

The CHHA Changes Shape

The most striking difference between the two boundary definitions, as shown in Maps 2-4, is the shape of the regulated area. The New CHHA is topographically based and thus includes parts of this coastal strip that are below the storm surge level, but excludes areas of higher elevation despite the proximity to the ocean or Intracoastal Waterway. Therefore the CHHA is no longer a contiguous blanketed area, but rather resembles “Swiss cheese,” where lands above the topographic level of the storm surge for a category 1 storm are removed from the CHHA zone.

In addition, depending on whether a county had included “storm surge” or “floodprone” language in its definition of the category 1 hurricane evacuation area (Old CHHA), the new definition could be perceived to expand the CHHA westward along the river basins of the St. Lucie, Indian, Loxahatchee, and St. Johns rivers. Because category 1 storm surge areas could extend up to eight miles inland along these waterways, the New CHHA incorporates inland properties that were not part of the evacuation zone.
Figure 1, which summarizes the change in acres, shows that for the entire three-county area, the new definition would increase the total land area subject to development limitations by 12%, from 56,321 acres to 62,888 acres. The impact of the redefinition differs in each county: in some counties the change results in an increase in land area and in others it causes a decrease. In Martin County there is an increase of 28% (7,621 acres) because the new definition picks up low-lying inland riverine areas on the southfork of the St. Lucie River. It also picks up inland riverine areas of the Loxahatchee River that lie...
within Jonathan Dickinson State Park. In St. Lucie County we note a decrease in land of 9% (1,509 acres) because small parts of the barrier island and some mobile home parks on the mainland drop out. In Indian River County we note a slight increase in acreage of 4%, as riverine areas replace coastal areas located on higher elevations of the coastal ridge. viii

![Figure 2](image2.png)

In terms of tax parcels, New CHHA results in a decrease of 34%, from 37,137 to 24,400. Again, the impact of the redefinition is different in each county, as seen in Figure 2. In Martin and Indian River counties we see a decrease of approximately 44%, which represents 6,897 and 5,142 parcels, respectively. St. Lucie has a significantly lower decrease of 7% or 698 parcels.

![Figure 3](image3.png)
In total, we identify that the assessed value of all the tax parcels in the Old CHHA was estimated at $14.146 billion (for year 2006). If we eliminate the government-owned parcels and vacant land, there is approximately $11 billion of improved property value in the three-county area. The total assessed value of property in the New CHHA is approximately $10.4 billion, or $8.7 billion if one excludes government-owned property. The 20% reduction in assessed value (Figure 3) is explained primarily by the removal of $1.9 billion and $1.1 billion of residential tax assessed value in Indian River and Martin counties, respectively.

Note that the net difference in terms of acres and tax parcels does not show the true total number of impacted properties: some were gained and others were conversely removed. Figures 4 and 5 depict the number of tax parcels and acres in each county that were either added or removed from the CHHA. For example, in Martin County the net impact of the change is 4,248 acres of land, but the redefinition actually impacts 10,778 acres, as 7,513 acres were gained and 3,265 were removed. Similarly, there is a shift in parcels that are added or removed from the CHHA.

Figure 4
## Parcels, Acres and Value Affected by Revision of CHHA

(Within 3 mile area of the coast)

<table>
<thead>
<tr>
<th>3-mile boundary</th>
<th>Old CHHA boundary</th>
<th>New CHHA boundary</th>
<th>Absolute Change**</th>
<th>Percent of Absolute Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Parcels</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Martin</td>
<td>24,759</td>
<td>7,665</td>
<td>4,854</td>
<td>2,811</td>
</tr>
<tr>
<td>St Lucie</td>
<td>12,912</td>
<td>7,135</td>
<td>6,603</td>
<td>532</td>
</tr>
<tr>
<td>Indian River</td>
<td>20,326</td>
<td>11,346</td>
<td>5,893</td>
<td>5,453</td>
</tr>
<tr>
<td>Total No. of Parcels</td>
<td>57,997</td>
<td>26,146</td>
<td>17,350</td>
<td>8,796</td>
</tr>
</tbody>
</table>

| **Acres** | | | | |
| Martin | 37,440 | 17,289 | 21,610 | -4,321 | -25.0% |
| St Lucie | 19,127 | 9,967 | 8,657 | 1,309 | 13.1% |
| Indian River | 22,108 | 12,899 | 10,464 | 2,435 | 18.9% |
| Total Acres | 78,676 | 40,154 | 40,731 | -576 | -1.4% |

| **Tax Assessed Value as of 2005** | | | | |
| Martin | $7,618,796,694 | $4,500,001,492 | $3,118,795,202 | $1,084,522,360 | 24.1% |
| St Lucie | $3,350,458,456 | $2,650,578,962 | $2,524,979,490 | $107,937,272 | 4.1% |
| Indian River | $8,718,252,036 | $6,995,788,093 | $4,453,215,373 | $2,542,572,720 | 36.3% |
| Total Assessed Value | $19,687,507,186 | $14,146,368,547 | $10,411,336,195 | $3,735,032,352 | 26.4% |

*This includes commercial, governmental, institutional, recreational, residential and vacant land uses

**The absolute change is the difference between the Old CHHA boundary and the New CHHA boundary
**Focusing on 3-Mile Coastal Area**

To focus on implications of the CHHA boundary change with respect to coastal resiliency, the study area was reduced to the 3-mile area that is nearest the ocean. The 3-mile area allows one to hone in on the impact of changing the CHHA definition, because it eliminates areas which may be included in the new SLOSH-oriented definition, but would not be subject to significant surge water rise due to their inland location and protective infrastructure (e.g., levees). It also highlights properties added or removed in key coastal areas; i.e., the area that faces the unattenuated hurricane winds and includes all National Flood Insurance Rate Map (FIRM) designated VE Flood Zones. The seaward-most land parcels have higher potential for both repetitive and storm surge damage; hence, an assessment of property falling in the National Flood Insurance Program (NFIP) VE Zone was also completed.

Overall, if one compares the old and new definitions in the three-country region there is a decrease of 34% in the number of parcels and a slight increase of 1% in the amount of land within 3 miles of the ocean and a decrease of 27% in the taxed assessed value of property within the New CHHA (Figure 6). These changes represent an offset of diverging trends in the three counties. The changes for each county must be analyzed carefully to understand how specific county definitions of

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**Impact of Reducing Study Area Size**

**Indian River:** Narrowing the study area to 3 miles did not alter the universe of acreage and tax parcels analyzed for the old definition, as all the parcels impacted by Old CHHA definition were within the 3-mile area. However, for the new definition, the smaller area reduces the acreage by 21% and the number of parcels by 5%.

**St. Lucie County:** Narrowing the study area reduces the universe of parcels by 26% and the acreage by 38% for the old definition. In the new definition it reduces the universe of parcels by 27% and land by 40%. This is primarily because the 3-mile area does not capture the north fork of the St. Lucie River basin. The percentage of land and parcels excluded from analysis are similar between the Old and New CHHA definitions because the Old CHHA in St. Lucie County already incorporated the SLOSH area for a category 1 hurricane.

**Martin:** Focusing on the 3-mile area reduces the universe of property parcels and acreage by 52% and 37%, respectively, in the old definition. With the new definition the 3-mile area reduces the tax parcels by 47% and the acreage by 38%.
Old CHHA and New CHHA distort the regional analysis (sidebar). More important, it raises the issues of which parcels are gained and removed, and what are the land use characteristics on the impacted parcels that contribute to vulnerability and additional development pressure.

Within the 3-mile coastal area in Indian River County, the change of CHHA boundary definition reduces the land in the CHHA by 2,435 acres, a decrease of 19%. There are also 5,345 fewer parcels, a reduction of 48%, the greatest net decrease of the three counties. Map 5 shows that the parcels eliminated from the CHHA are located throughout the length of North Hutchinson and Orchid Islands. The new definition adds only 81 parcels not previously included; these parcels are situated at the mouth of the St. Lucie River.

**Figure 6**

| Parcels, Acres and Value Affected by Revision of CHHA (within 3 mile area of the coast) |
|-----------------------------------------|-------|-------|------------|-------|-------|
|                                        | 3-mile boundary | Old CHHA boundary | New CHHA boundary | Absolute Change** | Percent of Absolute Change |
| Number of Parcels*                     |                  |                  |                  |                   |                                |
| Martin                                 | 24,759           | 7,665            | 4,854            | 2,811             | 36.7%                          |
| St Lucie                               | 12,912           | 7,135            | 6,603            | 532               | 7.5%                           |
| Indian River                           | 20,326           | 11,346           | 5,893            | 5,453             | 48.1%                          |
| Total No. of Parcels                   | 57,997           | 26,146           | 17,350           | 8,796             | 33.6%                          |
| Acres                                  |                  |                  |                  |                   |                                |
| Martin                                 | 37,440           | 17,289           | 21,610           | -4,321            | -25.0%                         |
| St Lucie                               | 19,127           | 9,967            | 8,657            | 316               | 13.1%                          |
| Indian River                           | 22,108           | 12,899           | 10,464           | 2,435             | 18.9%                          |
| Total Acres                            | 78,676           | 40,154           | 40,731           | -576              | -1.4%                          |
| Tax Assessed Value as of 2005          |                  |                  |                  |                   |                                |
| Martin                                 | $7,618,796,694   | $4,500,001,492   | $3,415,479,132   | $1,084,522,360    | 24.1%                          |
| St Lucie                               | $3,350,458,456   | $2,650,578,962   | $2,542,641,690   | $107,937,272      | 4.1%                           |
| Indian River                           | $8,718,252,036   | $6,995,788,093   | $4,453,215,373   | $2,542,572,720    | 36.3%                          |
| Total Assessed Value                   | $19,687,507,186  | $14,146,368,547  | $10,411,336,195  | $3,735,032,352    | 26.4%                          |

*This includes commercial, governmental, institutional, recreational, residential and vacant land uses

**The absolute change is the difference between the Old CHHA boundary and the New CHHA boundary
Map 5

Removed and Gained Parcels within 3 Miles from Coast: Indian River County

Parcels
- Gained (81)
- Removed (5,534)
- New CHHA Boundary

Data Sources include the Public Domain (National Hydrography Dataset), the Florida Data Group, Florida Department of Emergency Management, and the Florida Department of Libraries. Created by the UWF Planning Technology Lab, Florida Atlantic University, May 2007.
Map 6

Removed and Gained Parcels within 3 Miles from Coast: St. Lucie County

Parcels
- Gained (0)
- Removed (521)
- New U.S. A Boundary

Legend:
- Gained (0)
- Removed (521)
- New U.S. A Boundary

Scale: 0.5 1 2 Miles

Data Sources:
- Florida Department of Natural Resources
- Florida Department of Emergency Management
- Florida Geographic Data Library

Created by the Urban Planning Technology Lab, Florida Atlantic University, May 2002.
Map 7

Removed and Gained Parcels within 3 Miles from Coast: Martin County

Parcels
- Gained (1,883)
- Removed (4,889)
- New CHILIA Boundary Parcels

Legend:
- 0 km
- 0.5 km
- 1 km
- 2 km

Data Sources Include:
- Florida Department of Revenue Tax Parcel Data (2006)
- Florida Department of Environmental Protection
- State Planning and Land Use Model

Created by the Land Planning Technology Lab, Florida Atlantic University, May 2007.
In St. Lucie County there is a net decrease of approximately 1,309 acres of land, or 532 parcels. This is a 13% decrease in land and a 7.5% decrease in the number of parcels. The analysis illustrated by Map 6 shows that the land removed from the CHHA represents a few mobile home parks on the mainland, land on the oceanside of Route A1A on North Hutchinson Island, and a segment of land on South Hutchinson Island that has higher topographic features.

In Martin County the net difference between old and new definitions clearly illustrates how New CHHA encompasses different coastal geography than the Old. Focusing on the 3-mile area, the analysis excludes the inland acres and parcels in the low-lying river basins of the St. Lucie River that account for much of the land increases in the new SLOSH-oriented CHHA definition. Moreover, since Old CHHA did not include language about category 1 storm surge, it is easy to identify which portions of the evacuation zone are no longer covered by the CHHA when it is defined by SLOSH.

The analysis determined that there is a net increase of 4,321 acres, but a net decrease of approximately 2,800 tax parcels. Map 7, illustrating the gained and removed parcels, shows that the New CHHA now includes a few expansive, undeveloped conservation parcels in Johnathan Dickinson State Park and some parcels east of A1A and south of Cove Road, and east of A1A and north of Gomez Avenue in Hobe Sound, where A1A is on the mainland. On the other hand, the area removed from the CHHA includes land developed with housing. Specifically, the 4,689 tax parcels removed from the New CHHA include: 1) the majority of parcels in the Town of Jupiter Island, 2) coastal neighborhoods east of Country Club Drive bound by County Line Road, 3) the neighborhood on the east and west sides of Kubin Avenue in Port Salerno, 4) the western section of the Sewell Point peninsula, and 5) Langbord Park, Henderson Pond, and Martin Country Golf Club north of Sewell Point.

The maps illustrating which parcels are gained and which are removed shows that much of the land removed from the New CHHA are barrier island parcels with base elevations above the SLOSH-modeled category 1 storm surge. Although these parcels are believed to be located outside of the category 1 hurricane storm surge area, these
coastal locations are nonetheless very vulnerable to coastal storms. To further assess the impact of the new definition on mitigating vulnerability, a comparison is drawn between the number of parcels in the Old and New CHHA that are in designated VE flood zones (areas subject to inundation and wave action per the National Flood Insurance Program). Figure 7 shows that the newly defined CHHA covers 379 fewer VE-Zone parcels than the old definition, a decrease of 17%. The decrease in the number of properties covered in the New CHHA means that the tax assessed value of properties in the New CHHA is also decreased by nearly $250 million dollars. The greatest change occurs in Indian River County and on Jupiter Island in Martin County. In Indian River County for example, there are 1,503 acres of land and 636 parcels located in the VE flood zone. The Old CHHA applied to all these properties, while the New CHHA boundaries cover only 1,237 acres and 448 tax parcels.

**Figure 7**

<table>
<thead>
<tr>
<th>Parcel, Acres and Value in NFIP VE Flood Zone &amp; Selected Study Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3-mile boundary</strong></td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td><strong>Number of Parcels</strong></td>
</tr>
<tr>
<td>Martin</td>
</tr>
<tr>
<td>St Lucie</td>
</tr>
<tr>
<td>Indian River</td>
</tr>
<tr>
<td><strong>Total # of Parcels</strong></td>
</tr>
<tr>
<td><strong>Sq Acres</strong></td>
</tr>
<tr>
<td>Martin</td>
</tr>
<tr>
<td>St Lucie</td>
</tr>
<tr>
<td>Indian River</td>
</tr>
<tr>
<td><strong>Total Acres</strong></td>
</tr>
<tr>
<td><strong>Tax Assessed Value as of 2005</strong></td>
</tr>
<tr>
<td>Martin</td>
</tr>
<tr>
<td>St Lucie</td>
</tr>
<tr>
<td>Indian River</td>
</tr>
<tr>
<td><strong>Total Assessed Value</strong></td>
</tr>
</tbody>
</table>
Land Use Analysis

The unique development history of each county influences the number and size of parcels, land uses, land values, building types, and tenure of properties along the coast. Aggregated data on numbers and locations of parcels within the CHHA provides a perspective on how the change impacts coastal hazard resiliency. To address the research questions regarding the impact of CHHA boundary re-definition on community resiliency and development potential, land use and building age characteristics of affected coastal tax parcels were assessed. This specificity is critical to understanding the nature of possible impacts. The land use analysis presented herein is for the 3-mile coastal area in the three county region. Specific county differences that are noteworthy or that disproportionately influence the regional data are noted, and breakdowns by county are provided in the appendix.

Coastal Land Use Mix: In aggregate, much of the land in the coastal-most area of the study region has not been developed and is either recreation and conservation land (e.g., active park, mosquito impoundment areas, and submerged lands), or vacant land zoned for development. There are also about 10,000 acres of land in government ownership. Figures 8 and 9 illustrate the breakdown of acres and parcels by gross land use category in the New CHHA as a representation of the mix of coastal uses present. Although vacant, recreational, and conservation land make up the greatest amount of acreage within the CHHA — because these parcels tend to be large -- these land use categories do not represent the greatest number of parcels.
Residential use comprises the greatest number of tax parcels, 12,079 or 5,626 acres. The large number of residential tax parcels is to be expected since residential lots tend to be smaller, and in the case of multi-family structures, many units co-exist on one parcel of land. Additionally, there are approximately 330 commercial property parcels on 4,100 acres.

Change in Land Use Mix due to Redefining Boundary: Comparing the Old and New CHHA boundaries, we see a net decrease in nearly all categories except recreational land. Residential land uses are most impacted and account for 80% of the total net change. Our data also reveals that the change in boundary designation would remove
the upzoning restriction on a significant amount of vacant land held in private ownership, suggesting a chance for more intense development of these parcels. This impact is particularly relevant in Indian River County. In other counties, the New CHHA covers more vacant acreage, but this increase is modest. ix

The impact of the New CHHA boundary on each land use category is summarized below, and a detailed table appears in Appendix C.

- **Residential** - 7,106 fewer residential parcels (a 37% reduction) and 2,805 fewer acres of land would be included. These reductions represent $3.1 billion in tax assessed value.

- **Commercial** - 207 fewer commercial tax parcels (a 38% reduction) and 160 fewer acres of land. This represents $227 million dollars in tax assessed value.

- **Vacant Land** - 1,450 fewer vacant parcels (a 26% reduction) and 759 fewer acres of land.

- **Government/Public Facilities** - 19 fewer government parcels (a 3% reduction). However, unlike the previous land uses, this represents a net increase of 673 acres largely due to the addition of 1,400 acres in Martin County.

- **Recreational** - 5 more recreational parcels (a 3% increase) and a significant increase of 3,647 acres. Specific contributors are more difficult to discern in this case.

Again, note that the net change does not illustrate the actual number of parcels impacted. The net difference can be small, even if there are many parcels gained and many removed, and the type of parcels impacted may be different. Figure 10 illustrates the acreage and related land uses removed and gained in each land use category. The net difference in the amount of vacant land is only 594 acres between the old and new boundary definitions, yet the change in regulation actually removes 1,444 acres from the CHHA and adds 850 acres in different areas. In other words, the shift in boundary definition reclassifies many more parcels than the net change would indicate.
In each county, the new boundary definition includes land with a different combination of land uses, as seen in Figure 11. In Indian River County, where the barrier islands are largely developed with single-family homes and condominiums, the greatest net change in parcels and acres relates to residential properties. Because the City of Vero Beach has a commercial district on the barrier island and near the Intracoastal waterfront, approximately 155 commercial tax parcels would also be removed from the CHHA.\textsuperscript{x} In Martin County, where the new boundaries increase the amount of land within the CHHA but cover fewer parcels, the greatest gains in acreage are with respect to recreational land. We also observe a decrease of over 2,720 residential tax parcels.\textsuperscript{xii} In St. Lucie County the greatest shift in land use categories between the two CHHA definitions is a decrease of 238 acres of land with residential uses. The changes are relatively small in St. Lucie County because the Old CHHA already included the area within the SLOSH category 1 hurricane inundation area, so the new definition simply removes some parcels without adding any additional land.
**Built Age of Coastal Inventory**

The age of the building inventory was examined for Old and New CHHA. As expected, Figure 12 shows that the new definition contains fewer properties in each age group. However, there is a 45% reduction in the number of pre-1980 buildings and a 58% reduction of 1980s inventory removed from the CHHA boundaries. In aggregate, a boundary change would remove more than 5,700 buildings built before 1979 and 2,300 structures built between 1980 and 1989 from the CHHA. By comparison, only 744 tax parcels constructed after 2001 would be removed, a 32% reduction.
The disproportionate number of older buildings removed from the CHHA boundary is likely a result of the historical development patterns that crept northward along the coast, placing older construction in closer proximity to the coastline, while new construction is found in more inland locations. The majority of the older inventory removed from the New CHHA designation falls in Martin and Indian River counties. Their shorelines were developed earlier than that of St. Lucie County.

Inventory added and removed from the CHHA boundaries was further analyzed by land use code to determine whether older properties removed from the CHHA included land uses susceptible to redevelopment and upzoning pressure. Most of the older properties removed from the CHHA are developed with residential or commercial buildings. Of particular interest were large parcels with older buildings in locations with easy access and high visibility. We noted that in St. Lucie County, for example, five mobile home parks representing 119 acres of land would no longer lie within the CHHA. These include Ft. Pierce homes LLC, K&D Affiliates, Inc., Country Cove Mobile Home Community, RidgeCrest Mobile Home Park, and H&H Sons incorporated. (In the other counties there are several smaller and scattered mobile home parks or lots, making large-scale redevelopment less feasible.) There are two tax parcels with pre-
1970s commercial buildings in Indian River County that occupy 19 acres of land, and 16 commercial tax parcels in Martin County with construction from the 1970s that sit on a total of 168 acres.

The vast majority of tax parcels removed from the New CHHA boundaries are single-family homes and small residential complexes. Much of this inventory is more than 20 years old, which in Florida’s real estate market ranks them as bordering on obsolete in terms of amenities they offer in contrast to newer housing stock. Nonetheless, the proximity to the shoreline and some up-and-coming historic downtowns have made these properties desirable for tear-down and redevelopment. Typically, this process occurs incrementally as individual properties are sold, and then snowballs as rising home values in the neighborhood entice other neighbors to sell. Accelerating this process are investors who buy up homes in order to assemble larger parcels capable of accommodating higher density development, zoning permitting.

We briefly scanned the study area to identify distribution of the aged building stock susceptible to this type of scenario. Map 8 shows the barrier island neighborhoods in Indian River County, for example, that fit this criterion. Examples of similar neighborhoods in St. Lucie and Martin counties are shown in Maps 9 and 10. These are areas of the barrier island with topography above the SLOSH category 1 storm surge that contain concentrations of pre-1970s construction. While the fragmented ownership pattern poses significant hurdles to assembling large parcels, development companies are adept at identifying potential development sites, especially in highly desirable coastal areas. As the removal of the CHHA designation creates the potential of petitioning for higher density zoning, some older coastal areas may experience increased real estate speculation, especially if it is possible to assemble development sites through parcel mergers.
Research Conclusions

“It’s not a matter of size, but spatial geography”

The 8-mile and 3-mile study area assessments revealed that the change in definition increased the total amount of land in the CHHA by 12% (if focused on the 8-mile study area), and increased the number of acres by 1% (if focused on the 3-mile area nearest the ocean — an argument that proponents of the change would make. However, the aggregated data doesn’t illustrate the consequent spatial shift in relation to proximity to the ocean and related water bodies. Overall, the New CHHA in the three-county study area includes more inland property along low-lying riverine areas and excludes some coastal areas adjacent to the ocean but situated at higher base elevations.

As the increase in acreage within the New CHHA boundaries is attributable to previously excluded low-lying areas, the regulation may serve to curtail development in areas prone to minor and moderate levels of flooding, and may increase community resilience to flooding as a result of future sea level rise. However, these low-lying areas coincide with flood-prone areas already identified by the National Flood Insurance Maps and are already subject to the design guidelines of the National Flood Insurance Program.

Of great concern is the fact that many excluded areas are parcels on barrier islands; clearly, these are areas of high coastal storm vulnerability. The analysis also shows that the new designation does not comprehensively cover many of the parcels identified as VE Zones by the National Flood Insurance Program. These are areas of clear coastal flood hazard risk.

“Potential for upzoning and soft-site redevelopment”

The analysis revealed that the New CHHA boundary in Indian River and St. Lucie counties included fewer parcels and acreage, creating the potential to upzone select coastal areas with greater intensity of uses. In Martin we noted that the New CHHA
would include more acres but fewer parcels. Because the New CHHA designation removes upzoning restrictions from a large number of coastal properties and allows development projects to proceed by offsetting evacuation and hurricane shelter impact, there is concern that the new boundary designation and policies could encourage development density beyond what is currently planned in the FLUM. Localities seeking redevelopment of older areas or hoping to attract infill development may initiate upzoning plan amendments to facilitate profitable redevelopment of blighted areas or simply areas with lower tax assessed values. They may also choose to amend their FLUM during the EAR process, upzoning entire neighborhoods that are removed from the CHHA boundaries.

To better understand the nature of this development potential, we examined the land use and building characteristics of impacted properties using the following assumptions:

- Land held for recreation or conservation uses by government and non-profit conservation entities is not likely to be developed. Undeveloped land held by public entities for conservation purposes has lower vulnerability, since there are few to no built improvements on the land.

- Vacant land held by private entities will be developed at market values that can support development costs profitably. Privately held vacant land has low vulnerability, but may contribute to community vulnerability in the future when it is developed. Additional new development increases exposure. New development is also typically built to modern hurricane standards that may be very resilient.

- Land already containing residential, commercial or institutional uses has the potential for redevelopment depending on the condition of the existing structure in relation to property market conditions, such as land prices, achievable rents or prices per square foot of new construction. New buildings that replace older substandard construction can thus have a positive impact on community resilience in some cases. Older structures or buildings that do not maximize the developable square footage are likely to experience redevelopment pressure as property values increase. Hence, building age serves as a proxy for redevelopment potential.
The breakdown of land uses among parcels that are added and removed from the CHHA confirms and strengthens the conclusion that the New CHHA could allow upzoning on nearly 850 acres of vacant privately owned land removed from the Old CHHA. The New CHHA boundary also opens the door for upzoning of some already developed residential areas and commercial parcels.

The only land use categories that experience an increase in acres subject to the New CHHA are recreational use and government-owned facilities; this is limited only to Martin County. Increasing the amount of conservation and recreation land in the CHHA has no benefit in terms of directing development away from vulnerable coastal areas or limiting asset accumulation since this land is not likely to experience any development.

Insofar as some local government-owned parcels are removed from the CHHA the possibility arises that local governments will now choose to expand the capacity of infrastructure and public facilities previously denied additional investment under the CHHA regulations. Depending on specific government facilities no longer within the CHHA, local government may now be able to increase the level or service (LOS), thus justifying additional zoning density in the service area.

**Redevelopment:** In built-out areas with strong real estate demand, the potential for additional asset accumulation is greater from redevelopment of existing property than from development of new land. “Soft sites,” individual parcels or clusters of proximate properties with untapped development potential, are a function of market conditions and parcel characteristics, such as land use, built density, and obsolescence. When existing construction can no longer meet market expectations (that is, when the value of the existing inventory is significantly less than the value of rents associated with new construction), and especially where there is potential to increase the size of leasable or saleable building, conditions are ripe for redevelopment.
Our land use and built age analysis suggests that the shift in boundaries may kindle redevelopment activity of soft-sites within the study area, as several key parcels and desirable neighborhoods would become eligible for zoning reconsideration. The research identified a few properties zoned for commercial uses containing buildings constructed prior to 1979. These properties are on relatively large parcels and may be ripe for redevelopment. There are also a number of churches and institutional uses that are removed from the CHHA. These uses, some of which are strategically located on main thoroughfares, may be considered soft-sites because some non-profit owners are willing to sell the land to development interests and use the proceeds to relocate and build new facilities.xvi

The most likely soft-sites for redevelopment are mobile home parks. While some of the Old CHHA definitions established by localities based on evacuation criteria specifically included mobile home parks within the CHHA, the SLOSH category 1 definition does not. Thus mobile home parks located on elevated parcels are excluded from the CHHA and subject to rezoning that would allow higher density permanent construction. Mobile home parks engender particular risks, and from a community resiliency perspective, should be sited away from areas that would bear the brunt of storm impacts. Replacing mobile home parks with permanent construction would increase community resiliency, but their redevelopment raises serious concern about displacement of residents with limited means to obtain housing in their community.
V. DISCUSSION

The CHHA statute was created to identify a coastal area that required particular planning considerations with respect to hazard vulnerability related to coastal storms. The Comprehensive Planning statutes required that the localities identify a CHHA zone for “uniformity of planning purposes.” It instructs localities to adopt comprehensive plan language that reflects the state’s desire to restrict public investment that may be subject to storm damage and which would encourage additional development beyond what was planned in the FLUM. It further instructs localities to direct population concentrations away from the CHHA. For the past two decades or so, DCA advanced this objective by routinely rejecting comprehensive plan amendment changes that increased the intensity of land use in the CHHA.

Florida’s mid-1980s Comprehensive Plan legislation did not prescribe allowable uses, densities or development regulation to localities; rather, it tied regulation of coastal land development to maintaining or reducing evacuation clearance times. The CHHA policy text did not specifically limit private investment in land development, but deferred the specifics of coastal development policies to localities. As such, localities’ FLUMs reflect a range of development densities based on historical development patterns and local planning preferences. In areas where the FLUM’s building envelop has not been reached, new development continues to be built within the coastal high hazard zone.

Towards a Comprehensive Definition of the CHHA

The CHHA policy addresses the key role of land use planning in reducing the hazard vulnerability associated with coastal asset accumulation. However, insofar as the constraint on construction densities was grounded indirectly through reference to evacuation clearance times, the policy framework was somewhat narrow. The policy
acknowledged the ‘peril of life’ aspect of coastal storms, but failed to directly acknowledge the vulnerability engendered in property and economic losses associated with coastal construction. This stems from the political complexity of crafting regulations that are seen as impinging on property rights and development. Further, the CHHA boundary definition and regulatory policies were mismatched. The geographic scale at which land planning decisions are made (and have impacts on hazard resiliency), are different from the narrow objectives of evacuation traffic planning.

In the 2006 round of CHHA policy revisions, policymakers once again framed the vulnerability issue narrowly in terms of evacuation capacity, rather than holistically in terms of fostering resilient land development patterns. In changing the CHHA definition from the emergency management definition of the category 1 storm evacuation area to a measure of storm risk based on topography and SLOSH, policymakers believed they were moving away from a subjective definition that hindered the highest and best use of land to an objective measure that precisely differentiates parcels based on storm surge risk. The change would free up what some people considered safe coastal land for additional development. This would allow planning objectives related to local economic growth to be advanced, while theoretically maintaining regulations for the most vulnerable parcels. However, the policy framework still does not directly focus on reducing the vulnerability of community in terms of economic aspects like damage to the property, which impacts the tax base and business climate, and local culture embedded in the unique social networks of community.

Moreover, the New CHHA language actually reverses the indirect constraint on additional asset accumulation in coastal areas by providing explicit ways for developers to mitigate the impacts of development and be viewed as complying with state statute. As the focus of this study was to assess the impact of the redefined CHHA boundaries, little has been said regarding how HB 1359, by defining what is deemed adequate mitigation of hazard vulnerability, changed the direction of coastal
land policy. It is worth examining the change in requirements at this point because of its implication in terms of encouraging development.

Amendments introduced to the bill language during the legislative session, but which were never part of the Coastal High Hazard Study Committee discussion, expanded the opportunity for additional construction densities within the now smaller CHHA. HB 1359 introduces language that specifies ways in which local government can comply with rules [9J-5012(3)(b)(6) and 9J-5.012(3)(b)(7)]. The statute mandates: “Direct population concentrations away from known or predicted coastal high-hazard areas; and Maintain or reduce hurricane evacuation times.” The new law establishes a 16-hour out-of-county evacuation LOS if counties have not adopted LOS and a “12-hour evacuation time to shelter for a category 5 storm” as a standard. More important, it stipulates that appropriate mitigation of these requirements:

```
shall include, without limitation, payment of money, contribution of land, and construction of hurricane shelters and transportation facilities. Required mitigation shall not exceed the amount required for a developer to accommodate impacts reasonably attributable to development. A local government and a developer shall enter into a binding agreement to memorialize the mitigation plan.
```

By linking vulnerability impact only to shelter space and evacuation time, the law once again defines the coastal high hazard area as an area in which the state seeks to ensure life safety, but is willing to allow high levels of property damage and related economic losses. Facilitating additional assets in areas of coastal vulnerability runs counter to the spirit of hazard mitigation policy aimed at minimizing additional coastal asset accumulation. Furthermore, the link between development and the provision of shelter and evacuation resources does not take into consideration other facets of vulnerability and costs engendered in additional development, such debris clearing, emergency services, publicly subsidized insurance rates, etc.
Community vulnerability must be assessed by the exposure of interrelated, but not necessarily co-located assets, economic activities, and social networks within the coastal-zone impact that constitute the fabric of any community. Within a broader framework of vulnerability and resiliency, all land with improved property, including residential, commercial or industrial uses, represents assets subject to damage or loss. Increased asset exposure engenders economic risk, since its destruction would impact local employment opportunities, retail sales, and property tax revenue. Hence, increased asset exposure correlates with high levels of storm impact and is a factor in community vulnerability.

By framing the CHHA in terms of evacuation and shelter requirements, rather than comprehensively in terms of the various factors of community vulnerability, the new policy once again creates a mismatch between the objective of planning for resiliency and boundaries and regulations. Areas within the storm surge zone for a category 1 storm are not the only coastal areas that require evacuation, or where the residents would seek refuge in a public shelter. If coastal parcels now opted out of the CHHA are developed or redeveloped at higher density construction (with corresponding population increases), how would the impacts on shelter and evacuation from these projects be mitigated? A recent DCA technical report raises a similar issue pertaining to new construction arising outside of the coastal area, but impacting the capacity of evacuation routes for the CHHA.

Potential Impact on Insurance Industry

The potential increase in the number and value of assets located along the coast begets the question of how the additional asset risk will be insured. Will additional assets compound the current crisis of capacity in the insurance market and rising premiums? Presently, many private insurance companies are attempting to limit their exposure in high-risk coastal markets, raising concerns about the industry’s willingness to absorb more asset risk. As private insurers refuse to issue new policies and withdraw coverage from other properties, a growing number of property owners have turned to the state’s insurer of last resort, Citizens Insurance Company. The increasing number of policies issued by Citizens poses challenges to the insurers’ ability to adequately re-insure the risk in the secondary market. It raises the specter of a financial crisis if Citizens must turn to taxpayers for a bail out.
Additionally, by allowing developers to offset project impacts through the donation of land or money, developments maybe facilitated, but there is little assurance that mitigation measures will be implemented. Simply “memorializing the mitigation plan” does not ensure that a road will be widened or a shelter built prior to the development coming online. While the statute specifies that impact fees shall not exceed what is commensurate with the project, the city may need other resources to successfully execute the offsetting mitigation project. Thus, the project and implementation of mitigation efforts may not proceed concurrently. One can also imagine a situation where the funds provided to offset a project in one area would be directed toward mitigation projects elsewhere in the municipality. This could be justified by redrawing the shelter designation boundaries and forcing residents to seek shelter in locations that are not the most proximate or convenient to their homes. While a thorough examination of this component of HB 1359 is outside the scope of this report, suffice it to say that these changes, in conjunction with the change in boundary, suggest that the law now facilitates additional coastal construction.

Is the Category 1 SLOSH Storm Surge an Appropriate Criterion?

Our critique of the new policy language is also aimed at the adoption of SLOSH category 1 storm surge as the boundary criterion, as it may actually decrease resiliency and does not appear to be based on scientific analysis of vulnerability. Defining the CHHA boundary by the storm surge area narrows the hazard peril addressed. Flood and wave action from the ocean or gulf is but one of the hurricane perils coastal properties face. The waterfront and proximate parcels on the barrier island and mainland shoreline are also subjected to the strongest winds of the hurricane landfall, because there are no trees, buildings or topographical features to absorb wind gusts. By using a topographic measure of storm surge inundation, the change in the CHHA would allow for upzoning and possibly increased coastal densities and building heights in areas that are also part of the highest-wind zone, as identified by the state’s Citizens Insurance Company.
The topographic criterion raises interesting issues of implementation. One developer interviewed asked, “Would a parcel be eligible for rezoning if the landowner filled the parcel with sufficient dirt to raise the base elevation above the category 1 zone? What occurs if a portion of the parcel is elevated above the SLOSH category 1 area, but other parts are low-lying?” These examples once again illustrate how the CHHA definition mismatches the geography to which the CHHA land use restrictions apply with the geography needed to achieve desired mitigation objectives — whether they are limited to evacuation capacity or broader goals of reducing vulnerability.

While the adoption of the SLOSH category 1 storm surge criterion as the boundary definition appears to be more scientific than the past, our analysis concludes that the new boundary definition compromises hazard resiliency by lifting CHHA regulations from some of the most vulnerable coastal lands. It is critical to acknowledge that land elevated above the storm surge for a category 1 hurricane does not mean that it is not subject to inundation from the surge of a stronger category 2, 3 or 4 storm. Category 1 storms are relatively weak and not those that have inflicted damage in Florida in recent years.
Climate research indicates that stronger storms may become more common with an increase in ocean water temperatures, and our research suggests that the category 1 storm surge criterion used to define the New CHHA is insufficient. In Indian River for example, at the widest point, the storm surge from a more intense category 3 storm would extend to the first 7,300 feet of mainland west of the Intracoastal, whereas the storm surge category 1 area covers only 3,500 feet west of the Intracoastal. By contrast, the Old CHHA definition based on emergency management criteria, while not ideal, blanketed the coastline, discouraging upzoning and density throughout the barrier islands and up to 4,100 feet inward of the mainland coastline in some areas.

If policy is to be based on a "precautionary principle" grounded on the best available empirical science, then legislators may want to consider the SLOSH area for a stronger hurricane. Using the category 3 storm surge definition, for example, would add 248 parcels into the CHHA. In Martin County the category 3 storm surge area would increase the number of CHHA parcels by 171, but due to the steep topography of areas adjacent to the Intracoastal, such as Indian River Road, the change in designation does not move the boundary area westward. In St.

**Recommendations**

- "Adopt a Hurricane Mitigation Ordinance to identify and assess the impacts of future development and redevelopment within the CHHA and when mitigation would be considered."
- "Consider the adoption of a LGCP amendment to define a Coastal Storm Zone to include all properties/parcels connected to the mainland by bridges and or low-lying properties restricting evacuation and emergency access. Amend the LDRs to expand the policies and regulation associated to the CHHA to this Coastal Storm Zone."
- Consider adoption of a LGCP amendment to define a Hurricane Vulnerability Zone as the SLOSH category 3 hurricane zone and adopt appropriate policies and regulations.
- Consider adoption of a Coastal Planning Area as the area identified by the SLOSH model to be inundated from a Category 5 hurricane... and adopt appropriate policies and regulations.
- Amend Land Development Regulations (LDR) so that if 20% or more of the parcel is seaward of the CHHA boundary it is considered within the CHHA.
- Amend (LDR) to address parcel splits so that "if the parcel is greater than 5 acres and less than 50% of the parcel falls in the CHHA, an owner can either transfer the density to the area outside the zone or conduct a survey to determine the exact location of the structures."
Lucie County, as in Martin, the category 3 storm surge area would increase the number of parcels in the CHHA by 244. It would include the entire barrier island, but not move the CHHA boundary very much westward on the mainland. A comparison of the size of the SLOSH areas for a category 1 and category 3 storm are visualized in Maps 11 through 13.

The analysis of these two SLOSH storm surge areas should not be interpreted as an endorsement of the SLOSH category 3 criterion. Rather, it is made to emphasize the inadequacy of the SLOSH category 1 threshold. As new LIDAR information becomes available, it will be important to model the data in the context of community development patterns. The storm surge criterion may be augmented to include diverse factors of flood and wind risk, including areas with strategic facilities or key social and economic assets.
VI. RECOMMENDATIONS

The CHHA statute was created to identify a coastal area that required particular planning consideration with respect to hazard vulnerability related to coastal storms. The spirit of the regulation was not to prevent development, but to ensure that development intensity would not compromise safety in terms of evacuation capacity. Developers and some local policymakers have long felt that the CHHA regulations did not appropriately balance hazard risks against other planning goals, such as urban redevelopment and growth of the municipal tax base. Framed in this context, the previously legislated CHHA boundaries and regulations were not viewed as suitable, and thus the subject of revision by the Governor’s CHHA Study Committee. Revising the CHHA so that it was no longer based on emergency management criteria of evacuation zones is a sound idea, as this criterion was not an appropriate or efficient way to guide land development.

Our analysis of the changes introduced by HB 1359 suggests that the boundary definition adopted by the Florida legislature in 2006 may compromise objectives of planning resilient coastal communities. The CHHA regulation ought to be reexamined and perhaps new language should be developed that revisits the purpose and objectives of the CHHA holistically. Once these framing policy issues are clarified, other appropriate policy directives become evident. Following are recommendations for framing such a CHHA policy.

- **Clearly define the goals and objectives the CHHA designation is intended to promote.** The CHHA boundaries must be tied to and advance a well defined purpose.

As the definition of the CHHA boundaries evolved over time, so has the framework for assessing vulnerability. Although the evacuation criteria, a measure of risk to human life, remains important, the contemporary understanding of community vulnerability increasingly acknowledges that there is significant vulnerability (risk to recovery and
prosperity) associated with concentrations of high-valued property and economic activity along the shoreline. This suggests that if the CHHA is intended to guide development patterns with respect to coastal hazard risk, then the objectives of the CHHA should be expanded beyond regulating public investment and evacuation capacities. We would argue that lessons from Katrina and other recent storms compel us to develop an expanded definition of community vulnerability. We must move beyond the ability to save human life to promoting land use policies that create resilient communities — policies that protect community assets, including improved property, economic activities, social networks, and culture.

Moving beyond a CHHA focused on evacuation raises broader questions regarding policies that encourage increased investment at the coastal edge. Numerous other development policies and practices embodied in the Future Land Use Maps, the Local Comprehensive Plans, government public land acquisition priorities, and CRAs contribute to increased levels of coastal assets. The difficulty of identifying the best policy mechanisms for balancing asset exposure and economic expansion is why the work of the Coastal High Hazard Study Committee was a critically important first step. With additional time and resources the study committee’s participants and supporting experts would be able to ferret out and document the concerns of the diverse stakeholders and educate themselves with respect to the impacts of alternative policy. This empirical assessment is what is needed in order to generate a sophisticated and valid policy solution.

- **CHHA regulations should be based on an inclusive and precise statement of coastal risk being addressed.**

The current coastal high hazard area is defined as geography prone to risk from storm surge flood and wave action. However, coastal storms pose different types of hazard threats, including demolition and erosion from storm surge wave action, flooding from precipitation, and high wind, which may compromise the building envelop and result in water damage. Additionally, there are tornados, water spouts, and environmental degradation, etc. If the objective of the CHHA is broadened beyond the ability to evacuate and rather to reduce impacts from coastal storms, then coastal high hazard
areas cannot be narrowly defined to storm surge risk: the zones adjacent to storm surge flood areas may also be subject to intense hurricane damage necessitating extensive recovery.

If the CHHA is viewed as an area for land planning (in terms of development density and usage) that reduces vulnerability, then the CHHA geography should be defined at a scale commensurate with the built environment exposed to numerous aspects of storm events (including flooding, storm surge, wind, and erosion). A broader definition of hazards could theoretically expand the CHHA to include areas where road access may be cut off, where basic services are very vulnerable, or where particularly vulnerable populations are concentrated.

Presently in Florida there are several types of coastal planning zones including: the Hazard Vulnerability Zone; the CCCL, which addresses building setbacks; the Coastal Building Zones and NFIP flood maps, which regulate building design; and evacuation zones, which organize emergency response. Future revisions to the CHHA policy may be based on a composite of boundaries that relate to multiple hazard risk on the built environment. Policy makers may consider devising a CHHA with different tiers that address variable levels and types of risks. If the CHHA concept embraced a tiered approach, the SLOSH criterion would be supplemented by the adjacent flood zones in the second tier, and by the Coastal Building Zone or high-impact wind zones in a third tier.

CHHA boundaries should be based on a prudent criterion that embraces areas of risk comprehensively.

In setting CHHA boundaries, it would be important that the criterion used to configure the geographic delineation be based on a conservative threshold for risk. Should policymakers choose to focus the CHHA on storm surge risk — which we do not advise — then the CHHA definition based on some form of SLOSH criterion may suffice. However, the particular level of storm surge to be used as a criterion for the CHHA boundary should be very carefully examined.
The Coastal High Hazard Study Committee report discussed the possibility of using the category 1 storm surge “Maximum of Maximum,” which is defined as the maximum water envelope at all locations regardless of storm track or hurricane direction. This concept was not adopted as part of HB 1359. The SLOSH 1, as identified with the existing model, is clearly an insufficient criterion in terms of fostering greater resiliency, as the policy is to establish the threshold based on the weakest type of storm. The appropriate SLOSH model may be the SLOSH area for a higher category storm. We hesitate to state a criterion definitively until the new LIDAR data is run through the SLOSH model. Even then, the results of the SLOSH model should be compared to other storm surge models and ground-truthed in different parts of the state with different geographical features.

Local governments need to review how the CHHA is referenced throughout their Local Comprehensive Plans and other public policy documents to determine if the new geography is compatible with objectives of the referenced policies.

The CHHA is often referenced in the Infrastructure, Open Space, and other elements of Local Comprehensive Plans. It is also noted in the Comprehensive Emergency Management Plan, the Post-Disaster Redevelopment Plan, and the Local Mitigation Strategy. Insofar as the new boundary definition is spatially different from the past, localities need to determine if the new definition compromises the implementation of other objectives.

Given the New CHHA policies, each locality needs to assess the impact on forthcoming land planning decisions by the public and private sectors.

Specifically, local government and the state may benefit from a more thorough assessment of: 1) what type of land uses are being gained and removed; and 2) where this land lies in relation to the ocean, lagoons, urban areas, and community context. It is important to consider which building stock is being impacted and what redevelopment implications would increase risk and vulnerability. While we believe the three-county study area provided a diverse set of case studies and geography, these CHHA issues should be examined at a local scale in more communities around the state. Florida’s extensive coastline is geomorphologically different; i.e., its coastal
communities are at different stages of development and have varied local regulations. This suggests that the assessment upon which this report is based ought to be replicated in at least four other coastal areas, including Florida’s west coast, Panhandle, urbanized southeast, and northeast. Results from these research studies would confirm the results presented herein and may raise other issues relevant to reformulating the state’s CHHA.

The Coastal High Hazard Area should be defined at a regional scale that reflects variability of local geomorphology and sociopolitical linkages among neighboring jurisdictions.

The variability of geographic features along the coastline, in addition to the diverse development patterns of coastal communities, suggests that one statewide standard may not be applicable to this planning objective. While locally defined standards pose different challenges, a regional approach based on features of hydrology, bathymetry, and geomorphology should be explored. For example, coastal areas surrounding a particular river basin or inlet area, which may include several municipalities, might be considered as one planning region. A sector plan, which is more detailed than a local comprehensive plan’s goals and objectives but more holistic that the local zoning regulation, could be developed to coordinate land development, conservation, and hazard mitigation objectives for the related coastal geography.

Sector plans have been used to manage growth at the edge of urban areas and to manage large areas slated for new infrastructure development, such as the new Panama City airport. An amendment to the current planning statute might allow a variation of the sector plan, which could be used for planning an entire barrier island, or group of adjacent barrier islands. A planning initiative of this scope would be based on a comprehensive urban planning and hazard vulnerability analysis of economic, social, built, and natural environmental conditions similar to and perhaps more extensive than the Living on the Edge study completed by CUES for the Treasure Coast in 2007. Based on this information the governing jurisdictions, (e.g., county(ies) and municipalities) would develop a build-out plan with specific design features and policy actions to adapt to sea level rise, erosion, storm surge, and other
unique challenges coastal environments. Insofar as localities will be differentially impacted by development restrictions within a specific zone, the opportunity to balance costs and benefits among proximate jurisdictions can be explored through tax-revenue sharing and inter-municipal agreements on service provision.
REFERENCES


APPENDIX A

Methodology

Old and New CHHA boundary delineations

The Old and New CHHA boundaries were mapped to assess the impact of the definition change on geographic extent for the three study area counties.

As previously mentioned, the New CHHA boundary for all Florida counties is based on the category 1 storm surge definition. SLOSH data was obtained from the Florida Department of Emergency Management in 2006 for the entire State of Florida, clipped to the study area counties, reprojected to State Plane Florida East, NAD83. Category 1 storm surge zones were then selected and saved as New CHHA boundary data sets.

ArcGIS 9.2 functionalities, namely clipping, creation of new polygon features, on-screen digitizing, selection of features and attributes, buffering, and overlaying were used with parcel, SLOSH, rivers, street, and other data to create the Old CHHA boundaries. Each county was based on unique combinations of various criteria, listed below.

- **Indian River County**: (i) entire barrier island; (ii) western boundary of the category 1 storm surge (based on SLOSH data); and no rivers.
- **Martin County**: (i) areas west of the Atlantic Ocean to the Intracoastal Waterway; (ii) all mobile and manufactured home parcels; and (iii) residential parcels within half of a mile from Indian River, the North and South Forks of St. Lucie River, and the Loxahatchee River.

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1 SLOSH, Sea, Lake and Overland Surge from Hurricanes, was developed by the National Weather Service to calculate potential surge heights from hurricanes. The metadata further describes that the coastal surge zones were developed through a number of Hurricane Evacuation Studies; and the methodology for each study may not be identical.
- St. Lucie County: (i) entire barrier island; (ii) entire category 1 storm surge (based on SLOSH data); and (iii) all mobile home parks.

Comparing land use characteristics in Old and New CHHA boundaries
For a more specific assessment and comparison of the impacts of a definition change on (re)development potential, GIS was used to identify and compare parcel uses within the Old and New CHHA boundaries. The analysis was completed for the entire study area, as well as the areas within 3 miles of the coast. Summary tables for each parcel use category were generated to compare the amount of land and number of parcels. The tables were imported into Excel, additional fields were created (e.g., percent change), and related graphs and charts were prepared.

Parcel data for the year 2006 were obtained from the Florida Department of Revenue (DOR) to ensure consistency in “Record Layout DR-590/N.A.L. File Record Layout” for all counties in the study area. Key fields used included: UCOLD (for land use and parcel count), AV (for assessed value), GIS Area (for parcel acreage), and EFFYR (for Effective Year Built). It is important to understand the difference between tax parcels and land acres. While the acreage quantifies the size of land parcels, tax parcels represent improved real estate assets on the land. Thus, in the case of a condominium building, one can find many tax parcels correlated to a particular acreage.

Removed/Gained Parcels from Old to New CHHA boundary
This part of the analysis focused on the 3-mile coastal area only. ArcGIS’s Erase functionality was used to generate removed parcels shapefiles (i.e., Old Erase New), as well as gained parcels shapefiles (i.e., New Erase Old) for each study area county. The effective year built\(^2\) for the gained/removed data sets was further queried to identify patterns and potential problem “hot spots”. The underlying assumptions for this part of the

\(^2\) Effective Year Built categories used: pre-1970, 70-79, 80-89, 90-99, post-2000, and post-2001 (i.e., the years during which state building codes changed).
analysis were: 1) older properties located in areas of high real estate demand are more likely to be redeveloped with new and possibly greater development densities; and 2) certain types of land uses are more easily redeveloped.
Statutes Text:

The CHHA was defined by Florida Administrative Rule 9J-5.003 and Florida Statute 163.3178 (2)h as the evacuation area for a category 1 hurricane storm as defined by the Saffir-Simpson Scale. Section 163.3178, FS, and the related regulatory language in 9J-5.012 (3)b requires each Local Comprehensive Plan in the state to adopt a CHHA area and to:

5. Limit public expenditures that subsidize development permitted in coastal high hazard areas subsequent to the element’s adoption, except for restoration or enhancement of natural resources;

6. Direct population concentrations away from known or predicted coastal high hazard areas;

7. Maintain or reduce hurricane evacuation times;

8. Prepare post-disaster redevelopment plans which will reduce or eliminate the exposure of human life and public and private property to natural hazards.
## Detailed Data Tables

1) Changes in parcel areas due to change in CHHA boundary.

<table>
<thead>
<tr>
<th></th>
<th>Old CHHA boundary</th>
<th>New CHHA boundary*</th>
<th>Absolute Change**</th>
<th>Percent of Absolute Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Parcels</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Martin</td>
<td>16,080</td>
<td>9,183</td>
<td>6,897</td>
<td>42.89%</td>
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<td>St Lucie</td>
<td>9,711</td>
<td>9,013</td>
<td>698</td>
<td>7.19%</td>
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<tr>
<td>Indian River</td>
<td>11,346</td>
<td>6204</td>
<td>5,142</td>
<td>45.32%</td>
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<tr>
<td><strong>Total No. of Parcels</strong></td>
<td>37,137</td>
<td>24,400</td>
<td>12,737</td>
<td>34.30%</td>
</tr>
<tr>
<td><strong>Acres</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Martin</td>
<td>27,401</td>
<td>35,022</td>
<td>-7,620</td>
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<tr>
<td>St Lucie</td>
<td>16,021</td>
<td>14,512</td>
<td>1,508</td>
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<tr>
<td>Indian River</td>
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<td>13,354</td>
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<td>-4%</td>
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<tr>
<td><strong>Total Acres</strong></td>
<td>56,321</td>
<td>62,888</td>
<td>-6,567</td>
<td>-11.66%</td>
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<tr>
<td><strong>Assessed Value</strong></td>
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<td>Martin</td>
<td>$6,415,479,155</td>
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<td>Indian River</td>
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<td><strong>Total Assessed Value</strong></td>
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<td>$4,157,418,375</td>
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</table>

2) Changes in land use mix attributed to change in boundary definition.

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<td><strong>Institutions</strong></td>
<td>38</td>
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<td><strong>Recreational</strong></td>
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<table>
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<th>Acres</th>
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<table>
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<tr>
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<th>Net Difference (Old-New)</th>
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<tr>
<td>Recreational</td>
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<tr>
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## Comparison of Land Uses Contained in the CHHA - 8-mile Study Area

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<tr>
<th>Indian River County</th>
<th>St. Lucie County</th>
<th>Martin County</th>
<th>Total</th>
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<th>New</th>
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<td><strong>Value</strong></td>
<td><strong>Acres</strong></td>
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<td><strong>Acres</strong></td>
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<td><strong>Old</strong></td>
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</table>

ii The Senate version of the bill was dropped in favor of HB 1359.

iii Ch. 380.27, FS, Coastal infrastructure policy.-- (1) No state funds shall be used for the purpose of constructing bridges or causeways to coastal barrier islands, as defined in s. 161.54(2), which are not accessible by bridges or causeways on October 1, 1985. (2) After a local government has an approved coastal management element pursuant to s. 163.3178, no state funds which are unobligated at the time the element is approved shall be expended for the purpose of planning, designing, excavating for, preparing foundations for, or constructing projects which increase the capacity of infrastructure unless such expenditure is consistent with the approved coastal management element.

iv http://www.1000friendsofflorida.org/FL_Panhandle_Initiative/HighHazardAreaPlanning.asp


vii The SLOSH data was obtained from the Florida Division of Emergency Management (DEM). The data abstract reads as follows “coastal surge zones were developed through a number of hurricane evacuation studies. Methodology for each study may not be identical.” DEM released the data with a very strong disclaimer that it was old, it should be used as an estimate only, and that more accurate data based on LIDAR would become available in the near future.

viii With occasional interruptions, the Atlantic Coastal Ridge extends along the mainland coast of the Florida Peninsula from the south shore of the St. Maryandapos's River at the Georgia State boundary to the vicinity of Homestead, some 30 miles southwest of Miami in Miami-Dade County. It is made of relic beach ridges and bars sometimes single and sometimes multiple. North of Eau Gallie in Brevard County the ridge is generally wider than it is from Eau Gallie southward, but it widens again to maximal dimension near its southern end in Broward and Dade counties in the vicinity of Fort Lauderdale, Miami, and Homestead. The narrower part of the ridge south of Eau Gallie is generally located closely along the mainland shore with the Indian River or equivalent lagoon directly at its eastern toe, save for the stretch between Sebastian in Indian River County and Fort Pierce in St. Lucie County where lower ground intervenes between the ridge and the shore. See full explanation of the coastal ridge at Florida Environment online: The geomorphology of the Florida Peninsula at http://fulltext.fcla.edu/cgi/t/text/text-dx?c=feol;idno= UF00000149; id = 1fbb1ea587b2f870c2f8a9526f6080aa;cc= feol;view= text;subtype=citation; rgn=div4; a=45;node=UF00000149%3A2.4.1.1.

ix Upon closer examination at the county level, we observe that in Indian River County nearly 1,200 vacant parcels would be removed from the CHHA, while only 15 such parcels would be added. By contrast, in Martin County the net change in vacant parcels is only 106, but the net difference is a result of a large shift among parcels that are gained and removed. Hence in this geography, the shift means that 617 acres, corresponding to 470 parcels, are no longer within the CHHA, and 835 acres corresponding to 364 parcels previously not subject to regulation are now included.

x In Indian River County, 4,107 residential tax parcels, accounting for 1,364 acres of land are removed from CHHA, only 33 residential properties are gained; additionally 155 commercial tax parcels occupying 249 acres would be removed from the CHHA.
xi In Martin County, the New CHHA definition will encompass 3,850 additional acres of recreational land and 2,033 acres of land used for public government functions, while also removing 4 acres of recreation land and 634 acres of government lands. This would be a decrease in residential land uses of 1.238 acres.

xii The CHHA would only serve to discourage additional development density and perhaps reduce lot coverage, but the regulation does not impact the location of the building on the parcel.

xiii This does not mean that critical habitat may not be damaged or lost and that this natural resource does not have an economic value. Conservation land that is damaged or impacted should ideally be included in the assessment if it were possible to easily assign a value. But since natural resource valuation is not an exact science, it is excluded from the analysis.

xiv Storm damage assessments from the 2004 and 2005 hurricane seasons suggest that buildings constructed to the 2001 Florida Building Code standards faired much better than the older construction.


xix At the time of writing, the 2007 hurricane season has already manifested two category 4-5 storms that made landfall along the Central American coast.

xx The Precautionary Principle as defined in the Wingspread Statements is “When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof.” See the Precautionary Principle in the real world. Environmental Research Foundation. January 21, 2008 found at http://www.precaution.org/lib/pp_def.htm.