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STORM HAZARD MITIGATION AND POST-STORM REDEVELOPMENT POLICIES

A Report of a Project to the
Coastal Zone Management Program
Florida Department of Community Affairs
(Contract No. 930S-07-13-00-15-012)

January 15, 1994

by

Robert E. Deyle, Assistant Professor
and
Richard A. Smith, Professor

Department of Urban and Regional Planning
The Florida State University

Funds for this project were provided by the Department of Community Affairs, Florida Coastal Management Program, using funds made available through the NOAA under the Coastal Zone Management Act of 1972, as amended.

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EXECUTIVE SUMMARY

In July, 1992, Bob Nave, then Director of the Division of Emergency Management, Florida Department of Community Affairs, prepared a draft issue paper on post-disaster redevelopment for discussion by the state's Interagency Management Committee. The premise of the issue paper was that the diverse array of statutes and administrative rules adopted to guide development and redevelopment within coastal high hazard areas of the state were not operating effectively.

The discussion of the issues raised by Nave highlighted the significant costs that were accruing to the state as a result of current coastal development patterns. Adequate mitigation, it was argued, would reduce public costs by virtue of lower levels of storm damage to beaches, dunes, public facilities, and infrastructure, and would also reduce the public costs for emergency preparedness, response, and recovery. This strategy, however, would likely involve increased regulation of land use and development making it problematic from both legal and political perspectives. An alternative is a market based approach, in which public funds would be withdrawn from coastal high hazard areas so that the private sector would bear a larger proportion of the true costs of coastal development. As these costs mount, less development would be expected to occur.

It is unlikely that public policy would follow one approach exclusively over the other. The state's interests in the public welfare and in the protection of life and property argue against a full withdrawal from a regulatory approach. The specific policy mechanisms that are available under each approach may present different issues in feasibility and effectiveness. Moreover, the variety of different environments within the state suggests that different approaches may work better in different locations. Both approaches, therefore, raise issues of what can be done, where, and with what expected results.

Given this background, the Interagency Management Committee, utilizing funds available through

the federal Coastal Zone Management Act, awarded a contract to The Florida State University to study and analyze both the existing array of state policy initiatives as well as the possibilities for new policy initiatives concerning coastal development and storm hazards. This final report presents that analysis and presents a set of policy options that could be adopted and implemented through appropriate legislation and administrative rules.

The analysis is constructed upon an integrated policy framework of three dimensions: 1) desired outcomes; 2) policy instruments; and 3) the context within which means are adopted and implemented. Three goals from the existing statutory and regulatory framework are taken as the guiding principles of the project and are summarized as follows: (1) to protect and preserve coastal environmental resources; (2) to protect human life and property; and (3) to limit public expenditures in areas subject to destruction by natural disasters. For each of the goals we identified a number of policy objectives as initial statements of what should be achieved:

1) Protection of natural resources:
    a) Protect the natural storm protection features of the coastal environment.
2) Protection of life and property:
    a) Alter the coastal environment to reduce vulnerability to storms.
    b) Reduce the vulnerability of buildings and facilities to storm damage.
    c) Manage the development and redevelopment of land to minimize threats of storm damage.
3) Minimizing public costs:
    a) Reduce the vulnerability of public capital facilities and infrastructure to storm damage.
    b) Manage the development and redevelopment of land to minimize public costs of disaster planning, response, and mitigation.

c) Allocate public costs of storm hazards to private sector users in proportion to risk.

We organized the alternative policy instruments for achieving these storm hazard mitigation policy objectives into four general subject categories each including two specific types of means:

1) Regulation
    a) Regulation of construction and site development
    b) Regulation of land use
2) Mandate
    a) Planning mandate
    b) Regulatory mandate
3) Investment
    a) Acquisition of coastal property
    b) Development of capital facilities and infrastructure
4) Incentive
    a) Economic incentives
    b) Education and information.

Policies relating to storm hazard mitigation contain a time dimension, characterized as either pre- or post-storm. Pre-storm policies that are designed to address hazard issues are those that focus on the initial development of land. Policies that address post-storm issues are concerned with those of redevelopment and relocation. The opportunities for realizing hazard mitigation policy objectives may differ at each stage of this temporal sequence. During the development stage the opportunity may exist to construct land use patterns over large tracts of coastal land, effectively influencing both the intensity and density of land development with respect to hazard issues. In contrast,

during the redevelopment phase, fewer land parcels are likely to be involved and existing use patterns and investments may make the realization of hazard mitigation objectives more difficult. Thus, the same means may be more effective at one particular stage of the cycle as a result of differences in the development context.

Our framework suggests that two contextual features are particularly important. These are the government jurisdiction applying the policy instrument (federal, state, and local) and the characteristics of the environment within which the instrument is implemented. Three characteristics of environments are distinguished as particularly relevant: level of development, susceptibility to storms, and vulnerability to storm damage.

Our analysis begins with an elaboration of the analytic framework in Chapter 1. Current policies for realizing these policy objectives are reviewed and evaluated in Chapters 2-4 according to our three part jurisdictional distinction. Thus, in Chapter 2 we review and evaluate the content and operation of federal programs that affect storm hazard policies. In Chapter 3 we review and evaluate the history and current status of state policy initiatives. In Chapter 4 we evaluate the policies of local governments within the state through a content analysis of the coastal element of a selection of local comprehensive plans. In Chapter 5 we review the initiatives for coastal storms and other natural hazards occurring in other states, and in Chapter 6 we bring the separate parts of the analysis together into a set of policy options for the State of Florida. Our purpose in this final chapter is to suggest how state policy goals and objectives can be achieved through different policy instruments, organized at various jurisdictional levels.

The policy options developed in Chapter 6 include the following. The final section of the report presents configurations of these options in the context of the three state policy goals for storm hazard mitigation.

Option 1: Establish a dedicated source of state funds for purchasing properties that would be rendered unbuildable by strict enforcement of the state's coastal construction regulations.

Option 2: Mandate conformance of local subdivision regulations with the 30-year setback and other locational requirements under the 50-year setback and CCCL permitting programs.

Option 3: Impose relocation requirements comparable to those imposed under the grandfather provisions of the 30-year erosion setback rule, as permit conditions for all CCCL and 50-foot setback construction permits in areas with significant erosion rates.

Option 4: Require relocation of habitable structures at sites with receding shorelines before they interfere with natural sand movement or intrude into the sovereign beach.

Option 5: Amend the authorizing legislation for the Florida Communities Trust so that storm hazard mitigation is explicitly listed as an objective to be attained through the Trust's matching grants program for local land acquisition.

Option 6: Create a separate dedicated source of state funds for acquiring parcels of coastal property primarily with the objective of mitigating public losses from storms.

Option 7: Develop a state inventory of coastal properties that would be ranked highly for acquisition to achieve storm hazard mitigation policy objectives.

Option 8: Amend the statutory authorization for the conveyance of development rights covenants and conservation easements to explicitly allow such transactions for the purpose of achieving storm hazard mitigation objectives.

Option 9: Obtain authorization from the Federal Emergency Management Agency (FEMA) to certify structures as subject to imminent collapse under Upton-Jones provisions of the National Flood Insurance Act (NFIA) and actively promote the program in cooperation with local governments. Apply FEMA imminent collapse criteria rather than local condemnation criteria, and link the program to the state's coastal construction permitting program.

Option 10: Increase state funding allocated to the Department of Environmental Protection, Division of Beaches and Shores, for completing analysis of the remaining 97 miles of critically eroding shorelines.

Option 11: Extend state regulation of habitable structure design standards to all tidal shorelines including vegetated shorelines and the shores of inland waters.

Option 12: Revise the State Minimum Building Code and the Coastal Zone Protection Act so as to require application of wind load design standards and flood elevation standards comparable to those imposed in areas subject to state coastal construction permits.

Option 13: Lower the "substantial modification" threshold for requiring repaired or rebuilt habitable structures to meet design and construction standards seaward of the Coastal Construction Control Line (CCCL) or the 50-foot setback.

Option 14: Support and participate in the effort by the Building Officials Association of Florida to deploy retired certified building inspectors and provide for mutual aid among municipalities in the wake of major disasters.

Option 15: Promote adoption of proposed amendments to the National Flood Insurance Act that

would provide holders of federal flood insurance with coverage for rebuilding in compliance with current National Flood Insurance Program (NFIP) construction and elevation requirements.

Option 16: Explore the potential for the state to require that private insurance carriers operating in the state provide coverage for rebuilding in compliance with state and local building codes as modified under Options 11 or 12.

Option 17: Provide a means for correcting deficiencies in the coastal elements of local comprehensive plans and assuring their implementation through appropriate local land development regulations (LDRs).

Option 18: Provide statutory authority for expedited acquisition of coastal property under post-storm conditions.

Option 19: Give the Florida Communities Trust the authority and a mandate to acquire and replatt land and resell it to achieve density reduction objectives.

Option 20: Amend Chapters 163 and 380 of the Florida Statutes, and Chapter 9J-5 of the Florida Administrative Code governing the coastal elements of local government comprehensive plans to achieve greater consistency with the storm hazard mitigation policy objectives articulated in E.O. 81-105 governing post-storm redevelopment and federally-designated Coastal Barrier Resources System units.

Option 21: Amend Chapters 163 and 380 of the Florida Statutes and Chapter 9J-5 of the Florida Administrative Code so as to mandate use of a single definition of the Coastal High Hazard Area by all local governments and state agencies that is consistent with risk levels that are explicit or

implicit in other state policies governing natural hazards.

Option 22: Initiate action through the Office of the Governor to clarify the conditions under which state agencies are to adhere solely to the provisions of §380.27(2) of the Florida Statutes as opposed to Executive Order 81-105.

Option 23: Establish a formal process for coordinating state agency review of coastal infrastructure decisions.

Option 24: Repeal §380.27(2) of the Florida Statutes, and return to a centralized state decisionmaking process that assesses the appropriateness of state expenditures for coastal infrastructure based on state policy objectives, including minimizing short-term and long-term public costs of coastal storm damage.

Option 25: Extend the state's barrier island bridge policy to all unbridged coastal islands.

Option 26: Enact legislation modelled on the proposed Massachusetts bill that would require early and accurate notice to prospective buyers of property within some clearly defined coastal hazard area.

Option 27: Require that the cost-effectiveness of relocation of infrastructure vulnerable to coastal storm damage be assessed as a condition to any grants made from the Hurricane Catastrophe Fund for protecting local infrastructure.

Option 28: Impose a risk-based surcharge on all commercial and residential property insurance policies to cover the costs of planning for, responding to, and mitigating coastal storms.

Option 29: Establish regional hurricane mitigation districts as a means of coordinating and providing the emergency management services necessitated by hurricanes and other severe storms and for assessing the costs for those functions on the basis of relative risk.

The options can be characterized by the degree of change they embody. Some represent fine-tuning of existing statutes, regulations, or programs. Others involve more substantial change, but change which is incremental relative to existing policy instruments. Others constitute innovations that depart significantly from current policies and programs. Fine-tuning will generally have modest impacts. Some of the incremental changes, however, may yield substantial enhancements over current policies and programs. The most significant improvements, however, will require innovations that necessitate substantial changes in the allocation of public resources or in the role of state government in influencing the behavior of its citizens.

Our analysis suggests that enhanced achievement of the goal of protecting coastal resources can be partly accomplished through a combination of fine-tuning of existing statutes (Option 5) and incremental changes to current regulations (Options 1-3), land acquisition mechanisms (Options 7 and 8), economic incentives for relocating imminently endangered structures (Option 9), and state expenditures for analyzing critically eroding beaches (Option 10). Substantial gains in achieving this goal, however, will require two major policy innovations: (1) establishing a separate and dedicated source of funding for acquiring lands to achieve storm hazard mitigation objectives (Option 6) and (2) requiring the relocation of habitable structures at sites with receding shorelines before they interfere with natural beach processes and intrude upon the sovereign beach (Option 4).

Enhancing protection of life and property from the hazards of coastal storms will require policy initiatives focused primarily on two objectives: (1) reducing the vulnerability of private buildings and

facilities and (2) managing the development and redevelopment of land. In terms of the first objective, extension of the state's regulation of design and construction standards to all areas of the state's coasts (Option 11) coupled with revisions to the state's mandates governing local building codes (Option 12) can resolve the problem of inconsistent protection of habitable structures that face comparable risks from coastal storms. Effective application of these standards under post-storm conditions can be increased by incremental change to the substantial improvement/damage threshold under the state's coastal construction regulatory programs (Option 13), expanded capacity to enforce building codes in post-storm circumstances (Option 14), and initiatives to assure that property owners hold adequate insurance to cover bringing substantially damaged structures up to code (Options 15 and 16). Option 16, which suggests employing the leverage generated by creation of the Hurricane Catastrophe Fund, represents a more significant innovation that will require further study and, perhaps, substantial politicking.

Significant advances on the second objective will require a substantial departure from recent views of the state's role in guiding and influencing land use planning and regulation. Fine-tuning of the CARL land acquisition process may marginally enhance its applicability in post-storm circumstances (Option 18), but the more radical step of creating a separate, dedicated source of funds for storm hazard land acquisition (Option 6) appears essential if purchase of fee-simple property rights is to have any substantial impact on the development or redevelopment of coastal land.

Incremental changes to the state's barrier island bridge policy (Option 25) would provide more consistent state policy governing one form of growth-inducing infrastructure, but the current dichotomy between the state's earlier infrastructure policy, set forth in Governor Graham's 1981 executive order, and the policy established through 1985 amendments to Chapter 380 FS, necessitates more substantial changes if a consistent and effective state policy governing coastal infrastructure is to be achieved.

Absent any change to Chapter 380 FS, clarification is needed from the Governor's Office on the present status of the 1981 executive order (Option 22), and a formal process is needed to coordinate state agency decisions on coastal infrastructure (Option 23). If the state is to rely entirely on the mechanism defined in Chapter 380 FS, and there is a commitment to using that process to achieve state policy objectives, a combination of marginal and innovative policy changes will be required. Incremental changes are needed in the statutes and regulations governing the coastal elements of local comprehensive plans (Options 20 and 21) to achieve a consistent statewide policy that includes policy objectives defined in the earlier executive order. To be effective, however, these must be coupled with significant changes in the state's authority to mandate amendments to local comprehensive plans and adoption of local land development regulations that will achieve storm hazard mitigation goals (Option 17). A third option, which also represents a major shift in current policy, is to return to a centralized state policy that is uncoupled from the local planning process (Option 24). Such a policy would permit the state to make its own judgments as to what circumstances warrant expenditure of state funds for infrastructure that will create potentially greater state liability for the costs of storm damage.

Two other options which constitute entirely new initiatives may further contribute to the state's ability to influence the development of land so as to minimize the threats posed by coastal storms: (1) mandating provision of hazard disclosure information to prospective purchasers of property in hazardous coastal areas (Option 26) and (2) directing the Florida Communities Trust to actively buy and sell real property to reduce development densities in areas prone to coastal storm damage (Option 19).

The options listed for achieving the objective of minimizing the threats of coastal storm damage through managing the development and redevelopment of coastal land (Options 17-26) will have similar impacts on reducing the public costs that result from such development and redevelopment.

Most of these options will also reduce the vulnerability of public infrastructure by limiting the installation of infrastructure in areas most prone to coastal storm damage. Option 27, which fine-tunes provisions governing grants from the Hurricane Catastrophe Fund, would also contribute to this policy objective.

The greatest gap in the state's current array of policy instruments is the absence of effective means of allocating the public costs of coastal storms to those who incur them by occupying hazardous coastal lands. Options 28 and 29, both of which constitute major departures from current state policies, offer alternative means of addressing this gap. Option 28 is constrained by its linkage to property insurance policies which are not held by all owners of coastal property. Option 29 is more inclusive but will require significant further study and debate. Neither of these options need stand alone. They are complementary to all the other policy instruments and are best viewed as providing balance to a comprehensive set of policies that address all three of the state's storm hazard mitigation goals.

PREFACE

In July, 1992, Bob Nave, then Director of the Division of Emergency Management, Florida Department of Community Affairs, prepared a draft issue paper on post-disaster redevelopment for discussion by the state's Interagency Management Committee. The premise of the issue paper was that the diverse array of statutes and administrative rules adopted to guide development and redevelopment within coastal high hazard areas of the state were not operating effectively. Statutory provisions often worked in conflict with each other and no cohesive policy framework had been developed to guide coastal development.

The discussion of the issues raised by Nave highlighted the significant costs that were accruing to the state as a result of current coastal development patterns. Both development and redevelopment often proceeded without adequate recognition of the need for hazard mitigation strategies; i.e., managing the natural and built environments in ways that address the hazards inherent in coastal storms. Adequate mitigation, it was argued, would reduce public costs by virtue of lower levels of storm damage to beaches, dunes, public facilities, and infrastructure, and would also reduce the public costs for emergency preparedness, response, and recovery. This strategy, however, would likely involve increased regulation of land use and development making it problematic from both legal and political perspectives. An alternative, wrote Nave, is a market based approach, in which public funds would be withdrawn from coastal high hazard areas so that the private sector would bear a larger proportion of the true costs of coastal development. As these costs mount, less development would be expected to occur.

It is unlikely that public policy would follow one approach exclusively over the other. The state's interests in the public welfare and in the protection of life and property argue against a full withdrawal from a regulatory approach. The specific policy mechanisms that are available under each approach may present different issues in feasibility and effectiveness. Moreover, the variety of different

environments within the state suggests that different approaches may work better in different locations. Both approaches, therefore, raise issues of what can be done, where, and with what expected results.

Given this background, the Interagency Management Committee, utilizing funds available through the federal Coastal Zone Management Act, awarded a contract to The Florida State University to study and analyze both the existing array of state policy initiatives as well as the possibilities for new policy initiatives concerning coastal development and storm hazards. The project was also intended to suggest a set of strategies that could lead to adoption and implementation through appropriate legislation and administrative rules.

This is the final report of that project. The project period ran from May through December 1993 under the direction of the co-principal investigators, Robert E. Deyle and Richard A. Smith, both of whom are members of the faculty in Urban and Regional Planning. Assistance was provided by David M. Haight in his role as planner-in-residence within the department, and by Dennis Smith, a graduate student in urban planning. In addition to his other contributions, Dennis Smith is the primary author of Appendix A.

Because of the complexity of the issues involved, the breadth of statutes, programs, and regulations existing at the federal, state, and local levels of government, and the short period given to their study, it is likely that we have missed considering some issue, or have misinterpreted the application of some programs. Indeed, few are as familiar with the nuances of programs and regulations as those who work with them on a daily basis, so there is little that we can add at this level. What we hope to accomplish, however, is a review and analysis of current policy efforts within a framework that suggests a comprehensive and coordinated approach at the state level to the issues of development and redevelopment in coastal areas.

We thank the many persons within federal, state, and local governments who, in dealing with the issues of coastal storms and coastal development on a daily basis, shared their insights, knowledge, and files with us. We also thank the members of the Coastal Management Program, Florida Department of Community Affairs, and especially the director of the program, Ralph Cantral, for their support and for the opportunity to study this issue.

CHAPTER 1

INTRODUCTION

THE NEED FOR COASTAL STORM HAZARD MITIGATION

More so than most other states, Florida is particularly vulnerable to damage from coastal storms. This vulnerability is the result of a number of conditions that have come together, including an extended coastline and proximity of all portions of the state to the coastal area; rapid population growth, much of which is located in coastal regions; and geographical location within an area that is particularly prone to coastal storms.[1] While no one of these conditions, by itself, significantly increases Florida's risk from coastal storm damage, taken together they represent a serious threat to the well-being of the state's population, to the safety of buildings and property, to the quality of the state's natural resources, and to the integrity of state and local fiscal resources.

The damage that storms have wrought on coastal areas of the state can be represented in frequency and costs of recent storms. Since 1982 there have been a total of seven storm events that have qualified for a presidential disaster declaration, and these events have involved, in total, 34 of the state's 67 counties. Some counties have been involved in more than one such event. Each of these storms, moreover, has involved significant public and private costs. Damage from Hurricane Andrew has been estimated at $20 billion, making it the costliest natural disaster to date in U.S. history (U.S. Federal Emergency Management Agency, 1992a). Less dramatic, but still costly, are other storm disasters. The 1992 flooding involving the counties of Manatee, Sarasota, DeSoto and Charlotte has been estimated to cost $7.6 million in federal public assistance disaster funds and $1.9 million in National Flood Insurance Program claims (U.S. Federal Emergency Management Agency, 1992c). The tornadoes and flooding that led to a disaster declaration in the counties of Baker, Clay, Duval, Hillsborough, Nassau, Pinellas, and Union, in October 1992, has

been estimated at $7 million (U.S. Federal Emergency Management Agency, 1992d).

As high as these costs are, they underestimate the actual magnitude because they do not account for private expenditures, as when private insurance claims are paid or restoration and repairs are done without insurance. Nor do they account for repairs that are not done, as when buildings are left abandoned and derelict. They do not account for the revenues lost to business, or lost tourist dollars, and they do not reflect the costs in human suffering and grief that accompany major coastal storms.

Coastal storms also impose significant direct and indirect costs upon the state and its local governments. Governments must prepare for and remain ready for storm disasters. Often this requires the maintenance of a response capacity to deal with disaster events, including the maintenance of emergency equipment and personnel, response plans, shelter facilities, and emergency services. Of major concern in preparation for a disaster is the capacity of the road and transportation facilities to evacuate coastal residents, and these facilities must be designed, built, and maintained.

Other state and local costs resulting from coastal storms involve losses to the built environment, such as with damage to infrastructure and engineered facilities. Public costs may involve repair and/or replacement to roads and bridges, schools, water and sewer treatment facilities, etc. Public costs are also involved in the maintenance and restoration of beach and dune systems as well as to other natural resources that are subject to storm damage. Currently, there are no sound estimates of the vulnerability of the state's infrastructure to storm related damage. Incomplete estimates published by the Florida Department of Community Affairs (1990) suggest, however, that the potential for damage is severe. These estimates indicate that within the most vulnerable Category 1 storm surge area there exist 27 major bridges and causeway systems connecting coastal islands to

the mainland, 132 small water supply treatment plants, 29 large water treatment plants (over 1 million gallons/day), 341 small wastewater treatment systems, 47 large wastewater treatment plants (over 1 million gallons/day), 52 electric substations, 19 electric power plants, and 16 airports. Unaccounted for is a vast network of roads and bridges, community facilities, hospitals and health centers, schools, public service facilities, and a variety of other facilities that constitute the heart and functioning of our communities.

Public policy has been committed to dealing with the costs and hardships imposed by coastal storms. To date the state has put into place a variety of programs and legislative initiatives that deal with the issues generated by these storms. These actions have involved the development of new state programs and regulations, articulation with existing federal programs, and requirements for new local actions that address storm and disaster related issues. These initiatives speak to a variety of important issues, including 1) management of initial coastal development for the purposes of reducing exposure to storm hazards; 2) preservation of beach and dune systems for maintaining natural storm protection capabilities; 3) alteration of the coastal environment to help reduce vulnerability to storms; 4) strengthening of buildings and facilities to reduce storm related damage; and 5) post-storm redevelopment to help insure that communities are rebuilt in ways that do not repeat many of the risks of initial development. Unfortunately, however, the various statutes, rules, and programs available through federal, state, and local sources do not provide a wholly adequate and effective set of policy responses to the problems of storm hazards. Indeed, these programs "often work in conflict with each other, and do not form a cohesive policy framework to guide development and redevelopment (in coastal areas). What is missing is an integrated and coordinated state policy" that provides for a more effective response to the problems of storm damage. (Nave, 1992).

These perceived inadequacies of current coastal storm hazard policies represent the basis for this

study. Our charge is to examine the current array of policy initiatives within the state, as they exist within the context of federal and local policies, and to propose suggestions for the development of an integrated and coordinated policy system. The charge is represented in the three major project tasks spelled out in the study proposal, as follows:

1) What strategies are available that could play a role in a coordinated program of coastal storm hazard mitigation and post-storm redevelopment policies for the State of Florida?
2) How have the individual strategies been implemented and how effective have they been?
3) How can these strategies be implemented in Florida and what mix of strategies could be integrated into an effective, comprehensive state program appropriate to the unique physical, institutional, and legal setting of Florida's coastal high hazard area?

A PERSPECTIVE ON POLICY

Addressing these questions and working toward the development of an integrated policy framework requires an analytic perspective and guide. This guide should serve the double purpose of providing a framework for the evaluation of current policy efforts, as well as providing the basis for the development of new ideas. We have developed this perspective by initially considering each of the three dimensions that characterize a policy analytical framework. The three dimensions are consideration of: 1) what is to be accomplished (i.e., desired outcomes); 2) the means that are available for achieving these outcomes (i.e., policy instruments); and 3) the context within which means are adopted and implemented. Within each of these three categories our perspective articulates and differentiates the major considerations. Thus, we specify the desired outcomes that

would constitute an integrated storm hazard policy for the state, specify the means that are available to implement this policy, and examine the context within which the effectiveness and feasibility of these means are conditioned. The outline of this perspective is presented in Table 1.1 and details of the framework are discussed below.

DESIRED OUTCOMES

Desired outcomes are articulated in terms of a set of goals and objectives. Goals are general statements of intended outcomes; objectives tend to be more specific statements about outcomes that are related to and derive from the more general goals.

Goals

There are multiple goals governing the issues of storm hazards in coastal areas that serve to both justify and orient public policy intervention. These goals are variously expressed in state statutes and rules, often independently but sometimes together. Three goals appear within the state statutory and regulatory framework, most prominently in Chapters 161, 163, 186, 187, and 380 Florida Statutes. These goals are taken as the guiding principles of the project and are summarized as follows:

1) To protect and preserve coastal environmental resources.

2) To protect human life and property.

3) To limit public expenditures in areas subject to destruction by natural disasters.

We recognize that in any concrete circumstance goals may conflict. Thus, the goal of minimizing public expenditures may be at odds with that of protecting coastal natural resources, etc. An integrated policy framework should anticipate these conflicts and suggest the conditions under

Table 1.1: Outline of the Policy Analytical Framework

1. Desired Outcomes
    - a) Goals
    - b) Objectives
2. Policy Instruments
    - a) Means
        - Regulation
            - Regulation of construction & site development
            - Regulation of land use
        - Mandate
            - Planning mandates
            - Regulatory mandates
        - Investment
            - Acquisition of coastal property
            - Development of capital facilities & infrastructure
        - Incentive
            - Economic incentives
            - Education & information
    - b) Temporal characteristics
        - Development
        - Redevelopment
3. Context
    - a) Jurisdictions
        - Federal
        - State
        - Local
    - b) Environments
        - Level of development
        - Susceptibility to storms
        - Vulnerability to damage

which one may take precedence over another. The existence of multiple goals also suggests that particular policies about coastal hazards may serve different masters, thereby complicating the task of evaluating the effectiveness of alternative policies.

Policy Objectives

Policy objectives appear in various policy documents and administrative regulations, although these have not been codified into any consistent set of objectives. For each of the goals noted above we have identified a number of policy objectives as they appear in various state documents. Nevertheless, additional objectives are possible and may be considered. The policy objectives indicated below are suggested as important initial statements of what should be achieved.

1) Protection of natural resources:

   a) Preserve the natural storm protection features of the coastal environment.

2) Protection of life and property:

   a) Alter the coastal environment to reduce vulnerability to storms.

   b) Reduce the vulnerability of buildings and facilities to storm damage.

   c) Manage the development and redevelopment of land to minimize threats of storm damage.

3) Minimizing public costs:

   a) Reduce the vulnerability of public capital facilities and infrastructure to storm damage.

   b) Manage the development and redevelopment of land to minimize public costs of disaster planning, response, and mitigation.

   c) Allocate public costs of storm hazards to private sector users in proportion to risk.

POLICY INSTRUMENTS

Policy instruments are the mechanisms by which policy goals and objectives can be achieved. Two dimensions of policy instruments are their content and temporal characteristics. Content refers to the specific subject or policy strategy of the instrument. Temporal characteristics refer to the point within the planning and development sequence in which the instrument is put into effect.

Content

There are a variety of means available for effecting storm hazard goals and objectives and each means may serve a variety of objectives. We have organized the consideration of these means into four general subject categories, corresponding to the distinctions between regulation, mandate, investment, and incentive. Regulation refers to a government imposed requirement on the private sector for action or a requirement that action be constructed in a particular way. Government specified building codes represent one example. Mandate is similar to regulation but exists between higher order and lower order governments. For example, the State of Florida mandates that local governments prepare a comprehensive plan. In contrast, investment strategies attempt to influence outcomes through a "priming" mechanism. Governments commonly invest in infrastructure as a way of influencing the course and pattern of private development. The fourth category, incentives, is commonly thought of as options that are provided by government and made available to induce certain types of behavior by other public or private actors. While in some cases investments may operate as incentives for private action, not all investments are taken for these purposes. In contrast, incentives, such as tax relief, are available only if and when private sector actors participate in the specific behavior in question. The category of incentives also includes disincentives, such as when higher costs are imposed on private actors who engage in behavior that governments wish to discourage. The types of means available under each of the three categories are as follows.

Regulation. Two types of regulation are regulation of construction and site development, and regulation of land use.

Regulation of construction and site development. This category of regulation pertains to the construction and engineering of sites, and includes building codes, set-back and elevation requirements, septic tank requirements, and others designed to regulate the characteristics of construction and site development.

Regulation of land use. This includes regulations that govern the permissible uses of land and the conditions under which the land can be developed. Common examples include the land development regulations and zoning codes that are adopted to implement the local comprehensive plan.

Mandate. Mandates are requirements imposed by higher levels of government on lower levels. Two types of mandates are considered: planning and regulatory.

Planning mandate. Higher levels of government impose a requirement that lower levels of government develop a policy or prepare a plan for a set of issues, but the content of the policy or plan is left unspecified and the lower level of government is free to meet the issue as it sees fit. Thus, states impose the preparation of a comprehensive plan on local communities, or the federal government imposes the preparation of a hazard mitigation plan on the states.

Regulatory mandate. Higher levels of government mandate that lower levels of government impose specific regulatory mechanisms. Thus, the state may require local governments to adopt particular minimum building and construction standards.

Investment. Investment refers to direct expenditure by governments, either for property interests or the construction of infrastructure and facilities.

Acquisition of coastal property. This involves the control of property interests in land by a

public agency resulting in the full or partial removal from the development market. Acquisition may involve fee simple purchase, purchase of development rights, the purchase of easements, and others.

Development of capital facilities and infrastructure. Capital facilities and infrastructure are provided by a public agency with the authority to define the conditions under which such services and facilities will be used. Public agencies typically provide utilities, roads, water and sewer services, parks, etc. and determine the location of these facilities.

Incentive. Incentives are mechanisms constructed by government that are used to encourage appropriate behaviors by a lower level of government or private actors.

Economic incentives. Incentives include tax relief and development incentives, including density bonuses and transfers of development rights that are made available by public agencies in order to influence market behaviors. Disincentives may include added costs and fees, such as impact fees. Incentives and disincentives may also be applied to other levels of government.

Education and information. Public agencies may provide a variety of information, data, and other sources of intelligence to community members and other public agencies in order to inform them of costs, risks, benefits, and opportunities associated with coastal storm hazards.

Time

Policies relating to storm hazard mitigation contain a time dimension, characterized as either pre- or post-storm. Pre-storm policies that are designed to address hazard issues are those that focus on the initial development of land. Policies that address post-storm issues are concerned with those of redevelopment and relocation. Mitigation through development and redevelopment creates a continuing cycle of building and construction activities and often the same policy instruments can

be applied at each stage of the cycle. Nevertheless, the opportunities for realizing hazard mitigation policy objectives may differ at each stage of this temporal sequence. During the development stage the opportunity may exist to construct land use patterns over large tracts of coastal land, effectively influencing both the intensity and density of land development with respect to hazard issues. In contrast, during the redevelopment phase, fewer land parcels are likely to be involved and existing use patterns and investments may make the realization of hazard mitigation objectives more difficult. Thus, the same means may be more effective at one particular stage of the cycle as a result of differences in the development context.

POLICY CONTEXT

Context refers to a variety of conditions that characterize the environment within which policy instruments are applied and which will affect the feasibility and effectiveness of the instrument. For example, tax incentives for promoting private sector redevelopment or relocation must respond to the availability of suitable land for relocation and the local economic context within which redevelopment takes place. An integrated policy perspective should take account of the type of contexts within which alternative policy instruments are likely to be effective.

Our framework suggests that two contextual features are particularly important. These are the government jurisdiction applying the policy instrument and the characteristics of the environment within which the instrument is implemented.

Jurisdiction

Policy initiatives and actions may be applied at a variety of jurisdictional levels. While our concern is with the evaluation and design of state policy, state actions occur within the context of federal and local action. At each jurisdictional level there are different policy interests, resources, and legal authority for adopting and implementing different policy instruments. Thus, federal policy is

important because of the large resources available to the federal government for effecting policy as well as the unique interests and authority that reside at the federal level. Local actions are particularly important because land use and development decisions are made, for the most part, at the local community level. The willingness and ability of local communities to deal with storm hazard issues as part of their control over development will have a significant impact on the design and impacts of policy.

Environment

There are a variety of man-made and natural environments within which storm hazards occur and within which policies are applied. Natural environments may vary along important dimensions such as sandy vs. non-sandy shore, topography, the presence of dunes, and the presence of vegetation, and these characteristics will affect the potential for shoreline erosion, flooding, storm surge, and wind damage from storms of different magnitudes. Similarly, population and land use activities are not uniformly distributed over the coastal area and variations in both the density and intensity of development give rise to differences in the potential for damage created by coastal storms.

Three characteristics of environments are distinguished as particularly relevant: level of development, susceptibility to storms, and vulnerability to storm damage.

Level of development. Development level characterizes the degree to which a coastal area is developed or undeveloped, as well as the characteristics of this development. These considerations will affect both the potential for storm related damage as well as the opportunities for hazard mitigation strategies. Where development is extensive, the opportunities to influence the density and intensity of land use for the purposes of hazard mitigation will necessarily be limited and these opportunities are more likely to concentrate in the redevelopment portion of our temporal sequence. Alternatively, where levels of development are low, greater potential exists to realize hazard

mitigation objectives during the initial land development process.

Susceptibility. Susceptibility to storms characterizes the probability that an area will experience a storm of a given magnitude over a time period. We expect that communities with high probability of a storm event may be more willing to address hazard mitigation objectives on a pre-storm basis than areas in which the probability of an event is low.

Vulnerability. This concept relates to the likelihood of environmental damage from a storm of a given magnitude. Vulnerability may be related to the level and characteristics of development, but it also includes the potential for damage to natural systems. We expect that the potential for realizing hazard mitigation objectives will also be greater in those environments with higher levels of vulnerability.

OVERVIEW

The above framework creates the basis for our review and structures our perceptions and evaluations about current coastal storm hazard mitigation and post-storm redevelopment policies. It will also be used to structure our suggestions for new policy initiatives.

Our analysis begins with the statement of goals and objectives summarized in this introductory chapter and poses the question as to how these goals and objectives can be achieved. Current policies for realizing these policy objectives are reviewed and evaluated in Chapters 2-4 according to our three part jurisdictional distinction. Thus, in Chapter 2 we review and evaluate the content and operation of federal programs that affect storm hazard policies. In Chapter 3 we review and evaluate the current status of state policy initiatives. In Chapter 4 we evaluate the policies of local governments within the state through a content analysis of the coastal element of a selection of

local comprehensive plans. In each of these three chapters we maintain a correspondence with our framework in which policy initiatives are organized according to the four part distinction of regulation, mandate, investment, and incentive and are discussed and evaluated according to the broader aspects of our framework.

The consideration of new policy instruments is the subject of Chapter 5. In this chapter we review the initiatives for coastal storms and other natural hazards occurring in other states. These initiatives are evaluated for possible use in the Florida context.

In Chapter 6 we bring the separate parts of the analysis together into a set of policy options for the State of Florida. The options derive from our evaluations of the Florida context and especially the characteristics of the coastal environment, how current policies at each jurisdictional level are operating and how they can be improved, and the information that we have collected regarding policy initiatives in other states. Our purpose in this final chapter is to suggest how state policy goals and objectives can be achieved through different policy instruments, organized at various jurisdictional levels.

ENDNOTES TO CHAPTER 1

1. Of the state's 67 counties, 35 have coastlines that front on either the Atlantic Ocean or the Gulf of Mexico. These counties have approximately 1350 miles of general coastline and 8436 miles of tidal inlets, bays, and waterways. Approximately 78% of the state's population lives in these 35 coastal counties. (Florida Department of Community Affairs, 1993)

CHAPTER 2

A REVIEW OF FEDERAL PROGRAMS FOR STORM HAZARD MITIGATION AND POST STORM REDEVELOPMENT AND STATE PARTICIPATION AND IMPLEMENTATION

INTRODUCTION

State action for hazard mitigation and post-storm redevelopment exists within the context of federal legislation and programs. These programs, developed to pursue federal goals and interests, are operated within state and local jurisdictional boundaries. In some instances they operate with the state as an active partner, while in others the state is not a necessary participant, although opportunities for the state to become involved, directly or indirectly, may exist. The construction of an integrated coastal storm hazard mitigation policy for the state requires that state participation in federal storm hazard programs be identified and evaluated, with the aim of understanding how federal policies and programs can be leveraged in support of state policy objectives.

Four bodies of federal legislation are relevant to state storm hazard mitigation and post-storm redevelopment policies. They are:

1) National Flood Insurance Act

2) Disaster Relief (Stafford) Act

3) Coastal Barrier Resources Act

4) Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) of 1972 involves planning mandates that provide federal funding for the development and operation of state coastal management programs that are unique to each state. Since program participation develops state policy rather than a set of activities that are articulated with federal programs, we will reserve treatment of the CZMA and the

state plan for the chapter dealing with state policies (Chapter 3). In what follows is a brief summary of each of the other federal programs and an analysis and commentary on how well each pursues -- or can be reconstructed to pursue -- state policy objectives.

NATIONAL FLOOD INSURANCE PROGRAM

OVERVIEW

The National Flood Insurance Act (42 USCA §4001-4128, 1968) was adopted in order to provide previously unavailable flood insurance protection to property owners in flood prone areas. The act establishes the National Flood Insurance Program (NFIP), administered by the Federal Emergency Management Agency (FEMA).

The National Flood Insurance Program provides for the availability of insurance to property owners located in flood prone areas, defined as communities that contain a 100 year floodplain. The insurance is made available to owners of individual structures, but only within those communities that elect to join the program. Community membership, moreover, is contingent upon local government adoption and enforcement of a set of specified construction and land development regulations that are designed to minimize the risk of loss to structures in the flood prone areas. The minimum acceptable regulations are specified by FEMA (44 CFR §60).

The nature of the local community regulations depends on the flooding characteristics associated with the designated flood prone areas. Four flood areas and associated regulations exist (44 CFR §60.3, 60.5), as follows:

1) For river systems, a floodway is defined as the channel of the river and the adjacent

land that must be reserved in order to discharge the base flood without increasing the water surface elevation. Regulations must prohibit all building and development within this area unless it can be shown that such building will not increase flood levels.

2) 'A-zones' are defined as the area of the 100 year floodplain. Within this zone all new or substantially improved residential structures must be elevated above the base flood elevation, and this may be accomplished through the use of fill. Commercial and industrial structures may be elevated or floodproofed.

3) 'V-zones' (termed the coastal high hazard area) are defined as the areas subject to damage via wave action of up to 3 feet. Within these areas all new or substantially improved structures are required to be elevated to allow for the passage of wind driven water below them. All structures, moreover, must be built landward of the mean high tide line. Insurance premiums are higher in these higher risk zones.

4) 'E-zones' are defined by the 1973 amendments (Flood Disaster Protection Act) and are intended to reflect those areas subject to acute erosion caused by water action. These zones are to be defined by FEMA, within which the local community must require setbacks for all new development. The setbacks are intended to create a safety buffer, consisting of natural vegetation or land elevation between the development and water body, that can be used for green space, agriculture, outdoor recreation, etc. When these E-zones have not been formally defined by FEMA and the community indicates that these erosion hazards are present, the community is obliged to "consider" flood related erosion in their local planning process and land development decisions. (E-zones have not yet been defined for Florida or any other state (National Research Council, 1990)).

Insured structures that sustain damage requiring repairs valued at less than 50% of the current

market value of the structure may be made from insurance proceeds according to the original design of the structure. Only structures that sustain damage that requires "substantial improvement," equal to or exceeding 50% of the market value of the structure, are subject to the design/construction standards that regulate new structures. Where substantial damage has occurred or where a structure is subject to repeated flooding, FEMA may elect to negotiate a purchase of the property and to transfer it to a state or local agency. Under this option (Section 1362), the public agency must agree to remove the structure and to hold the land, in perpetuity, for recreation, open space, or other similar non-developed uses.

Structures may also be removed, through demolition or relocation, under the 1987 Upton-Jones amendments (Section 544 of the Housing and Community Development Act of 1987). Under these provisions, FEMA may pay an insurance and relocation claim on a structure prior to the actual damage when an authorized state or local authority certifies the structure in danger of imminent collapse or subsidence from water related action in response to a request from the owner. Relocated structures must be placed on a new site (but not necessarily a new parcel) beyond a 30 year erosion setback line defined by FEMA. If an owner does not participate in this removal/relocation option, subsequent collapse of a certified structure entitles the owner to reduced insurance benefits only. Furthermore, for all parcels of land on which this determination is made, no further and subsequent assistance is available under the act.

ANALYSIS

The National Flood Insurance Act is principally of interest to state storm hazard mitigation and post-storm redevelopment policy because of its focus on both construction standards and land use in flood hazard areas. Through a system of incentives and investment the program attempts to achieve three main objectives that correspond to policy objectives noted for Florida. The objectives of the NFIP include:

1) The construction of buildings to design standards that will reduce the risk of damage from flooding.

2) The discouragement of further development in flood hazard areas.

3) The removal/relocation of existing threatened structures from flood hazard areas.

Virtually all Florida communities participate in the insurance program (U.S. Federal Emergency Management Agency, 1992e) and this provides the potential for near universal floodplain regulation. The design of the program involves FEMA directly with local communities and insured properties; the state is a minor part of this federal-local relationship. Nevertheless, given the program's potential to achieve a number of state policy objectives, it can be an important component of the state's policy instruments. There also are significant opportunities for state action that promote and extend the federal program in pursuit of these state policy objectives. Thus, Florida has taken some additional steps to enhance the program by requiring program participation for all communities that wish to be included in the state's hazard mitigation plan prepared under the federal Disaster Assistance Act (Chapter 252 FS), and by requiring construction to the standard specified in NFIP within the state's coastal building zone, irrespective of whether the local jurisdiction is a participant in NFIP (Chapter 161 FS). At issue, however, is how well the three potential benefits of the program are realized in Florida and the degree to which the state can utilize the program in pursuit of hazard mitigation and post-storm redevelopment objectives. Our perceptions are given below.

Improving Construction Standards to Minimize Flood Damage

While the standards under NFIP are written as minima, there is little doubt that they are considerable improvements over the standards generally in effect in flood prone areas prior to the implementation of the program. In spite of a general improvement, however, there are severe limitations. The standards adopted by the program apply only to newly constructed buildings within

flood hazard areas or to buildings that, as a result of flood related damage, require repairs that are at least 50% of the current market value of the structure (i.e., substantial improvements). Thus, many older structures, not initially covered by the higher building standard, are able to avoid meeting the higher standard by virtue of the magnitude of the repairs that may be required. FEMA's standard of substantial improvement, moreover, is based on a single incident. Thus, older structures may undergo successive improvements and repairs over time, each of which is under the 50% improvement threshold, and not meet the newer construction codes. Cumulatively, such structures can achieve 100% improvement. Unfortunately, data do not exist on the proportion of flood insurance claims that have involved substantial damage (Speights, 1993), and no assessment of the impact of this program on the upgrading of structures is possible.

It is also not clear that when structures do require substantial improvements that the standards will be maintained. Currently, the insurance program is not designed to fund the additional costs of repair of a structure to the higher construction standard and this can cause serious hardship to homeowners. Thus in Dade County, after Hurricane Andrew, local officials prevailed upon FEMA to use a standard of replacement value rather than market value to define the threshold for substantial damage. The effect was to reduce the number of structures classified as substantially damaged and, therefore, the number of structures that were subject to being repaired under the requirements for new construction.

Florida has taken a number of steps to promote and enhance the operations of the NFIP, and the minimum standards of construction are supplemented under Florida legislation in a number of important ways. Chapter 161 FS defines the Coastal Building Zone (CBZ; see Chapter 3 for a discussion of the CBZ.) Local communities that contain a CBZ are obliged to adopt a series of state specified building standards and to incorporate these standards into the local building code irrespective of their participation in the flood insurance program (i.e., regulatory mandate).

Furthermore, the statute defines "substantial improvement" as any repair or improvement that exceeds a cumulative total of 50% of the market value of the structure over a five year period. This definition contrasts with the FEMA standard and extends it by a considerable degree. This more stringent requirement holds only for structures within the CBZ however; the state has not sought to mandate a similar cumulative condition over a larger area of the coastal zone. Current policy by Florida Department of Community Affairs encourages local communities to adopt a five year period for accumulating repair costs but no data exist on the number of communities that have adopted this standard (Speights, 1993).

Other supplements to the requirements of FHIP that are defined within Chapter 161 FS are the Coastal Construction Control Line (CCCL) and the 30 year erosion setback line (this line is within the CCCL). The CCCL is defined for the areas of coastal counties that contain a sandy shore. All new construction within this area must receive a construction permit from the state and must meet specific construction conditions as well as exist landward of the setback line. These standards are designed to protect the beach and dune system and go beyond those required by NFIP alone. Unfortunately, however, the state does not impose a substantial improvement condition over those existing structures that suffer from storm related damage. Such structures may be rebuilt on their existing foundations without reference to the permitting or setback requirements. (See Chapter 3 for a fuller discussion of the CCCL and permitting requirements.) The 30 year setback line also represents an independent supplement to the FHIP requirement that FEMA define E-zones within which building setbacks are required to protect against the effects of erosion. Again, however, these setbacks, as defined under Chapter 161 FS, exist only in areas with a sandy shore. Since FEMA has not yet defined E-zones it is impossible to comment on how the state defined setback will compare.

Discouraging Further Development

In spite of the potential for widespread floodplain management, the flood insurance program represents only moderate potential for affecting the type and density of development in flood hazard areas. Participating communities must adopt restrictions on development only in the floodways of riverine systems; no such restrictions are required for larger floodplains including coastal areas. Under this system, the only mechanism for discouraging development in coastal areas is the rather indirect one created by the imposition of higher development and construction costs required to meet NFIP standards. But these standards may be relatively minimal and the costs are not always an important part of the development and construction calculus. This is particularly true in coastal areas where the value of the land may make additional construction costs a relatively small part of the total development cost. To the contrary, the NFIP has been criticized for making development easier in areas where it may not have otherwise occurred. The existence of a system of insurance has made it more attractive to finance development in areas in which the risks, without insurance, may have been too great.

The flood insurance program also attempts to discourage floodplain development through a disclosure/notification mechanism. The authorizing statute (42 USCA §4104a) mandates that federal bank regulatory agencies require the financial institutions under their authority to notify the purchaser or lessee of land of flood hazards to the property in conjunction with any associated financial transaction. In addition, the program regulations (44 CFR §60.22) contain language recommending that local communities adopt a similar disclosure requirement. Unfortunately, we have no information about how well the federal notification requirement has worked. Similarly, no centralized source of information exists for the State of Florida regarding the number of communities that have adopted a local notification requirement or what effects a requirement has had on development (Speights, 1993). In our discussion of the Community Rating System (CRS, discussed below) we note that only 22% of a sample of Florida communities indicate the adoption

of a notification program (but the sample is small and not all communities within the state participate in the CRS program.)

More effective for discouraging development may be the additional development controls that communities can impose within flood prone areas. Local communities are given incentives to adopt both construction and land use regulations that are more stringent than the required minima as specified by the act. FEMA has outlined additional construction and land use regulations (44 CFR §60.21-60.22) that communities are encouraged to consider as part of a comprehensive floodplain management program. These additional community regulations speak to planning, land use and land development, and building construction standards, including the requirement for consistency between state, local, and regional comprehensive plans and floodplain management programs (44 CFR §60.22(c)(16)). FEMA encourages communities to adopt more stringent building and development regulations and offers a program, the Community Rating System (CRS), whereby local flood insurance rates are reduced according to the degree to which the community adopts higher standards. This prospect of lower rates is an incentive for community participation in the CRS. Florida's growth management laws further promote regulation of development within floodplains. Chapter 163, Part II FS and Rule 9J-5 FAC governing the preparation of local comprehensive plans, require local governments to address floodplain management in their future land use, conservation, and coastal management elements. Additionally §163.3202 FS and Rule 9J-24.003 FAC require local governments to adopt land development regulations to implement floodplain management plans. The latter rule requires that floodplain regulations control the type, location, density, and intensity of land uses that local governments allow within the flood prone area. Because of these requirements, state officials claim that local governments within Florida have already undertaken program activities that extend beyond the minimum required by FHIP and may be well positioned to qualify for insurance rate discounts under the CRS program (Florida Department of Community Affairs, Division of Emergency Management, nd).

While it is true that state statute and administrative regulations require local communities to address issues of floodplain development, the expectation that Florida's communities already have in place an effective system of development regulation in these flood areas appears overstated. The requirements for the appropriate elements of the comprehensive plan are stated in terms of goals, objectives, and policies. Frequently the goals and objectives are vague and general, and the policies adopted by communities are weak, ambiguous, or inappropriate. These conclusions derive from a review of a sample of city and county coastal management elements, the results of which are reported in Chapter 4. Communities are also required to adopt a set of land development regulations that implement these policies. These regulations were due within one year of the adoption of the comprehensive plan. The State Department of Community Affairs (DCA), however, has no authority to comprehensively review these regulations and their status as effective mechanisms for regulating floodplain development is unknown.

If the Community Rating System is intended to be an effective extension of the basic flood hazard protection of the act, then it is instructive to understand the level and extent of community participation within the state. Currently, only 106 out of a total of 204 (52%) coastal cities and counties participate in the program as determined by a comparison of coastal communities with a list of 144 CRS participants maintained by DCA. The level of participation within CRS varies considerably, however, with some communities having adopted more comprehensive and rigorous floodplain management programs than others.

Comprehensive data on the magnitude and nature of participation in the CRS program are available but we have not been allowed to view these data.[1] We have, however, secured a small set of 41 community applications to the CRS program from DCA. They cover a small number of both coastal and non-coastal communities, but are not representative of the distribution of all communities within the state. Moreover, since the reports whereby the accuracy of community applications are

evaluated were not made available, it is not possible to determine which of the CRS activities contained in each community's application are actually in place. Nevertheless, a tabulation of these activities, shown in Table 2.1, gives a crude idea of the distribution of these floodplain management programs within local jurisdictions. Table 2.1 also compares these distributions with those at the national level, as provided by FEMA (U.S. Federal Emergency Management Agency, 1992g). The codes associated with each activity are those given by the program; their definitions are as follows (Florida Department of Community Affairs, Division of Emergency Management, nd; U.S. Federal Emergency Management Agency, 1992g):

Public Information Activities

310 Elevation certificate: maintain FEMA's elevation certificates and make copies available upon request.

320 Map determinations: respond to requests for information on Flood Insurance Rate Map zone and flood data.

330 Outreach projects: advise residents about the flood hazard, flood insurance and flood protection measures.

340 Hazard disclosure: ensure that potential purchasers of flood prone properties are aware of the hazard.

350 Flood protection library: maintain a library of references on flood insurance and flood protection.

360 Flood protection assistance: provide direct advice to property owners desiring to protect themselves from flood damages.

Mapping and Regulatory Activities

410 Additional flood data: develop new flood elevations, delineations and other regulatory flood hazard information.

420 Open space preservation: preserve floodplain areas for conveyance and storage of flood waters.

430 Higher regulatory standards: adopt regulations which protect future development at higher standards (e.g., freeboard, compensatory storage); protect beaches and dunes; and protect floodplains with low density zoning.

440 Flood data maintenance: make the community's floodplain maps more current, useful and accurate.

450 Stormwater management: regulate new developments outside the floodplain to minimize adverse effects of development in flood-prone areas.

Flood Damage Reduction Activities

510 Repetitive loss projects: develop and implement a plan to reduce damages in repeatedly flooded areas.

520 Acquisition and relocation: relocate buildings and convert flood-prone properties to open space.

530 Retrofitting: document retrofitting measures taken to protect buildings from flood hazards.

540 Drainage system maintenance: maintain the capacities of drainage channels and detention facilities in developed areas.

Flood Preparedness Activities

610 Flood warning program: provide flood warnings to the public and develop a response plan.

620 Levee safety: maintain levees not recognized by the NFIP and develop emergency response plans for them.

630 Dam safety: refers to state dam safety program.

Table 2.1 shows that both nationally and for Florida, only a small number of management programs are adopted by a majority of communities. Two of these majority activities (codes 310 and 320), while important to the flood insurance program, are data storage and reporting activities and are not active efforts to control development. A small number of CRS activities appear to us as particularly important in the context of storm hazard mitigation and post-storm redevelopment because they involve local programs and regulations that affect directly floodplain development and redevelopment. Important examples include 430 (higher regulatory standards) and 520 (acquisition and relocation). In each instance the percentage of Florida communities adopting appropriate programs is relatively small, and less than the national proportions, and this is in spite of the local comprehensive plan requirements (Chapter 163 FS and Rule 9J-5 FAC) that address these issues. These findings, moreover, are consistent with the relatively low levels of adoption and use of

Table 2.1: Participation in the Community Rating System, Florida and U.S.

Activity	% of applicants Florida	US
Public Information Activities		
310 Elevation certificate	97.5	100
320 Map determinations	95.0	92
330 Outreach projects	30.0	53
340 Hazard disclosure	22.5	40
350 Flood protection library	90.0	77
360 Flood protection assistance	25.0	45
Mapping and Regulatory Activities		
410 Additional flood data	7.5	20
420 Open space preservation	30.0	42
430 Higher regulatory standards	22.5	59
440 Flood data maintenance	12.5	41
450 Stormwater management	52.5	37
Flood Damage Reduction Activities		
510 Repetitive loss projects	37.5	11
520 Acquisition and relocation	0	13
530 Retrofitting	0	3
540 Drainage system maintenance	92.5	82
Flood Preparedness Activities		
610 Flood warning program	32.5	5
620 Levee safety	2.5	0
630 Dam safety	0	45

hazard mitigation techniques found by Burby and Dalton (1993) in a comparison of Florida, North Carolina and Texas communities.

Land Use Changes through Removal and Relocation

The NFIP also contains a number of incentives to encourage land use change through removal and relocation. Section 1362 of the act provides for structures that are repeatedly damaged by flooding

to be purchased by FEMA (acquisition). Title is then given to the state or the local community who accept responsibility for demolishing the structure and holding the land in non-developed uses. Additionally, structures can be demolished or relocated where they fall under the condition of imminent collapse specified by the Upton-Jones amendments. In this instance incentives are offered to make it attractive for landowners to participate in the removal/relocation.

Within Florida the purchase of structures and parcels by FEMA and the subsequent preservation of these parcels in non-developed uses by local governments has been negligible. To date, only one parcel, located in Longboat Key, has been purchased (in 1988) under the Section 1362 program (Wilson, 1993). A number of conditions operate to reduce the potential usefulness of this program. It applies only to structures that are insured under NFIP and this is a relatively small proportion of the total number of structures within the CHHA. Exact figures for the CHHA are unavailable (Speights, 1993), but data made available by DCA for 1988 and organized by flood hazard versus non-flood hazard area show that only 26% of the households in flood hazard areas are insured. Other conditions that seem to limit the program include relatively small program budgets, a preference for contiguous parcels and the high price of such parcels in a coastal environment. From the perspective of the local community, the incentive of securing title to the land does not appear to outweigh the costs of demolition and the lost tax revenue (Wilson, 1993). Florida has moved to incorporate the Section 1362 program within its regulatory system by specifying that if a coastal construction permit cannot be approved for an otherwise eligible structure, the state will recommend that the property be acquired under the program (§16B-41.005(9) FAC). This option has not occurred, however, for the reasons cited, including a perceived lack of interest on the part of local governments to accept title to Section 1362 properties (Green, 1993). It is unlikely, therefore, that this program will ever become an important component of post-storm redevelopment policy within the state.

Use of the Upton-Jones provisions has also been very limited (National Research Council, 1990), and no claims under this program have occurred in Florida. Moreover, Florida officials are not sanguine about the potential for this program within the state (Speights, 1993). The erosion conditions along Florida's coast are not likely to produce many conditions of imminent collapse as specified by the legislation and the incentive offered to landowners may not be sufficiently attractive to induce participation (National Research Council, 1990). Even if the program were to operate, however, the removal of structures is likely to occur on a small scale and piecemeal basis so that large scale and long range planning for the future use of both these and Section 1362 sites is impracticable.

The public ownership of land is not well stimulated by the incentives offered through NFIP. However, the attractiveness of direct investment through acquisition of flood prone parcels has been addressed in a report written by the DCA (Florida Department of Community Affairs, 1986), but until recently, acquisition for the purposes of hazard mitigation was not recognized as a formal criterion. The State of Florida has recently taken the initiative, however, through the ELMS III bill (CS/CS/HB 2315,1993), in providing for acquisition for the purposes of hazard mitigation in the Conservation and Recreation Lands program (CARL). Additionally the Florida Communities Trust (FCT) program provides for cost sharing for acquisition by local jurisdictions when the purchase is in support of the local comprehensive plan, and specifically including the coastal management element of the plan. This would also allow for acquisition for the purposes of hazard mitigation. (See Chapter 3 for a fuller discussion of state acquisition programs.)

Acquisition of properties in the CHHA by local communities, while made substantially easier by the ELMS bill, may still not occur because of the impediments to local action. These impediments are, chiefly, the adoption of acquisition as a strategy for hazard mitigation at the local level, the local share of acquisition costs and the loss of tax revenues on acquired properties. In Chapter 4 of this

report we review selected content of a sample of local coastal management elements and find that 44% of the sampled communities include objectives or policies that use acquisition for hazard mitigation. In our analysis of the Community Rating System program, however, we found no communities that indicate an operational acquisition program. Acquisition for the purposes of hazard mitigation, therefore, does not appear to be a much sought after alternative.

OTHER INITIATIVES

The ability of states to play a larger role within the flood insurance program and to address the three objectives of encouraging construction standards that reduce the risk of damage, discouraging floodplain development, and promoting removal and relocation of threatened and damaged structures, are enhanced under new legislation that has been introduced into the U.S. Senate by Senator Kerrey (National Flood Insurance Reform Act of 1993, S.1405). The bill addresses some of the shortcomings of the current act and focuses the flood insurance program more directly on mitigation activities, thereby providing states and communities with the ability to address flood hazards prior to their occurrence. By including states as a major actor in the design of mitigation strategies, the bill creates new opportunities for state leadership.

Among the provisions of the bill is the establishment of a funding program for state and local community mitigation activities that are designed to reduce the risk of flood and erosion damage to insured structures (Title IV). To be eligible for funding a state or community is required to develop an approved flood and erosion risk management plan that is more protective against flood and erosion losses than the minimum FEMA requirements. The plan is to include a comprehensive strategy for mitigation activities. The latter may include regulation instruments (elevation, relocation, demolition, or floodproofing requirements); investment instruments (acquisition of property for public use that has been substantially damaged by floods); and incentive instruments (the provision of technical assistance by states to localities). Funding also is available for planning

assistance grants under which these mitigation plans may be developed. Federal cost sharing is proposed on the basis of a 75% federal share, thereby creating the further opportunity for the state to readily leverage federal funds for state and local projects.

Since acquisition is included within the set of eligible mitigation strategies, the little used Section 1362 program is repealed (§404). Other parts of the proposed bill include statutory authorization for the CRS program (Title III), restrictions on the availability of insurance within the 30 and 60 year erosion zones (§406) and the addition of funds to cover the costs of bringing a substantially damaged structure up to code when repaired (§602).

DISASTER RELIEF (STAFFORD) ACT

OVERVIEW

The Disaster Relief Act of 1974 was enacted as a means of providing assistance by the federal government to states and communities in dealing with the issues associated with emergencies and major disasters. These issues include those of damage to property and the impacts on individual and family welfare. The act was amended in 1988 to provide for a broadening of disaster relief programs, to encourage the development of comprehensive disaster preparedness and assistance plans, and to encourage states and localities to adopt hazard mitigation measures, including land use and construction regulations, as a means of reducing disaster related losses. Federal assistance is meant to be supplemental and to extend beyond the levels at which states and localities are able to respond on their own resources.

The process of assistance is initiated by a declaration by the President, after application from the

Governor of the state. The application/declaration may be for either an emergency or disaster. Emergencies are non-storm related events that exceed local government capacities to react (riots, sudden population influx, etc.) and involve a lesser degree of assistance than the storm related disaster event.

Under the declaration of a disaster, there are two types of relief that may be provided, depending on the severity of the damage: individual and public assistance. The program for individual assistance provides aid for the repair of damaged homes and businesses, for temporary housing, and for a variety of individual and family needs (medical, transportation, unemployment, food, legal services, crisis counseling, etc.). Given the personal and emergency nature of this aid, this aspect of the program has little implication for storm hazard mitigation and post-storm redevelopment.

The public assistance program provides aid to state and local governments, and to private nonprofit organizations who operate government type facilities (schools, utilities, medical and custodial facilities, etc.). Public assistance aid is classified as either emergency or permanent. The former includes efforts to save lives, to protect property, and to maintain the operation of essential community services. Permanent aid relates to work for restoring facilities to their pre-disaster design so that they can continue in their intended use and functions. Eligible facilities include roads and bridges, water control facilities, public buildings and equipment, utility systems, park and recreational facilities, and others. This aspect of the program has important implications for storm hazard mitigation and post-disaster redevelopment because it affects what may be rebuilt, where, and how.

Assistance to a public body for the restoration of a facility is a function of the extent of damages; facilities are considered repairable when damages do not exceed 50% of the costs of replacing the

facility to its pre-disaster condition. Hazard mitigation measures may be added to the process of repair or restoration on a site specific basis and are eligible costs. If the facility is not repairable (i.e., repair costs exceed 50% of replacement), a replacement for the facility may be approved. FEMA maintains other options as well. Where the facility is subject to repeated heavy damage they may require restoration at a new location, with eligible costs including those for land acquisition, site preparation, and demolition. When relocation is required, no future funding for the facility at the original site will be approved. The local community may also argue that restoration of a damaged facility will not serve the public welfare and that an alternative project should be approved. This can consist of new facilities, expanding other facilities, or funding hazard mitigation measures.

Public assistance funding is regulated by the FEMA-State agreement. This agreement sets out the understandings, commitments, and conditions for assistance, including the proportion of funds that are to come from federal vs. state and local sources, and imposes binding obligations on all parties. Generally, federal funds will cover 75% of eligible costs. The State of Florida will cost share the remaining 25% on a equal basis with localities. Beyond cost sharing, the act also provides for community disaster loans to any local government that has suffered a substantial loss of revenue as a result of a major disaster and which requires such funds, up to 25% of its pre-disaster budget, in order to continue to perform its governmental functions.

A major component of the act is the requirement for hazard mitigation planning. Hazard mitigation surveys are performed by an interagency task force immediately following the declaration of a disaster in order to identify hazard evaluation and mitigation measures that must be incorporated into the recovery process. The state is then required to prepare and implement a hazard mitigation plan for the disaster area (termed 409 plan). The plan should include an evaluation of the natural hazards in the designated area and the methods to be used for dealing with these hazards, through

mitigation, so as to reduce or avoid long term vulnerability. The plans are to be continually monitored and updated and they should be structured in such a way as to help states and localities develop hazard mitigation capabilities as a part of their normal governmental functions. States are also encouraged to develop a basic mitigation plan prior to a disaster event so that the plan can be expanded or updated to address the specific issues arising from each particular disaster. The state is given primary responsibility for developing and updating the plan, involving local governments and others as necessary. The status of this plan and its implementation is, in theory, considered by FEMA when evaluating a state's application for subsequent disaster declarations.

The act also provides for a hazard mitigation grant program (Section 404) in which hazard mitigation project grants are made to states (and through them, to local governments and private non-profit organizations) for projects identified in the state hazard mitigation plan. The Section 404 grant program provides funding for mitigation projects to the limit of 10% of the cost of public assistance permanent work. The federal government will pay 50% of this amount. Eligible projects need not be site specific and may be of any nature that will result in protection to public or private property and include construction, acquisition, relocation, development of mitigation standards, and development of comprehensive mitigation programs.

ANALYSIS

Unlike the National Flood Insurance Program, the Disaster Relief Act provides an important and central role for the state in the organization and delivery of disaster assistance. The state is the agent responsible for preparing and submitting the disaster application; is the grantee for disaster assistance funds; participates in the organization and delivery of disaster relief, including cost sharing with localities for the non-federal share of costs; is responsible for the preparation of hazard mitigation plans for both the state and declared disaster areas; and is responsible for setting priorities and implementing funding for mitigation projects under the Section 404 hazard mitigation

grant program. By virtue of its roles in this process the state is in a unique position to use the disaster assistance program to leverage post-disaster redevelopment policy objectives. Our analysis of state behaviors suggests, however, that little has been done to pursue state objectives through this program.

Public Assistance Program

The public assistance program represents one instance in which the state can influence how public facilities are rebuilt after a disaster, thereby utilizing an investment instrument to further state policy goals. Public assistance funding may be used to restore damaged structures, to replace them when damage estimates exceed 50% of replacement, remove them to a new location, or to fund alternative projects. Little information exists on the distribution of these alternatives in practice, but informants suggest that most public assistance funds are utilized to return damaged facilities to their pre-storm condition and functions. Utilizing the state's leverage to remove or relocate public facilities to new locations -- both to secure their future safety as well as to utilize them as "priming" mechanisms for inducing other development trends -- apparently is not a characteristic of this program.

Hazard Mitigation Plans

The state is required to develop, in conjunction with the local areas and other interested parties, a hazard mitigation plan for the declared disaster area. The state is also encouraged to develop a state-wide plan into which the separate plans for disaster areas would be integrated as they occur. Moreso than a policy for the use of public assistance funds, this planning mandate represents a unique opportunity for the state to focus disaster assistance in a manner that promotes and pursues its policy interests.

Unfortunately, the state has seriously avoided using the leverage of the mandated plan to promote

state policy objectives. Currently, there is no state hazard mitigation plan, although a plan does exist in draft form with anticipated completion by 1994 (Florida Department of Community Affairs, 1993c). The draft follows the minimum content as specified by FEMA, with coverage across four items:

1) An evaluation of the natural hazards of the state.
2) A description and analysis of state hazard management policies, programs, and capabilities to mitigate hazards.
3) A statement of hazard mitigation goals and objectives, and proposed strategies, programs, and actions to reduce long term vulnerability to hazards.
4) A method of implementing, monitoring, evaluating, and updating the plan.

In responding to minimal FEMA criteria, however, the draft state plan does not provide an effective guide for statewide hazard mitigation. Rather than a plan that can guide future action, the current document is little more than a report that specifies the natural hazards that threaten the state, some generally worded goals and objectives for hazard mitigation, and some mitigation recommendations that are unevenly drawn across the different natural hazards. Most of the latter recommendations have appeared in the separate Interagency Hazard Mitigation Team Reports completed by FEMA for the separate disasters and do not derive from a careful analysis of hazards and the capabilities and opportunities for dealing with these hazards. Beyond the failure to adequately connect problems with resources, the plan does not develop criteria by which to place mitigation strategies in a priority order nor does it relate adequately to other state goals, objectives, and priorities. Without establishing priorities, there can be no serious attempts at implementation. Thus, the report contains a short section on implementation that does little more than specify the composition and general responsibilities of the various teams and committees involved in hazard mitigation, including the responsibilities of the state hazard mitigation officer, rather than mechanisms for the implementation of policy.

We believe that the plan should be a document that, at a minimum, carefully studies the nature of the subject problems and then analyzes and evaluates alternatives for dealing with the problem(s) and achieving the desired outcomes established as state policy goals and objectives. Indeed, the opportunity for preparing a state hazard mitigation plan represents a significant opportunity to rethink the state policy objectives noted in Chapter 1 and to expand them in ways that are unique to hazard mitigation and post-storm redevelopment. Having associated goals and objectives with means, the plan should then specify a set of policies and implementation devices for putting the policies into effect, including the relative priority of each policy. The plan should also consider periodic evaluation and update in light of new information and analysis on how well implemented alternatives have worked. The plan should be a policy statement of a decision making body with the power and legal authority to commit resources in pursuit of the plan.

Legislation that is currently before the U.S. Senate in the form of the "Natural Disaster Mitigation, Relief, and Insurance Act of 1993" provides some formal guidance for the construction of mitigation plans. The act would require each state to develop a mitigation plan that includes schedules for improving the state's ability to reduce the hazards of future disasters. The plan should include, at a minimum, a process for verifying compliance with multi-hazard building codes and insuring that these standards are enforced; identify areas within the state that have risk from disasters and categorize these areas on the basis of degree of risk; establish priorities by risk and location of the types of structures that may be in need of hazard mitigation; and identify the types of mitigation, in the form of building codes, non-structural mitigation, or retrofitting, that will be most cost effective.

Most of these critical elements of a useful plan are missing from the state hazard mitigation plan and have been identified by FEMA as necessary revisions before the plan can be approved (U.S. Federal Emergency Management Agency, 1992f.) FEMA has commented on the failure of the plan

to rationally tie the nature of the problem to stated goals and objectives, to identify priorities in hazard mitigation, and to adequately relate priorities to implementation strategies. FEMA's critique of the plan recognizes that it is an inadequate guide for public action, and encourages the state to "take a broad, statewide approach towards implementing policies and programs directed at reducing future hazard related losses ... (that will) ... allow the state, following future disasters, to implement priority programs and projects, regardless of the type of disaster incurred." (U.S. Federal Emergency Management Agency, 1992b:7)

We have also reviewed a number of mitigation plans that have been produced after specific disasters and our assessment of these individual plans is substantially similar: they represent reports rather than plans, with no thoughtful attention given to the evaluation of alternative mitigation strategies and their implementation in pursuit of state policy goals and objectives. While the disaster specific plans discuss the issues of disaster and hazard mitigation within particular local jurisdictions, so that the hazard mitigation recommendations are specific to the local context, no formal authority is associated directly with the plans.

Also at issue is the use of these plans at the local level. Rule 9J-5.012 FAC, dealing with the content of the coastal management element of the local government comprehensive plan has, in the past, specified that local governments incorporate the recommendations of the interagency hazard mitigation report into the hazard mitigation policies of the coastal management element. Action by the 1993 legislature has modified this language, however, specifying only that where an interagency hazard mitigation report exists, local governments may incorporate its recommendations into the local comprehensive plan (CS/CS/HB 2315, Section 13 [ELMS III Bill]). This permissive language means that local governments may be free to ignore the lessons and recommendations (although informants involved in the process of constructing this language suggest that the intent was to allow communities to make changes to the local comprehensive plan

with respect to the hazard mitigation report without involving a formal plan amendment process (Flack, 1993)).

Hazard Mitigation Grant Program

A third significant opportunity for the state to promote hazard mitigation objectives is through the hazard mitigation grant program. Section 404 grants represent the major mitigation funding program available on a non-site specific basis. Since project funding is tied to the state hazard mitigation plan, it represents a major incentive to states and localities to take seriously the preparation and implementation of the hazard mitigation plan and then to pursue mitigation projects identified by the plan.

The amount of funding that is available through federal cost sharing is substantial; estimates exist of $15-18 million available to the state from Hurricane Andrew alone (Hutchins, 1993). The cost sharing basis of this program, requires the state and/or local jurisdictions to match this amount on a dollar for dollar basis. Funded projects must be a part of the state hazard mitigation plan. Without an adequate state hazard mitigation plan, however, it is not reasonable to expect that hazard mitigation grant funds will be effectively used. Neither the state nor the involved local jurisdictions appear to have identified the most important mitigation projects and placed them within a funding plan. To date, the state has not applied for any of the funds available from earlier disasters (Koutnik, 1993) and a considerable degree of hazard mitigation initiative has been lost.

In addition to the impediment of the state hazard mitigation plan, another factor in the inadequate use of this program may be the state's posture on cost sharing with local communities. Cost sharing is an incentive mechanism and should be constructed to induce the desired actions in the intended parties. Currently the state will pay from 10 to 25% of project costs, requiring the local jurisdiction to pay the remaining share, for a total of 50% non-federal share (Koutnik, 1993). State

funds are to be taken from general revenue, however, so that the magnitude of the potential match will vary and cannot be depended upon by a local community. This arrangement appears to be an inadequate incentive and may be particularly burdensome on the local community in light of the financial strain caused by the disaster event. Furthermore, the inability of the state to commit to cost sharing reduces the incentive and opportunities for long range mitigation planning. More useful to the state and its local communities is a program in which the state, through the preparation of an adequate statewide hazard mitigation plan, identified those projects with the greatest potential for satisfying state mitigation policy objectives, and utilized state funding to promote those identified projects.

COASTAL BARRIER RESOURCES ACT AND EXECUTIVE ORDERS 11988 AND 11990

OVERVIEW

The Coastal Barrier Resources Act (CBRA) was enacted in 1982 (and amended by the Coastal Barrier Improvement Act of 1990) in response to the goals of minimizing the loss of human life, wasteful expenditures of federal revenues, and damage to natural resources associated with coastal barriers. The act establishes the Coastal Barrier Resources System (CBRS) which is an identification and inventory of undeveloped sections of barrier islands, and removes federal subsidies for infrastructure and other public purposes in these places as a means of reducing development incentives. Under the act, federal expenditures for roads, bridges, infrastructure, community development, disaster relief (except assistance necessary to save lives and to protect public health and safety), flood insurance, and others are prohibited. Exceptions are made for the repair and maintenance of facilities that are critical links in a larger system. These prohibitions do not apply to coastal barriers not incorporated within the CBRS. The act does not interfere with

state and local rights to regulate development in CBRS units within their jurisdictions, and the act does not prohibit development in CBRS units that occurs with non-federal funds.

The Department of Interior is responsible for designating undeveloped coastal barriers and distinguishing them from developed coastal barriers and "otherwise protected" areas (e.g., state and federal lands, wildlife refuges, etc.). Three criteria have been used for including parcels within the CBRS: 1) less than one walled and roofed building per five acres of fastland; 2) absence of urban infrastructure (vehicle access, water supply, wastewater disposal, etc.); and 3) not part of a development of 100 or more lots (Godschalk, 1987). Minimum parcel sizes generally include at least one quarter of a mile of ocean-facing shoreline. These criteria have resulted in the designation of 33 individual CBRS units in Florida, encompassing 119 miles of shoreline (U.S. Department of Interior, 1988).

Executive orders 11988 (floodplain management, 1977) and 11990 (wetlands protection, 1977) were issued by President Carter and are conceptually similar to the CBRA, although not as powerful both in concept and in substance. Their effect is to limit federal actions and expenditures in floodplain and wetland areas, but not to prohibit such actions altogether. Both executive orders mandate consideration by all federal agencies of actions that would encourage development in floodplains or wetlands, respectively. Federal agencies are to refrain from programming, financing, or permitting development in floodplain hazard areas except where no other practical alternative exist. Where actions are taken in the floodplain, agencies are directed to pursue them in ways that seek to minimize flood damage and which protect, preserve, and restore floodplain values. This same measure of protection is given to wetlands, which are not to be destroyed unless no practical alternative exists. Where construction in these areas is unavoidable, federal agencies must insure that damage is minimized. (Godschalk, Brower, and Beatley, 1989).

Like the CBRA, the limitations on federal actions and subsidies within floodplain and wetland areas are intended to discourage development in these areas and to protect these natural resources. The prohibitions are not encompassing, however, and refer only to federal actions. State, local, and private development actions are unaffected unless they use federal funds.

ANALYSIS

CBRA and the Executive Orders are infrastructure investment policy instruments that do not directly involve the state. The degree to which state policy objectives are realized is only fortuitous, and since there is no role for the state in the program, it is difficult to see how the programs can be leveraged for state interests. On the other hand, the federal programs can be taken as models for state action, using, to the extent possible, the precedent and experiences of the federal actions to inform state policy instruments. The model inherent in the federal program is the withdrawal of investment, i.e., withdrawal of state subsidies for infrastructure within defined coastal areas thereby affecting the development potential of these areas as well as saving the costs of replacing infrastructure that is at risk. A literal interpretation of the model limits state expenditures to units of the CBRS; a more expansive development of the model would define those areas of coast that are of unique concern to the state and impose these limitations thereupon. To the degree that development is reduced state policy objectives will be realized.

Two issues to be addressed include: 1) the degree to which CBRA does provide a useful and effective model for state action; and 2) the degree to which this model has been implemented by the state.

Evaluations of CBRA

Since CBRA only limits federal expenditures in CBRS units, the overall impact on development will depend on the behaviors of other actors affecting development. This includes the actions of state

and local governments in limiting public spending; private insurance companies in not filling the gap created by the unavailability of national flood insurance; banks and development agencies in deciding the conditions under which they will make available real estate loans and mortgages; conservation organizations in deciding whether or not to acquire land within the CBRS; and private developers in deciding whether they are able to develop land within the CBRS under greater hazard risk and infrastructure costs (Godschalk, 1987). Clearly, some of these decisions will be made in conflict with the intent of CBRA, leading to greater development. Godschalk has forecast that private development companies with major land holdings in CBRS units will "focus on high-density, luxury condominium projects, where they can make a profit...even with higher infrastructure costs and where homeowners' associations can deal with negotiating insurance contracts and maintaining infrastructure." (1987:21) He also suggests that CBRA would generate greater pressure for more dense development of areas designated as developed coastal barriers plus provide incentives for redevelopment to make way for new, higher density projects. Leitman (1990) has made similar predictions in reviewing the Gulf County, Florida comprehensive plan which encompasses the CBRS unit at Cape San Blas.

Because of the number of favorable decisions that must come together, the success of CBRA has been limited. In a recent report of development in 34 selected CBRS units (U.S. General Accounting Office, 1992), the GAO found that new development had occurred on nine units since 1982 and that at least one of the nine could no longer qualify for CBRS designation. Each of these nine units had an attractive coastal setting, and eight of them were readily accessible by road or bridge. Some units included in the study remained undeveloped, mainly because of their relative inaccessibility. Similarly, some examples of units that were intended to be developed but where development was stopped or slowed because of the unavailability of federal flood insurance or infrastructure subsidies are provided. A major conclusion of the report, however, is that other CBRS units that are accessible and/or suitable for development may undergo development similar to that of the nine

developing units.

> "While the availability of accessible coastal land is limited, populations of coastal units are expected to increase by tens of millions by the year 2010. This population increase will further spur market demand providing an incentive for developers, owners, and investors to assume the risks associated with owning and building in these storm prone areas. Stronger protective measures may be needed if further development is to be discouraged." (U.S. General Accounting Office, 1992:24)

The Florida Model

Florida has adopted the model suggested by CBRA, but only weakly and in an inconsistent fashion, failing to provide the safeguards and additional protective measures called for in the GAO report. Two aspects of state regulation speak to this issue: Executive Order 81-105, and portions of Chapter 380 FS codified as the Coastal Infrastructure Policy (see Chapter 3 for a more complete discussion of these regulations.) While some portion of this policy structure is directed to barrier islands (although not necessarily to units of the CBRS,) the main focus is on the coastal high hazard area.

Executive Order 81-105 was issued by Governor Graham in 1981 and prohibits the use of state funds "to subsidize growth or post-disaster redevelopment in hazardous coastal areas." The Executive Order, however, has been a difficult policy instrument to enforce. As an executive order it applies only to the operations of executive agencies and cannot supersede statutory requirements. The order has also been beset by problems in interpretation. The geographical focus of the order is not clearly defined nor are many of the important terms, and this has allowed for inconsistent application by the different state agencies. The order, moreover, was not intended to be a permanent policy instrument; it was to remain in effect only until local governments implemented policies that were at least comparable (Florida Department of Community Affairs, 1991).

Given both the enforcement difficulties of an executive order and its interim nature, it is important

that the provisions be reinforced by statute. Unfortunately, this has occurred in only meager ways. Florida's Coastal Infrastructure Policy, incorporated as Chapter 380.27 FS (1985) prohibits the use of state funds for the purposes of constructing bridges or causeways to unbridged barrier islands only; the prohibitions are limited in both geographical focus and application. On the issues of infrastructure and coastal areas in general, state policy has been abdicated in favor of local policy. Chapter 380.21 FS declares that state land and water management policies, to the maximum extent possible, should be implemented by local governments. Furthermore, Chapter 380.27 FS provides that after a local government has an approved coastal management element as part of the local comprehensive plan, no state funds can be used to increase the capacity of infrastructure unless such expenditure is consistent with the approved coastal management element of the local plan. This requirement has reduced the ability of the state to implement projects in pursuit of state policy. As such, leadership for defining appropriate projects is given to the local jurisdiction, and the important areas of coverage provided for in the Executive Order, and which are in need of statutory protection, are left unaddressed.

The issue of the state assuming an unambiguous leadership position for coastal development policy is neither clarified nor reinforced in other statutes and rules. The State Comprehensive Plan (Chapter 187 FS) speaks to the issue of state investment by using state funds to subsidize development in coastal high hazard areas, but falls short of specifying a prohibition; it states merely that it is policy to avoid such expenditures. The plan treats the issue of transportation improvements that encourage or subsidize development in the same way. The general theme is repeated in the policies regulating local comprehensive plans (Chapter 163 FS and Rule 9J-5 FAC), in which local communities are required to address certain coastal issues. In practice, however, communities have been given considerable freedom as to how to address these issues and many are addressed only weakly or not at all (Florida Department of Community Affairs, 1991). This perception is reinforced in Chapter 4 where we review our analysis of the content of the coastal

management element of a sample of local comprehensive plans. This analysis suggests that state policy interests are not well realized by placing decision authority at the local level. Consequently, the considerable leverage that is inherent in state infrastructure investments is lost.

SUMMARY

Our review of the operation of federal programs has highlighted the degree to which these programs help the state to realize state policy objectives for storm hazard mitigation and post-storm redevelopment. To a degree the extent to which state interests are served by these federal programs is coincidental; they are organized and implemented according to the interests of the federal government. Throughout, however, there are significant opportunities for state participation. Using the federal programs as either opportunities or models for involvement holds the potential to leverage them in the pursuit of state objectives. The degree to which the state relies on federal programming to realize state objectives, and the degree to which the state leverages this federal programming in further pursuit of state policy objectives are important issues in the design and construction of state storm hazard mitigation policy.

NATIONAL FLOOD HAZARD INSURANCE PROGRAM

The National Flood Hazard Insurance Program is organized chiefly on a federal-local dimension utilizing incentive and investment strategies to stimulate local action. The formal state role is a relatively small one, consisting mainly of the provision of support and technical assistance to local communities. Florida has managed to adopt and reinforce some aspects of the program in order to increase its program impacts and these were noted above. Nevertheless, other opportunities to enhance the operations of the program exist, and are mainly of four types (Association of State Floodplain Managers, 1992). These are: greater community participation in NFIP, increased

purchase of insurance by property owners, strengthened content of community floodplain regulations, and state adoption of floodplain regulations. Activities of the first three types are discussed below. Direct regulation by the state is considered in Chapter 3.

An obvious area of opportunity is in encouraging increased community participation in NFIP. Community participation in NFIP is important, independent of the extent to which property owners purchase insurance policies, because community participation results in the adoption of floodplain management policies that affect all floodplain development -- whether insured or not. Currently, however, participation is near universal among the state's communities so that little additional benefit exists in new initiatives. We mention this alternative simply for conceptual completeness. Within this context, however, we suspect that there are relatively low levels of individual purchase of flood insurance within coastal areas. This is based on the assessment that only 14.5% of all households within the state carry flood insurance (as of 1988) and that this proportion increases to only 26% of all households when only those living in FEMA designated special flood hazard areas are considered.

A more important area of state policy is in influencing the content of local community floodplain regulations. FEMA specifies the minimum content for community regulations, given in terms of building and construction standards, but provides additional incentives for communities to adopt a more comprehensive floodplain management program. The incentive for doing so is the Community Rating System program and the insurance discounts that property owners within the participating communities receive to their flood insurance policies. Participation in the CRS program has the potential to extend community regulation beyond building and construction standards, to include land use regulation, investments through acquisition and capital facilities, and incentives in the form of education and information programs, economic assistance, and others. Given the requirements of the local comprehensive plan to address issues of development, mitigation, and

redevelopment in floodplains and coastal areas, there has been the expectation that Florida's cities would fare well in their rate of CRS participation and in the strength of the floodplain management programs included within their CRS programs. Unfortunately, neither expectation appears realized. Only 52% of coastal communities participate in the CRS, and the content of this participation does not appear to be stronger than that which exists at the more general, national level. Indeed, in many instances the adoption of important management techniques appears to be less frequent in Florida than nationally.

State mandates that extend community participation beyond the minimum required by FEMA and which effectively convert comprehensive plan requirements to tangible policies and programs that can be incorporated within a local CRS program have the potential to leverage the flood insurance program to greater advantage. They are, therefore, likely to have important effects both in realizing state interests, in providing a greater degree of safety to residents and property owners in flood hazard areas, and doing so at a reduced cost.

DISASTER RELIEF ACT

The Disaster Relief Act involves the state in a number of important ways, including participation in the process of public assistance funding, and the preparation of a general statewide hazard mitigation plan (as well as hazard mitigation plans for the separate disaster areas.) How the state fulfills these mandates represents opportunities for realizing hazard mitigation policy objectives. In addition, the state's share of public assistance funding represents an opportunity to influence how these funds are spent for hazard mitigation and the state hazard mitigation plan represents a significant opportunity to establish hazard mitigation priorities. The plan also provides the opportunity to participate in the Section 404 hazard mitigation grant program whereby these priorities may be implemented. Unfortunately, the state has done little to fulfill its mandated responsibilities and to take advantage of the opportunities that these mandates create.

The most important component of state policy for hazard mitigation and use of federal hazard mitigation resources is the state hazard mitigation plan. To date, drafts of the plan appear to be written only to satisfy the minimal requirements of FEMA and to take advantage of the hazard mitigation grant funds made available after Hurricane Andrew. This attitude is short sighted and fails to use the opportunity to develop a meaningful statewide hazard mitigation plan that adequately addresses the problems caused by storm events.

COASTAL BARRIER RESOURCES ACT

The Coastal Barrier Resources Act helps to realize state policy objectives through the withholding of federal investments in critical coastal areas. More importantly, however, the program represents a model for state action. The model is that of limiting state funded infrastructure investments in coastal areas in which the state expresses a policy interest. A narrow interpretation of the model suggests limiting funding in units of the CBRS in order to reinforce the federal regulation, while a more expansive interpretation of the model suggests that the state focus on a wider area of interest. The more expansive interpretation may be made necessary by a perception that CBRA is having an unanticipated consequence on development outside the units of the CBRS such that development restrictions within the CBRS serve to place greater development pressures on those areas of barrier islands not under this regulation.

The interest in focusing beyond the CBRS has already been expressed by the state in its attention to the larger coastal high hazard area. What the state has not done, however, is to define a set of incentives and mandates that consistently pursue the stated policy objectives. Rather than a consistent and mutually reinforcing set of incentives and regulations, there exists a partial system of regulation characterized by the overriding policy of local land use control; state policy has been abdicated in favor of local decision making. Beyond this, the impediments to the success of CBRA, in terms of influencing the decisions made by other actors in the development process, have not

been addressed.

ENDNOTES TO CHAPTER 2

1. DCA and FEMA contract with a private organization to evaluate the local community application. This firm, ISO, while holding public information, will not make it available, even for public analysis purposes. We encourage the DCA to correct this situation.

CHAPTER 3

A REVIEW OF CURRENT FLORIDA STATE POLICIES AND PROGRAMS GOVERNING COASTAL STORM HAZARD MITIGATION

INTRODUCTION

Florida has a diverse array of policies and programs that contribute to mitigating the costs and risks posed by coastal storms. Some have been designed specifically to protect coastal environmental resources, public safety, and property from storm damage, or to minimize the public costs of coastal storm damage, while others have contributed to these goals while focused on other primary policy objectives. Table 3.1 summarizes these policies and programs.

The state directly regulates coastal construction and site development through four programs that have the potential to reduce coastal storm hazards: 1) & 2) two coastal construction permitting programs operated by the Division of Beaches and Shores (DBS) in the Department of Environmental Protection (DEP) which regulate structures above and below the mean high water line along open, sandy shorelines; 3) dredge and fill regulations administered by the DEP Division of Water Management; and 4) regulations governing the location and installation of onsite sewage disposal systems administered by the Department of Health and Rehabilitative Services (HRS). The State Department of Community Affairs (DCA) also serves in an oversight and guidance role for local coastal construction standards mandated under the Coastal Zone Protection Act of 1985. DCA provides technical assistance and limited formal review of these local government regulatory programs.

Regulation of land use is almost entirely a function of local governments who have the authority to restrict types of land uses and the density of development through promulgation of local land development regulations (LDRs) such as zoning and subdivision ordinances. The state does not directly

Table 3.1: Summary of Florida Storm Hazard Mitigation Policy Instruments

Policy Instrument	Legal Authorization	Summary
Regulation of Construction and Site Development		
Coastal armoring permits	§161.041 FS	A permitting program administered by the Department of Environmental Protection (DEP) Division of Beaches and Shores (DBS) regulates construction and major reconstruction of rigid erosion control structures along open sandy coasts that are designed to protect upland buildings and facilities from erosion. Temporary structures permitted during declared shoreline emergencies.
Coastal construction control line (CCCL) permits	§161.053 FS	Permits are required from DBS for excavation or construction within an area demarcated by Coastal Construction Control Lines (CCCLs) in counties with predominantly sandy shores fronting on the open sea. Permit conditions include construction standards and dune protection and restoration requirements.
50-foot coastal construction setback permits	§161.052 FS	Permits are required from DBS for construction within a 50-foot setback from the MHWL in those areas not covered by the CCCL permit program that have a sandy shore on the open coast. Permit conditions are comparable to those imposed under the CCCL permit program.
30-year construction setback	§161.053 FS	DBS prohibited from allowing construction of any structure other than a shore protection structure, which will be seaward of the "seasonal high water line" within 30 years after the date of application for a CCCL permit. Single-family residential structures are permitted seaward of this line for lots platted prior to October 1985 under certain conditions.
Regulation of dredge and fill activities	Part VII, Chptr 403 FS	Permits are required from DEP for dredge and fill activities in, on, and over state surface waters, including wetlands and mangroves. Applicants must demonstrate no significant impacts on surface water quality or various wetland values.

(continued)

Table 3.1: Summary of Florida Storm Hazard Mitigation Policy Instruments

Policy Instrument	Legal Authorization	Summary
Regulation of onsite sewage disposal systems	§381.0065 FS	Regulations administered by the Department of Health and Rehabilitative Services (HRS) specify minimum lot sizes and siting standards for septic tanks and drainfields, including minimum setbacks from the MHWL of tidal water bodies.
Regulation of Land Use		
Local land development regulations	§125.66 FS §166.041 FS Chptr 177 FS	Land development regulations (LDRs) of individual local governments can contribute to storm hazard mitigation by regulating types and densities of land uses.
State land development regulations for Areas of Critical State Concern	§380.05 FS	Where an Area of Critical State Concern (ACSC) is designated and the affected local government(s) fail to adopt plans and LDRs approved by the state, the State Administration Commission may adopt LDRs to be implemented within the ACSC.
Planning Mandates		
Local comprehensive planning requirements governing coastal high hazard areas, hazard mitigation, and post-storm redevelopment	§163.3178(2) FS §9J-5.012(3) FAC	Requires local governments to designate a coastal high hazard area (CHHA); limit development and public expenditures within the CHHA; relocate infrastructure and direct population away from the CHHA; adopt policies for storm hazard mitigation; prepare a post-storm redevelopment plan; identify regulatory and management techniques for post-storm redevelopment; and establish a process for identifying and ranking coastal properties for acquisition by the state.
Regulatory Mandates		
Adoption of local building codes for construction within the Coastal Building Zone	Part III Chptr 161 FS	Local governments required to include construction design standards in local building codes for areas that include and extend further landward of the CCCL and 50-foot setback. Also applies to areas with vegetated shorelines based on position of the Federal Emergency Management Agency (FEMA) velocity zone.

(continued)

Table 3.1: Summary of Florida Storm Hazard Mitigation Policy Instruments

Policy Instrument	Legal Authorization	Summary
State minimum building code	Part VII Chptr 553 FS	Local governments with building construction regulatory responsibilities are required to adopt one of four model building codes for application throughout their jurisdiction except as modified by the requirements governing the Coastal Building Zone.
Acquisition of Coastal Property		
Conservation and Recreation Lands (CARL) Program and Preservation 2000	§253.023 FS §259.101 FS	Funds from sale of state bonds are used to acquire environmentally unique and irreplaceable lands of which a specified percentage must be coastal lands. Projects are designed to protect rare and endangered species, historic or archaeologic resources, or to provide recreational opportunities. Recent statutory amendments added consideration of storm hazard potential to the acquisition criteria.
CCCL takings purchases	§161.053 FS	DBS occasionally purchases a property when denial of a CCCL permit would constitute a "takings" requiring compensation. At present there is no dedicated sources of funds for such purchases.
Florida Communities Trust	Chptr 380 FS	The Florida Communities Trust operates a matching grants program available to local governments with approved comprehensive plans for acquiring land so as to further implementation of the coastal, conservation, or recreation and open space elements of the local comprehensive plan. The Trust may also acquire land directly and hold it for up to five years.
Conveyance of conservation easements and development rights	§704.06 FS §193.501 FS	State statutes authorize the conveyance of conservation easements and development rights by private property owners to state or local governments or qualifying private nonprofit organizations for protecting lands with significant natural resource or recreational value.

(continued)

Table 3.1: Summary of Florida Storm Hazard Mitigation Policy Instruments

Policy Instrument	Legal Authorization	Summary
Development of Capital Facilities and Infrastructure		
Beach erosion control assistance program	§161.091 FS	State funds from the Beach Management Trust Fund are authorized to be used to pay up to 75% of the costs of beach erosion control projects including beach restoration and renourishment, construction of hard erosion control structures, and dune construction and revegetation.
County beach and shore preservation programs	Part II, Chptr 161 FS	Authorizes boards of county commissioners to develop and implement comprehensive beach and shore preservation programs. Counties may do so through creation of special benefits districts within which ad valorem taxes are based on benefit categories. Other mechanisms may also be used including creation of municipal service taxing units.
Governor Graham Executive Order	E.O. 81-105	Limits expenditures of state funds for new infrastructure or post-storm redevelopment on hazardous coastal barriers. Elaborated in 1986 to prohibit use of state funds to expand infrastructure or economic development in any designated unit of the Federal Coastal Barrier Resources System.
Barrier island bridge policy	§380.27(1) FS	Prohibits use of state funds to construct bridges or causeways to coastal barrier islands which were not already accessible by bridges or causeways on October 1, 1985.
Coastal high hazard area infrastructure policy	§380.27(2) FS	Prohibits expenditure of state funds that will increase the capacity of infrastructure within coastal high hazard areas unless such expenditures are consistent with the coastal elements of local comprehensive plans.

(continued)

Table 3.1: Summary of Florida Storm Hazard Mitigation Policy Instruments

Policy Instrument	Legal Authorization	Summary
Economic Incentives		
Financial assistance for local coastal land acquisition	Chptr 380 FS	The Florida Communities Trust operates a matching grants program available to local governments with approved comprehensive plans for acquiring land so as to further implementation of the coastal, conservation, or recreation and open space elements of the local comprehensive plan.
Tax concessions for conveyance of conservation easements and development rights	§193.501 FS	Local property appraisers are required to grant property tax relief for owners who have conveyed conservation easements or development rights to state or local governments or qualifying private nonprofit organizations.
State beach erosion control assistance program	§161.091 FS	State cost-sharing of up to 75% of the costs of beach erosion control projects. Local or private match required. Project sponsors are required to provide permanent public access, including adequate parking areas.
Hurricane catastrophe fund and grants	CS/HB 31-C	A bill enacted in 1993 created a state hurricane reinsurance trust fund financed by insurers' (and ultimately insureds') premiums. Surplus funds may be used for grants to local governments to protect local infrastructure.
Emergency Management, Preparedness, and Assistance Trust Fund	Chptr 93-128 Laws of Florida	A fund to provide supplemental monies for state and local emergency management programs. Financed by surcharges on annual property insurance premiums.
Education and Information		
Training for local building inspectors and deemed-to-comply manual	§161.56(4) FS	The Department of Community Affairs (DCA) sponsors training workshops for local building inspectors and preparation of a compliance manual for coastal building zone building codes.
Technical assistance for local coastal land acquisition	§§380.22(4) & (5) FS	The 1993 ELMS bill directed DCA to develop a technical assistance program to establish a county-based process for identifying and setting priorities for state acquisition of coastal land.

(continued)

Table 3.1: Summary of Florida Storm Hazard Mitigation Policy Instruments

Policy Instrument	Legal Authorization	Summary
State beach management plan	§161.161(2) FS	Developed by DBS, the plan identifies and characterizes all areas of the state's sandy shorelines that are subject to erosion and identifies appropriate strategies for each area.
CCCL public notice procedures	§161.053(2) FS	Public hearings accompanied by formal public notice are required prior to setting CCCLs. CCCLs must be recorded in public records of affected local governments and surveys of the line provided to the clerk of the circuit court in each county.

regulate land use except under limited circumstances where a local government fails to adopt LDRs consistent with development guidelines developed by the state for designated Areas of Critical State Concern.

The state operates one major land acquisition program that has been used to directly acquire property interests in coastal lands, the Conservation and Recreation Lands (CARL) Program. State funds are also provided to assist local governments in acquiring real property to further specific objectives of their comprehensive plans under the Florida Communities Trust (FCT) Program. While the FCT Program is more accurately categorized as an economic and technical assistance program, the land acquisition program has been the focus of most of its efforts since its establishment in 1991. State laws also define the authority of local and state governments to acquire less-than-fee interests in real property as well as establishing tax incentives for property owners to convey certain less-than-fee property rights such as conservation easements and development rights to public or nonprofit entities.

The state also provides financing for beach restoration and renourishment projects. These projects can be viewed as both economic assistance and as state capital facilities investments. In addition, the state has adopted several policies governing state expenditures on growth-inducing infrastructure in coastal high hazard areas. There is some inconsistency among these policies, two of which provide for a singular statewide policy while the third is closely linked to parallel policies in the coastal elements of local government comprehensive plans.

Within the past year, two state initiatives have been taken which will increase the costs of residential and commercial property insurance as well as providing funds that can be used by state and local agencies to accomplish some storm hazard mitigation objectives. The Emergency Management, Preparedness, and Assistance Trust Fund imposes a surcharge on insurance

premiums to provide supplemental funds for state and local emergency management programs. It could serve as a model for more equitably financing state costs of responding to coastal storm emergencies. The Hurricane Catastrophe Fund, a reinsurance fund for companies that write property insurance policies in the state, is expected to raise property insurance premiums based on relative risk associated with hurricane damage. It could serve as an economic disincentive to occupying areas prone to coastal storm damage.

In the following sections, each of these major state policies and programs is summarized and discussed in the context of storm hazard mitigation and specific application to post-storm redevelopment situations. Several state agencies also play a role in the implementation of several federal programs, most notably the National Flood Insurance Program and the Disaster Assistance Program. For the most part, the state's role in these programs is administrative or involves the provision of technical assistance. Details on federal programs were contained in Chapter 2.

STATE COASTAL CONSTRUCTION PERMITTING PROGRAMS

The Division of Beaches and Shores (DBS) exercises regulatory control over construction activity along the state's open sandy shores fronting on the Gulf of Mexico, the Straits of Florida, or the Atlantic Ocean, through three permitting processes under Chapter 161 FS. None of these programs applies to "interior waters," such as the lagoon-side of a barrier island or mainland areas or islands within a lagoon protected from the open sea by a barrier island or spit.

One program, authorized by §161.041 FS, regulates structures located below the mean high water line (MHWL). This governs erosion control structures such as seawalls, jetties, breakwaters, and groins, as well as beach nourishment and inlet construction and maintenance. While the statute gives DBS authority to regulate any structure on state sovereign lands below the MHWL "of any

tidal water of the state," the statute also authorizes DBS to exempt interior tidal waters (§161.041(1) FS). DBS has made this exemption in Section 16B-41.004 FAC. The other two programs regulate construction landward of the MHWL. In counties with predominantly sandy shores fronting on the open sea, permits are required for excavation or construction within an area demarcated by Coastal Construction Control Lines (CCCL) established by DBS pursuant to §161.053 FS. In coastal counties not dominated by sandy shores, DBS administers a program for granting waivers or variances to a 50-foot construction setback from the MHWL imposed under §161.052 FS for construction in those areas that do have a sandy shore on the open coast.

All three of DBS's permitting programs are focused on protecting the state's beach and dune system. These permitting programs help mitigate the impacts of storms by maintaining the natural protection from wave and water damage afforded by the beach and dune system. The program governing structures below the MHWL also controls the use of engineered structures to protect upland structures. This was deemed necessary because of the potential for improperly sited or designed structures to interfere with the natural longshore and onshore/offshore movement of sediments that maintain the beach and dune system (§16B-41.005 FAC). Each of these regulatory programs has specific provisions governing post-storm circumstances.

REGULATION OF STRUCTURES BELOW THE MEAN HIGH WATER LINE

Overview

Section 161.041 FS limits the circumstances under which new rigid erosion control structures can be constructed along open coasts to protect upland buildings and facilities from storm damage. Siting and design constraints are imposed to minimize the adverse effects of such structures on the beach and dune system, its natural recreational and storm protection values, and on sea turtle nesting.

DBS allows the construction of erosion control structures below the MHWL "only as a last resort to protect an eligible structure which is threatened by erosion" from a five-year return interval storm (Florida Department of Natural Resources, Office of Policy and Planning, 1993:I-2; §16B-41.005(6)(b) FAC). "Eligible structures" include major nonconforming habitable structures, which are residences, hotels, and commercial structures that were not built under a DBS permit or that do not meet current structural requirements for coastal construction, but were not built in violation of Chapter 161 FS (§16B-41.002(18) FAC). They also include public roads and safety facilities, bridges, water and waste water treatment facilities, hospitals or other structures of state or national significance. Owners of habitable structures built landward of the MHWL in conformance with a DBS permit are not allowed to build a major erosion control structure, even if shoreline recession eventually exposes them to erosion from a five-year storm (Devereaux, 1993).

The applicant for an erosion control structure must demonstrate that "there will be no significant adverse impact and all other alternatives, including dune enhancement, beach restoration, relocation of the structure, and modification of the foundation, are ... economically and physically unfeasible" (Florida Department of Natural Resources, Office of Policy and Planning, 1993:I-2). DBS prohibits coastal armoring in areas designated by the federal government as critical habitat for sea turtles (Florida Department of Natural Resources, 1990a).

The regulations limit the level of protection that an erosion control structure can be designed to provide (§16B-41.005(6)(b) FAC). Coastal armoring may not be designed to protect against hurricanes. Nonconforming major habitable structures may be protected from the erosion impacts of up to a 10-year return interval storm and other eligible structures from a 25-year storm event. "Designated hurricane evacuation routes, public safety facilities and historical sites of national significance may be provided protection of up to a 50-year return interval storm event, if feasible" (§16B-41.007(1)(b)(1) FAC). Similar constraints on protection design level are also imposed on

major reconstruction of existing facilities. "Major reconstruction" is defined as "the repair, replacement, or rebuilding, of an existing rigid coastal structure which is no longer capable of providing its original level of protection or which would change the alignment, design or level of protection afforded by the original structure" (§16B-41.002(32)).

DBS also has the authority to require redesign, landward relocation, or removal of existing erosion control structures "whose alignment has been determined ... to interfere with the natural movement of sand resulting in significant adverse impact to the coastal system or adjacent properties" (§16B-41.005(10) FAC). According to DBS Director Kirby Green (1993), all permits for rigid structures require monitoring of impacts on the sediment transport system. In virtually all cases where problems have been detected, the division has required modification of the structure rather than removal.

Emergency permits may be granted in the event of a declared shoreline emergency as a result of storm-induced "erosion, beach or coastal damage or damage to upland structures and which endangers the health, safety or resources of the citizens of the state" (§16B-41.014(1) FAC). Activities allowed under such permits include "repairing, reinforcing or replacing an existing [erosion control] structure or constructing a temporary structure in order to prevent immediate collapse of a major structure, public road or bridge, water or sewage treatment facility, power or safety facility, or historical structure, or to reduce the rate of erosion [of property] during a storm, or relieve severe flooding conditions; and activities necessary to facilitate post-storm recovery" (§16B-41.014(4) FAC).

Actions that have been allowed to "facilitate post-storm recovery" have included debris removal and, in some cases, on-shore placement of sand from an offshore bar created by storm-induced erosion (Green, 1993). The term "recovery" is interpreted narrowly to apply to the beach and dune

system rather than to man-made structures. Actions that have been allowed "to reduce the rate of erosion of property during a storm" have included use of sand bags, beach bulldozing, and, in a few cases, temporary construction of sheet-pile walls to protect a vulnerable building (Green, 1993).

Analysis

DBS's coastal armoring policies strike a balance between the state's policy goal of protecting private property and public safety and the goal of protecting natural resources. The beach and dune system is a natural resource with inherent aesthetic, ecologic, and recreational values that also provides a natural buffer against the potential impacts of storm surge and waves. While rigid coastal erosion structures such as seawalls or groins may protect an upland residence, motel, road, or other facility from storm damage, the structure may also interfere with natural sediment transport processes that maintain the beach and dune system both at that location and on adjacent properties (Komar, 1976; Leatherman, 1991). Seawalls may interfere with the onshore and offshore movement of sand and lead to a narrowing of the beach. Groins and jetties may interrupt the longshore movement of sand parallel to the beach and cause accelerated erosion at downdrift properties. Provisions for emergency shore protection permits allow for short-term, temporary actions to protect life and property without compromising the long-term stability of the beach and dune system. But, habitable structures built in conformance with a DBS permit (see next section) are not eligible for protection by permanent coastal armoring structures.

REGULATION OF STRUCTURES ABOVE THE MEAN HIGH WATER LINE

Overview

Pursuant to §161.053(1)(a) FS, DBS establishes Coastal Construction Control Lines (CCCLs) on a county basis along the sandy shores fronting on the Gulf, the Atlantic, or the Straits of Florida so as to define that portion of the beach and dune system subject to the erosion effects of a 100-year

storm surge. Location of the line is determined from analysis of historical storm and hurricane tides, maximum wave uprush, shoreline morphology, and existing upland development (Chiu and Dean, 1984; Chiu, 1993). Portions of the sand coast may be exempted from the CCCL regulations if DNR determines that those areas are not subject to substantially damaging erosion (§161.053(10) FS). CCCLs have been drawn along all portions of the coasts of the designated counties except for areas owned by the federal government (Chiu, 1993).

In counties with no CCCL (Monroe County and the Big Bend counties from Pasco to Wakulla), excavation or construction within 50 feet of the MHWL is prohibited at any sandy-shored, riparian coastal location fronting the Gulf of Mexico or Atlantic coast exclusive of bays, inlets, rivers, bayous, creeks, passes, and the like. The setback does not apply, however, to shore protection structures, e.g. seawalls, or to structures existing or under construction on June 27, 1970 (§161.052(3) FS). The 50-foot setback regulations apply to a total of about 18 miles of shoreline statewide, while the CCCL permit program covers approximately 800 miles of shoreline (Devereaux, 1993).

No construction on or modification of beaches or dunes seaward of the CCCL or 50-foot setback is allowed except in conformance with a permit issued by DNR pursuant to §161.053(2) and (5) FS. Any habitable major structure (residence, motel, commercial building) that extends seaward of the CCCL or 50-foot setback must meet specific construction standards for wind, wave, hydrostatic and hydrodynamic loads, and erosion conditions designed to resist the predicted forces associated with a 100-year storm event (§16B-33.007 FAC). Construction and excavation must be located as far landward of the CCCL or 50-foot setback as possible (§16B-33.006(3) FAC). The proposed structure or excavation must also be located sufficiently landward of the beach and dune system "to permit natural shoreline fluctuations and to preserve the dune stability and natural recovery following storm induced erosion" (§16B-33.007(1) FAC). DBS may also require dune restoration as

a permit condition where it would be practical, economically feasible, and beneficial (Green, 1993). Local governments are authorized under §161.053(4) FS to administer an approved permit program in lieu of the state program, but none has taken the initiative to do so (Green, 1993).

Under the provisions governing both the CCCL permit program and the 50-foot setback, DBS may allow construction closer to the MHWL consistent with a "uniform construction line" established by existing development on adjacent lots (§§161.053(5)(b) and 161.052(2) FS), "if the existing structures have not been unduly affected by erosion" (16B-33.006(3) FAC). DBS Director Kirby Green has indicated (1993) that this uniform construction line caveat has not presented a significant constraint to the division's regulation of new structures along eroding shorelines because they have generally been able to show that the existing structures have been significantly affected by erosion.

DBS encourages applicants to locate structures as far landward as possible (§16B-33.005(6) FAC). Chapter 161 also imposes a 30-year setback on construction within the area defined by the CCCL. Section 161.053(6)(b) FS prohibits DBS or a local jurisdiction operating a program in lieu of the CCCL permit program from allowing construction of any structure other than a shore protection structure, pier, or "minor structure" which will be seaward of the "seasonal high water line" within 30 years after the date of application for such a permit. The 30-year "erosion projection" line is determined on a site-by-site basis (§16B-33.024(1) FAC) and can be no further landward than the CCCL.

Exceptions to the 30-year setback requirement may be granted where enforcement would preclude issuing a permit for a single-family dwelling on the parcel so long as 1) the parcel was platted before the effective date of that provision (October 1, 1985); 2) the parcel owner does not own another parcel immediately adjacent to and landward of that parcel; 3) the dwelling is located

landward of the frontal dune; and 4) the dwelling is situated as far landward on the parcel as practical without being seaward of or on the frontal dune (§161.053(6)(c) FS). Green (1993) estimated that DBS has granted about 15 to 20 such exceptions during the past five years. He predicted, however, that the number would increase in the future as more marginal land is proposed for development, i.e. most of the best-suited land has been developed.

According to Devereaux (1993), permits authorizing construction of single-family residences seaward of the 30-foot erosion projection line in areas with relatively high average erosion rates (e.g. 8 to 10 feet per year) include a condition that requires the house be removed when the MHWL reaches the house. Applicants are required to provide financial assurance such as an irrevocable certificate of deposit or a letter of credit to cover removal or relocation. This requirement has not yet been tested in court, however; none of the applicable structures has, as yet, been required to move. Similar conditions are not imposed on other CCCL or 50-foot setback permits (Devereaux, 1993). However, §161.061 FS gives DBS jurisdiction to require removal of any structure below the MHWL, regardless of whether it was constructed in conformance with a valid state permit, if that structure constitutes a nuisance, i.e. endangers human life, health, or welfare or "proves to be undesirable or unnecessary."

Post-storm reconstruction of storm-damaged structures is addressed by the statute and DBS regulations. Existing major habitable structures can be remodeled or repaired after a storm without complying with the 50-foot setback requirement, the CCCL permit conditions, or the 30-year setback so long as the modified or repaired structure remains within the confines of the existing foundation and no modification of the foundation is involved (§§161.052(6) and 161.053(12) FS). Minor repairs to the foundation are allowed so long as the foundation footprint is not altered (Devereaux, 1993). A major habitable structure may be rebuilt within the confines of the original foundation or relocated further landward in compliance with the CCCL construction conditions

(§161.053(13) FS). DBS has construed these provisions narrowly, stating in its regulations that such repair or rebuilding will only be allowed "where the proposed construction is necessary to prevent the imminent collapse or further damage to a structure" (§16B-33.007(4) FAC). The CCCL regulations also prohibit repairs or rebuilding "that expand the capacity of the original structure seaward of the thirty year erosion projection." Nonetheless, Green (1993) has indicated that there have been no cases where a permit has been denied to rebuild on the existing foundation, even in several cases where the foundation was on the active beach as a result of the storm.

Analysis

The permit requirements under the 50-foot setback and CCCL programs, including the 30-year setback, achieve storm hazard mitigation objectives by 1) reducing the vulnerability of buildings and facilities through location and construction standards and 2) preserving the natural storm protection attributes of the beach and dune system. There is no comparable protection of buildings and facilities along inland shores and areas with vegetated shorelines, including Monroe County and the Big Bend counties.

On portions of the state's coast where significant shoreline recession occurs, the area subject to regulation will become progressively narrower as the MHWL moves landward. These areas are limited to active barrier islands and sites affected by inlets (Devereaux, 1993). In addition, §161.053(6)(b) FS stipulates that the 30-year erosion projection line shall be no further landward than the CCCL. These provisions have not limited location of the 30-year setback so far (Chiu, 1993), in part because the base annual erosion rate is multiplied by a factor of 2.5 in setting the CCCL in areas with significant annual erosion (Green, 1993). DBS has been redrawing the CCCLs using a new technical methodology since 1980. Once this process is completed for the last three counties, Bay, Palm Beach, and Pinellas, DBS will probably resurvey selected areas of the coast that have significant rates of shoreline change due either to erosion or accretion (Chiu, 1993).

The protection afforded by the 30-year setback will also gradually diminish over time on eroding coasts. Single-family structures built seaward of the 30-year erosion projection line do not have to be relocated until the MHWL reaches the structure. Storm-damaged structures can be repaired in place so long as the foundation remains intact. Only where the foundation is also damaged can DBS require location further landward and, therefore, presumably apply a recalculated 30-year erosion projection line for the site.

In its 1993 report titled Beach Redevelopment, DNR's Office of Policy and Planning recommends that Chapter 161.053 be amended so that DBS can require that private structures located within the 30-year erosion projection area be rebuilt to the same standards that would apply to new structures if the structure were damaged more than 50% of its replacement value (Florida Department of Natural Resources, Office of Policy and Planning, 1993a). This would essentially redefine the distinction between repairing and rebuilding a structure and lower the damage threshold over which standards for new structures would apply. This threshold could be lowered further by employing a damage basis of 50% of the market value of the structure rather than 50% of the replacement value, since the market value is often less than the replacement value. The market value threshold is typically applied under the National Flood Insurance Program, although following Hurricane Andrew, FEMA permitted use of the higher threshold based on replacement value (Speights, 1993; see Chapter 2).

An alternative approach that could potentially promote relocation **before** structures are damaged would be to apply the MHWL relocation standard to all structures permitted under §§161.052 and 161.053 or to require relocation when a structure is within some threshold distance from the MHWL defined by a multiple of the average annual erosion rate. Section 161.061 FS appears to allow DBS to invoke the MHWL requirement for any structure that is below the MHWL. Imposing a relocation requirement based on a setback threshold would probably have to be based on

protection of the beach-dune sand sharing system or an argument that the structure should be moved when incursion on the sovereign beach is imminent.

In an analysis of post-storm redevelopment policy options for the CCCL permit program, researchers with the FAU/FIU Joint Center for Environmental and Urban Problems note that there are no restrictions on creating lots within the CCCL area that are too shallow to permit development in compliance with state regulations (Metzger et al., 1993). They imply that local government subdivision regulations should reflect the 30-year erosion setback and other CCCL locational requirements.

REGULATION OF DREDGE AND FILL ACTIVITIES

Overview

The State Department of Environmental Protection (DEP) regulates dredging and filling activities in, on, and over the wetlands and surface waters of the state through regulations promulgated as Chapter 17-312 FAC under the authority of Part VIII Chapter 403 (recently moved to 373) FS. DEP jurisdiction under Chapter 403 extends to all tidal waters of the state as well as natural lakes and non-intermittent rivers, streams, and natural tributaries. Activities on state sovereign lands require additional authorization by the State Board of Trustees of the Internal Improvement Trust Fund pursuant to their powers under Chapter 253 FS (§403.922 FS).

The regulations focus largely on protection of water quality (§17-312.080 FAC), but other wetland and surface water values are also considered including fish and wildlife, endangered species, recreation, navigation, erosion, shoaling, and flow (§403.918(2) FS). Applicants are required to demonstrate that the proposed activity will not violate state water quality standards. Additional restrictions apply to dredging and filling activities in waters approved for shellfish harvesting and those containing mangroves.

Analysis

DEP's dredge and fill regulations constitute the only direct state control of development along nonsandy and interior coastal shorelines. Their focus on surface water quality contributes to preservation of estuarine and near-shore ecosystems and the recreational and commercial values associated with those systems. However, neither the statute nor the regulations explicitly addresses the storm hazard buffer value of coastal wetlands with the exception of flooding impacts. Pursuant to the statutory directive to consider impacts on flow, DEP hydrologists do estimate the impact of wetland alterations on local flooding (Wonnacott, 1993). There are also no provisions in the regulations that govern wind load and flood elevation construction standards for habitable structures.

The dredge and fill regulations apply to shoreline protection structures as well as docks, piers, marinas, and navigation channel dredging. So long as water quality conditions are not compromised, the regulations impose no explicit restrictions on the level of protection that can be provided to an upland structure through construction of a bulkhead or other shoreline protection structure. However, the statute restricts the installation of vertical seawalls and encourages use of more "environmentally desirable" shore protection such as riprap or gently sloping, vegetated shorelines (§403.918 (5) FS). The primary impact of these regulations in the context of storm hazard mitigation and post-storm redevelopment has been through control of onsite sewage disposal systems as illustrated by the March 1993 storm that hit the Big Bend area (see next section). At present there are no statewide statistics on the numbers of acres of regulated wetlands that have been altered under state dredge and fill permits. However, a database is being developed from permit files since the late 1980s that will allow such analyses (Wonnacott, 1993).

REGULATION OF ONSITE SEWAGE DISPOSAL SYSTEMS

Overview

The siting and design of onsite sewage disposal systems, such as septic tank-drainfield systems, are regulated directly by the Department of Health and Rehabilitative Services (HRS) under §381.0065 FS. The DEP may play a role in coastal settings, under regulations governing protection of surface water quality in the state (§§17-302.600 - 302.700 and §17-4.242 FAC), where installation of an onsite sewage system requires a department permit, such as for filling a wetland or surface water of the state.

The HRS regulations specify minimum lot sizes, maximum development densities (lots per acre), and minimum setbacks of septic tanks and drainfields from potable wells and the mean high water line (MHWL) of tidal water bodies (§10D-6.046(7) FAC). The regulations also specify minimum effective soil depth and maximum flood vulnerability of drainfields.

The sewage disposal system must be setback 75 feet from the MHWL (§10D-6.046(3) FAC). Where a lot was platted prior to 1972, the minimum surface water setback is 50 feet, and the minimum lot size requirements do not apply (§10D-6.046(7)(e) FAC). In the Florida Keys and portions of south Dade County, where more than 60% of the surface and subsurface soils consist of Key Largo limestone or Miami oolite, the MHWL setback is reduced for septic tank systems and aerobic treatment systems using sand filter drainfields (§381.0065(12) FS). In Dade County, however, local ordinances are enforced in lieu of the state regulations (Heber, 1993).

The effective soil depth[1] of a drainfield must extend 42 inches or more below the bottom surface of the drainfield trench or absorption bed (§10D-6.047(1) FAC), and the water table elevation at the wettest season of the year must be at least 24 inches below the bottom surface of the

drainfield trench or absorption bed. HRS will allow the use of "suitable fill material" to achieve the necessary vertical separation between the drainfield and the water table (§10D-6.047(2) FAC). The existing lot elevation at the site of the proposed system installation must not be subject to flooding which occurs more than once every two years on average (§10D-6.024(25)(a) and 6.047(6) FAC). In addition, the absorption surface of the drainfield trench or absorption bed must not be subject to flooding based on 10-year flood elevations, although the department is authorized to grant a variance from this restriction under specified circumstances (§10D-6.0471(1) FAC).

HRS is also authorized to grant variances to these siting and design requirements where 1) the hardship was not caused intentionally by the action of the applicant; 2) no reasonable alternative exists for the treatment of sewage; and 3) the discharge from the individual sewage disposal system will not adversely affect the health of the applicant or other members of the public or significantly degrade ground or surface waters (§381.0065(8)(a) FS). Their policy has consistently been to allow no less than a 25 foot setback from the MHWL of tidal water bodies (Heber, 1993). This reflects, in part, the fact that regulations prior to 1972 required a setback of only 25 feet.

In a post-storm situation, if a system is damaged, it must be repaired or replaced to meet the same conditions that would apply to a new system on the lot (Heber, 1993). However, the grandfathering provisions that apply to lots platted prior to 1972 would also apply to a repaired or replaced system following a storm. Where storm-induced erosion affected the setback of the system from the MHWL, HRS's variance procedure might be employed if a new system could not be sited on the lot in conformance with the applicable regulatory requirements.

DEP enters the picture only when they are required to issue a permit that is related to the installation of an onsite wastewater disposal system proximate to surface waters of the state (Deadman, 1993). This involves a confluence of DEP responsibilities under Chapter 403 (recently

moved to 373) FS governing protection of water quality and regulation of dredge and fill activities in, on, and over the surface waters of the state.

All surface waters are classified Class III (Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife) unless expressly classified otherwise (§17-302.600(1) FAC). Portions of the coastal waters of many counties are classified Class II (Shellfish Propagation or Harvesting), e.g. parts of Dixie and Levy Counties but not Taylor, and most of the coastal waters of Franklin County (§17-302.600(3)(b) FAC).[2] Some coastal waters are also designated as Outstanding Florida Waters (OFW) (§17-302.700(9) FAC). DEP is prohibited from issuing a dredge and fill permit or water quality certification for any proposed activity or discharge within an OFW or which significantly degrades, either alone or in combination with other stationary installations, any OFW, unless the proposed activity or discharge is clearly in the public interest and the existing ambient water quality within the OFW will not be lowered as a result except on a temporary basis (§17-4.242(2) FAC).

The principal circumstances under which these regulations would govern siting or replacement of an onsite sewage disposal system are those where a property owner must obtain a permit to fill waters of the state under §17-312 FAC to 1) achieve the necessary linear setback from the MHWL of a tidal water body or 2) achieve the required elevation of a drainfield above the water table (Deadman, 1993). Where a DEP permit is not required, the agency exercises no jurisdiction over installation of sewage disposal systems, except in the DRI review process.

Analysis

The March 1993 storm that hit the Big Bend area of the Florida west coast especially hard has highlighted the role that onsite sewage disposal system regulations can play in a post-storm situation, especially in areas of the state where the CCCL and 50-foot setback permit programs do

not apply. Reconstruction was precluded for approximately 97 of 345 affected properties because of inability to comply with these regulations (Boland, 1993; Heber, 1993; Raffington, 1993). In more than half these cases, redevelopment would also have been precluded because the habitable structure had originally been built illegally on state sovereign lands and could not be relocated to a site above the mean high water line (Florida Interagency Management Committee, Winter Storm Task Force, 1993).

The area hardest hit by the storm lies in Taylor, Dixie, and Levy counties which are excluded from DEP's CCCL regulatory program because they do not have sandy shorelines. The majority of the oceanfront lots in the affected areas were platted before 1972. In many instances onsite sewage disposal systems were installed without state or local permits, either because installation predated state regulation or because the regulations were not effectively enforced (Heber, 1993). Many of the lots that were developed would not have met the state's regulatory requirements had permits been sought, and many of the remaining platted lots could not meet permit requirements now. In a number of cases both the habitable structure and the onsite sewage system were located on state sovereign lands (wetlands or in waters of the Gulf) (Florida Interagency Management Committee, Winter Storm Task Force, 1993). While state and local officials were aware of the situation, they had attempted to rectify problem cases as opportunities arose, e.g. when a building permit was sought to remodel a structure or when a structure was sold (Heber, 1993). Inconsistent local enforcement has evidently been an impediment to successfully following this strategy.

In reviewing applications to replace damaged onsite sewage disposal systems in the affected area, HRS attempted to allow modifications to existing systems where possible, following its variance procedures under §10D-6.045 FAC. As a general rule, HRS required use of a no-discharge, black-water system, such as a composting or incineration toilet, and a gray-water drainfield that would be no closer than 25 feet to the MHWL (Heber, 1993). However, there were numerous instances

where the 25-foot minimum setback could not be achieved without placing fill below the MHWL or within a state-regulated wetland. Thus many HRS variances were conditioned on receipt of a DEP dredge and fill permit (Florida Interagency Management Committee, Winter Storm Task Force, 1993).

DEP subsequently refused to allow placement of fill for the purpose of installing a drainfield because the adjacent Gulf waters are designated as Outstanding Florida Waters (Deadman, 1993). Extension of public sewers to the affected area was proposed, but was determined to be economically infeasible (Florida Interagency Management Committee, Winter Storm Task Force, 1993). Rebuilding would have been precluded on at least half the lots even with a centralized sewage treatment plant because of infringements on state sovereign lands.

The circumstances that arose in this case are evidently not unique. There are other developed areas of the coast, primarily in rural counties, where onsite sewage disposal systems have not been properly sited, and where rebuilding following a storm could be precluded because of the HRS setback requirements and DEP's policy of not granting permits to fill wetlands or below the MHWL for siting wastewater drainfields. Analogous circumstances could also arise where a storm caused significant erosion that precluded meeting the setback requirements. How the setback requirement for an onsite sewage disposal system would interact with CCCL regulatory requirements in areas with a sandy shore would vary with the site, but it is likely that under some circumstances the sewage disposal system setback could be the determinative regulation.

Not all coastal waters are designated as Outstanding Florida Waters. However, DEP would be similarly reluctant to permit filling for installation of a sewage disposal drainfield on properties adjacent to Class II or Class III coastal waters (Deadman, 1993). A determination might hinge on an analysis of the probable impact on existing water quality.

REGULATION OF LAND USE

Regulation of land use is almost entirely the prerogative of local governments who have the authority to restrict types of land uses and the density of development through promulgation of local land development regulations (LDRs) such as zoning and subdivision regulations. The state does not directly regulate land use except under limited circumstances where a local government fails to adopt LDRs consistent with development guidelines developed by the state for designated Areas of Critical State Concern.

LOCAL GOVERNMENT LAND DEVELOPMENT REGULATIONS

Overview

Local governments exercise control over land use types and densities through LDRs such as zoning and subdivision ordinances, dune protection ordinances, etc. These are generally authorized under Chapters 125, 166, and 177 FS. The state does not statutorily mandate adoption of specific LDRs. However, local governments are required under §163.3202 FS to adopt LDRs to implement their state-approved comprehensive plans. Thus the state indirectly influences the content of local LDRs governing coastal land use through the planning mandates concerning storm hazard mitigation that are set forth in Chapter 163 FS and Chapter 9J-5 FAC (see next section).

Analysis

Local LDRs governing coastal land use were not systematically analyzed in this study other than in our analysis of the implementation of the storm hazard mitigation planning mandates (see Chapter 4). While Chapter 163 directs local governments to enact necessary LDRs to implement their adopted comprehensive plans, DCA has no authority to conduct a systematic, substantive review of the LDRs adopted by local governments to implement their comprehensive plans. DCA's regulations "do ... not mandate the creation ... of regulatory authority for other agencies nor ... [do

they] authorize the adoption or require the repeal of any rules, criteria, or standards of any local ... agency" (9J-5.005(6) FAC). DCA only has the authority to bring suit in a state circuit court to compel a local government to adopt "one or more land development regulations" (§163.3202(4) FS) or to review the consistency of a specific LDR with the approved comprehensive plan if a challenge is initiated by a "substantially affected person" (§163.3213 FS). A new subsection (6) was added to §163.3202 by the 1993 ELMS bill which states that LDRs "may not be submitted to the state land planning agency and are not otherwise subject to state review or approval ..."

STATE LAND DEVELOPMENT REGULATIONS FOR AREAS OF CRITICAL STATE CONCERN

Overview

When Areas of Critical State Concern (ACSCs) are designated by the State Administration Commission pursuant to §380.05 FS, the Commission also adopts principles for guiding development within the ACSC. "Once an area is designated by rule, affected local governments have 180 days to submit land development regulations consistent with the principles set forth in the rule. If the local government fails to submit regulations, or its proposals are insufficient, the State ... [Dept. of Community Affairs] may propose regulations. If the agency's proposals are adopted by the Administration Commission, the local government must apply the regulations" (Christie, 1991:456). The ACSC designation can be repealed once DCA has approved LDRs and plans adopted by affected local governments.

Analysis

Three of the four ACSCs that have been designated to date include coastal lands: 1) Apalachicola Bay; 2) Big Cypress Swamp; and 3) the Florida Keys. Resource Planning and Management Committees have been appointed to assess two areas for possible designation as ACSCs that would include areas subject to coastal storm damage: 1) Charlotte Harbor and 2) the northwest Florida coast. We have not analyzed the LDRs adopted for these areas as part of this study.

LOCAL COASTAL PLANNING MANDATES

Overview

Chapter 163 FS sets forth planning mandates for all of the counties and municipalities in the state. The 1985 amendments to the statute require local governments to submit comprehensive plans to DCA for review and approval pursuant to general criteria stipulated in the statute and more detailed criteria promulgated by DCA as rule 9J-5 FAC. Section 163.3178 FS lays out the general requirements for the coastal elements of local government comprehensive plans. Several of these requirements specifically concern storm hazard mitigation.

Subsection (1) states that "it is the intent of the Legislature that local government comprehensive plans restrict development activities where such activities would damage or destroy coastal resources, and that such plans protect human life and limit public expenditures in areas that are subject to destruction by natural disaster." Plans must also include principles for hazard mitigation and protection of human life, redevelopment principles to be used to eliminate inappropriate and unsafe development, a list of regulatory and management techniques to mitigate storm hazards, and designation of "high-hazard coastal areas" that will be subject to the state's coastal infrastructure policy set forth in §380.27(2) FS (see later discussion in this chapter).

Local comprehensive plans are also required to be "coordinated" and "consistent" with the State Comprehensive Plan (§§163.3177(4)(a) and 163.3177(9)(c) FS). The State Comprehensive Plan, initially adopted by the State Legislature in 1985, includes two formal policies concerning coastal storm hazard mitigation:

1) Avoid the expenditure of state funds that subsidize development in high-hazard coastal areas (§187.201(9)(b)3 FS).

2) Avoid transportation improvements which encourage or subsidize increased development in coastal high-hazard areas ... (§187.201(20)(b)12 FS).

Rule 9J-5 FAC details the minimum criteria by which local comprehensive plans are evaluated under DCA's formal review process. Local governments are required to identify "coastal high hazard areas" (CHHAs) and inventory and assess the capacity of the infrastructure within them (§§9J-5.012(2)(e)3 and (h) FAC). Coastal elements are to include goals, policies and objectives that "[l]imit public expenditures that subsidize development permitted in coastal high hazard areas ..." and that "[d]irect population concentrations away from known or predicted coastal high hazard areas" (§9J-5.012(3)(b) FAC).

Analysis

We present a detailed analysis of the implementation of the coastal storm hazard mitigation planning mandates of Chapter 163 FS and 9J-5 FAC in Chapter 4 based on a survey of 18 coastal counties and municipalities. Several of these planning mandates are also discussed later in this chapter in the context of the state's coastal infrastructure policy.

MANDATED LOCAL REGULATION OF CONSTRUCTION WITHIN THE COASTAL BUILDING ZONE

Overview

The State Coastal Zone Protection Act of 1985 (Chapter 161, Part III, FS) created an additional mechanism for mitigating coastal storm hazards through more uniform control of coastal construction by local governments. The statute establishes minimum construction criteria for all new and substantially improved major and minor structures within an area labelled the "Coastal Building Zone." These were to have been incorporated in local building codes by ordinance by January 1, 1987. DCA was designated to oversee the adoption of these local ordinances (§161.56 FS) and to provide technical assistance to local building code enforcement personnel.

Most local governments enacted ordinances which adopted the provisions of §161.55(1) FS by reference (Smith, 1993). All new and "substantially improved" major structures (including houses, mobile homes, multifamily, commercial, and public structures) located within the designated Coastal Building Zone were required to meet 1) the state minimum building code in effect in the jurisdiction; 2) federal mobile home construction and safety standards; 3) National Flood Insurance Program regulations or those of a local flood damage prevention ordinance, whichever is more restrictive; 4) wind velocity standards of 110 mph, except on the Keys where the standard is 115 mph; and 5) foundation design and construction standards.

The Coastal Building Zone is defined in general as "the land area from the seasonal high-water line landward to a line 1,500 feet landward from the coastal construction control line ... and, for those coastal areas fronting the Gulf of Mexico, Atlantic Ocean, Florida Bay, or Straits of Florida and not [having a CCCL] ... the land area seaward of the most landward velocity zone (V-zone) line as established by the Federal Emergency Management Agency and shown on flood insurance rate maps" (§161.54(1) FS).

The zone is more extensive on coastal barrier islands where it is defined as "the land area from the seasonal high-water line to a line 5,000 feet landward from the coastal construction control line ... or the entire island, whichever is less" (§161.55(5) FS). Where a CCCL has not been established, the Coastal Building Zone is defined as "the land area seaward of the most landward velocity zone (V-zone) boundary line fronting upon the Gulf of Mexico, Atlantic Ocean, Florida Bay, or Straits of Florida." The entire Florida Keys is also designated as being included in the Coastal Building Zone.

The specific post-storm applications of this policy hinge on the definition of "substantial improvement." The term is defined in the statute as "any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds, over a 5-year period, a cumulative total of 50%

of the market value of the structure either: 1) Before the improvement or repair is started; or 2) If the structure has been damaged and is being restored, before the damage occurred" (§161.54(12) FS).

Outside the Coastal Building Zone, local governments that choose to regulate building construction are required to adopt one of four model building codes specified under the state "minimum building code" (Part VII, Chapter 553 FS). These vary in their requirements for hurricane wind load resistance (Saffir, 1992). Communities that participate in the National Flood Insurance Program are also required to adopt floodproofing and building elevation and design standards part of their local building codes for areas designated as flood zones (A-zones) and coastal velocity zones (V-zones) (see discussion in Chapter 2).

Analysis

There is an overlap in local and state jurisdiction between the seasonal high water line (SHWL) and the CCCL. Within this zone, the more stringent state standards take precedence (Devereaux, 1993). DBS Director Kirby Green indicated (1993) that in most cases, local governments tell applicants to secure the state permit first, but problems have arisen where the "substantial improvement" threshold may pertain, because those determinations must be made by the local government. DBS has no authority to apply a similar threshold. They are empowered to require nonconforming structures to meet the state construction and setback standards for new structures following a storm only where reconstruction involves major repair or modification of the original foundation (§§161.052(6) and 161.053(12) FS).

The time basis for calculating cumulative damage under the "substantial improvement" threshold of Part III of Chapter 161 FS was originally interpreted as being over the life of the structure (Koutnik, 1993; Smith, 1993). In 1991, the State Legislature added the phrase "over a 5-year period" to

§161.54(12) FS. This has the effect of reducing the number of cases where a repair, reconstruction, or improvement project will qualify as a substantial improvement and, therefore, be subject to the 1985 construction standards. Apparently the change was motivated by both a concern with administrative costs of documenting and monitoring improvements over the life of a structure and a desire by property owners to raise the substantial improvement threshold (Smith, 1994). The change has evidently not raised any serious concerns among state personnel.

The Coastal Zone Protection Act construction requirements were designed to be consistent with the CCCL and 50-foot setback permit regulations (Green, 1993). They included the wind load design standard of Section 1205 of the Southern Building Code Congress (SBCC) Standard Building Code (Smith, 1993). However, the DBS regulations (§16B-33 FAC) have subsequently been amended to employ more stringent wind design and flood elevation standards. The American Society of Civil Engineers (ASCE) wind design standard (1990), which was recommended by the Hurricane Andrew Interagency Hazard Mitigation Team (U.S. Federal Emergency Management Agency, 1992a) as the national consensus, state-of-the-art wind design standard, is now employed by DBS for coastal construction permits above the MHWL. This standard calls for about 20% greater wind load resistance than the SBCC standard for structures less than 60 feet in height (Smith, 1994). DBS also uses a more conservative method for estimating 100-year storm flood elevations that are typically one to two feet higher than those developed by FEMA for V-zones on Flood Insurance Rate Maps (Devereaux, 1993). The Hurricane Andrew Interagency Hazard Mitigation Team Report reports that structures built to these standards on Key Biscayne suffered little or no damage compared to structures located outside the CCCL permit zone.

DCA has no authority to enforce implementation of these building code conditions by local governments (Smith, 1993). Local governments were required to provide evidence of adoption of an appropriate ordinance to DCA by April 1, 1987, and DCA was required to provide a list of any

noncompliant local governments to the State Administration Commission. While the Administration Commission was empowered to withhold state monies from local governments that failed to comply with the requirements of the Coastal Zone Protection Act (§161.56(2) FS), no such sanctions were imposed (Smith, 1993). One of the few localities that refused to comply was Horseshoe Beach in Taylor County which was one of the areas hard hit by the March 1993 storm (Smith, 1993).

DCA's role has been primarily to provide technical assistance. They sponsor workshops for local building inspectors conducted by the SBCC, and they financed preparation of an initial "deemed-to-comply" manual by the SBCC as required by the statute (§161.56(4) FS). The manual supplements the SBCC code, which is a performance code rather than a specification code, with detailed specifications on how to meet the performance code for single- and multi-family construction (Saffir, 1992). The SBCC recently published a revised version of the manual on its own initiative titled Standards for Hurricane Residential Construction (Smith, 1993). The State Board of Building Codes and Standards has adopted the SBCC standards as an approved option for one- and two-family dwellings (Smith, 1993). However, the provisions of the manual are not enforceable unless the local government adopts them as part of their building code (Saffir, 1992). DCA also recently surveyed local building inspectors to determine how they are enforcing the SBCC wind load standards. Some are requiring an architect's or engineer's seal on building drawings. Others require submittal of calculations used to determine wind load resistance.

Despite the recommendations of the Hurricane Andrew Interagency Hazard Mitigation Team, that the ASCE wind load standard be employed in all hurricane-prone areas, there are apparently no state initiatives under way to mandate changes in local building code hurricane standards (Smith, 1994). Amendment of Chapter 161, Part III, FS would only apply within the Coastal Building Zone. Hurricane Andrew clearly demonstrated that wind damage can occur far landward of this zone

(U.S. Federal Emergency Management Agency, 1992b). Climatological data referenced in the ASCE wind load standard indicate that the majority of the state of Florida is subject to basic wind speeds[3] of 90 to 100 miles per hour (American Society of Civil Engineers, 1990). Impact over a broader geographic area would be obtained by amending the statutory statewide minimum building code (Part VII, Chapter 553 FS) (Smith, 1994). In a recent review of hurricane-resistant building codes, Herbert Saffir, one of the designers of the Saffir-Simpson hurricane index, recommends use of the ASCE standard statewide (Saffir, 1992). Saffir also cites the South Florida Building Code as the best model code for hurricane-resistant construction.

ACQUISITION OF COASTAL PROPERTY

Investments in land can contribute to coastal storm hazard mitigation policy goals in three ways: 1) protecting natural features that mitigate storm damage to upland property (e.g. beaches, dunes, and wetlands); 2) minimizing threats to public safety and property by removing vulnerable land from the development market; and 3) altering the pattern of development and thereby affecting choices about infrastructure investments that might otherwise induce further risk-prone development and increase the potential public costs of storm damage (Burby, Cigler, French, and others, 1991; Godschalk, Brower, and Beatley, 1989). Acquisition can also be used as a supplement to state regulation of site development along the coast. Where storm-induced damage renders a parcel unbuildable or precludes rebuilding of a damaged structure, the state can offer to purchase the land to avoid a takings claim.

Appreciation of this potential is evidenced in Section 59 of the recently enacted ELMS bill (CS/CS/HB 2315) which adds §380.21(4) to the statutory declaration of legislative intent for the state coastal management program:

"The Legislature recognizes that land acquisition has great potential to support the

> state's coastal management and regulatory efforts. Removing coastal properties from the pool of developable acreage reduces the adverse land use and environmental impacts the state coastal zone management program is attempting to eliminate or diminish, while at the same time minimizing public expenditures and reducing risk to life and property in storm-prone coastal areas."

Investments in land can include fee-simple purchase as well as purchase of part of the property rights of a parcel such as through conservation easements or purchase of development rights. The State of Florida has one major program for direct acquisition of coastal property, the Conservation and Recreational Lands (CARL) Program administered by the Division of State Lands (DSL) within the Department of Environmental Protection (DEP), formerly the Department of Natural Resources (DNR). The state also has a program to facilitate local land acquisition through the Florida Communities Trust. Each of these programs is discussed in the following sections followed by a discussion of state enabling statutes governing acquisition of less-than-fee interests in land.

CONSERVATION AND RECREATIONAL LANDS, SAVE OUR COAST, AND OTHER STATE LAND ACQUISITION PROGRAMS

Overview

The principal mechanism available for direct state acquisition of coastal properties is the Conservation and Recreational Lands (CARL) Program with funds allocated from the Preservation 2000 (P2000) bond sale program (§259.101(3) FS). The Save Our Coast (SOC) Program, which was initiated in 1981 to purchase "the remaining undeveloped sections of the Florida coastline" (Florida Joint Legislative Management Committee, 1992:7), has not funded any new projects since 1992 when the last of its uncommitted funds were combined with CARL monies to purchase the final parcel of the Avalon tract (Buchanan, 1993). CARL has received the largest share (50%) of the $300 million a year allocated from the P2000 bond sale program for 1991-1993. CARL expenditures are also financed with about $45 million per year from documentary stamp taxes and phosphate mining taxes (Gluckman and Henderson, 1991).

Five other state land acquisition programs are allocated another 40% of the P2000 funds, but only the CARL Program has an explicit priority for acquiring coastal lands: one fifth of the P2000 CARL funds are earmarked for purchase of coastal properties (§259.101(3)(a) FS). However, coastal property might conceivably be purchased under any of the other programs under specific circumstances. The remaining 10% of the P2000 bond sale proceeds go to the Florida Communities Trust (FCT) Program which assists local governments in acquiring land to accomplish needs addressed in the conservation, recreation, open space, and coastal elements of their comprehensive plans (see next section).

Prior to enactment of the ELMS III bill in the 1993 legislative session, none of the state land acquisition programs specifically targeted purchase of coastal lands for the purpose of storm hazard mitigation. The SOC Program was limited to acquiring beach frontage along the Gulf and Atlantic coasts for public recreation. Properties also had to "have coastal features that are desirable for retention in their present condition or are capable of being restored for environmental benefit" (Florida Department of Natural Resources, Office of Policy and Planning, 1993:II-3). In the last funding cycle, $5 million was set aside to fund smaller beach access projects through a 75%/25% state/local match program. The maximum project size was $250,000. About $2 million of that money was not spent for lack of projects (Buchanan, 1993).

Projects for annual funding under the CARL program are selected from a priority list established by the Land Acquisition Advisory Council (LAAC) and approved by the Board of Trustees of the Internal Improvement Trust Fund, which consists of the Governor and Cabinet (Florida Department of Natural Resources, Division of State Lands, 1993). Projects must meet both the CARL acquisition criteria and those set forth in the P2000 enabling statute. The CARL Program criteria emphasize protection of high quality, environmentally unique and irreplaceable lands that contain native flora and fauna, endangered or threatened species, opportunities for natural resource-based

recreation, significant archaeologic or historic sites, and lands that will help enhance or protect significant natural resources (Florida Department of Natural Resources, Division of State Lands, 1993).

Properties acquired with P2000 funds must also conform to one or more of the following statutory acquisition criteria (§259.101(4) FS): 1) a significant portion of the land in the project is in imminent danger of development, loss of significant attributes, or subdivision; 2) the value of the land is likely to appreciate at a rate that favors immediate purchase; 3) a significant portion of the land in the project serves to protect or recharge groundwater, protect other natural resources, or provide space for natural resource based recreation; 4) the project can be purchased at 80% or less of the appraised value; or 5) a significant portion of the land in the project serves as habitat for endangered, threatened, or rare species or serves to protect natural communities which are critically imperiled, imperiled, rare, or excellent quality occurrences.

These purposes were supplemented by Section 64 of the ELMS bill which adds project criteria language to the statutory authorization for CARL purchases under P2000 (§259.101(4)) concerning the value of acquiring coastal high-hazard parcels. "In the acquisition of coastal lands pursuant to paragraph (3)(a) [i.e. §259.101(3)(a) FS which refers to §253.023 FS which is CARL], the following additional criteria shall also be considered: The value of acquiring coastal high-hazard parcels, consistent with hazard mitigation and post-disaster redevelopment policies, in order to minimize the risk to life and property and to reduce the need for future disaster assistance... ."

There is also a direct link between the state's coastal construction regulatory program and coastal land acquisition. DEP is directed under Chapter 161 FS to make recommendations to the Governor and Cabinet for the purchase of lands seaward of the CCCL, in fee-simple or less-than-fee, under the CARL or Outdoor Recreation Land acquisition programs (§161.053(14) FS). Pursuant to this

mandate, DEP's Division of Beaches and Shores (DBS) has recommended state purchase of properties when the CCCL lines are being drawn and, in a few cases, where CCCL permits have been sought and there has been no alternative other than permit denial (Green, 1993). DBS also contracted an inventory of privately owned, undeveloped coastal properties in coastal counties with sandy beaches in 1990 and 1991.

Analysis

Two issues emerge from an assessment of the CARL Program: 1) the extent to which it has and can be effective in achieving storm hazard mitigation goals; and 2) the extent to which it can be applied in a post-storm situation to acquire property that owners may be more willing to sell as a result of storm impacts.

Incorporating storm hazard mitigation as an objective of state land acquisition initiatives may be difficult because of potential conflicts between such an objective and the other acquisition criteria that have been applied under CARL and P2000. If storm hazard mitigation is to be an acquisition objective, parcels with high rates of erosion or that are more subject to flooding or storm surge should probably be ranked highly. However, DSL staff and the LAAC view highly erosive sites as a management liability (Brock, 1993). When DBS staff were preparing acquisition recommendations from their 1991 inventory of undeveloped coastal properties, they also ranked highly eroding parcels lower because of their management problems (Flood, 1993). Furthermore, if a parcel lacks natural resource value or is not threatened by development, it would not generally be considered for a CARL purchase (Brock, 1993). Thus an area of developed beachfront property that was severely damaged in a storm and could not be rebuilt in compliance with applicable regulations would not be a viable candidate for CARL funding under P2000.

Despite the absence of any acquisition criteria focused on storm hazard mitigation, the SOC and

CARL programs have undoubtedly contributed to mitigating some of the impacts of coastal storms. Acquisition of large parcels of coastal land has removed them from the development market and contributed to the preservation of the protective features of beach, dune, and wetland systems. The SOC program acquired 22 miles of beach frontage along the Gulf and Atlantic coasts and 52 miles of marshland frontage along the Gulf coast in 26 projects totalling more than 73,000 acres over the period from October 1982 through January 1993 (Florida Department of Natural Resources, Office of Land Use Planning and Biological Services, 1992). Most projects extended at least as far landward as the nearest public street or highway, but some had depths of as much as 1/4 to 2 or 3 miles (Buchanan, 1993). An additional 5,171 feet of shorefront has been obtained through the beach access initiative that began in 1988 (Florida Department of Natural Resources, Division of Recreation and Parks, 1993). This effort included 46 projects developed jointly with county or municipal sponsorship. While these projects clearly removed potentially hazardous property from the development market, the acquisition criteria did not "emphasize post-disaster or hazard mitigation ... or providing an alternative for marginally developable shoreline lots" (Florida Environmental Land Management Study Committee, 1993: 98).

Comparable data on total miles of shoreline protected under CARL and its predecessor, the Environmentally Endangered Lands Program, are not available (Brock, 1993). However, review of the 84 projects on the 1993 LAAC priority list reveals several that will contribute to storm hazard mitigation objectives, although in some cases only a small portion of the acreage to be acquired has storm hazard mitigation potential. Four projects in the Florida Keys (Monroe County), which have been undertaken primarily to preserve rare and endangered species and ecosystems or to protect nearby water quality, will remove property from the development market that is highly vulnerable to storm damage. Several other projects will protect varying lengths of beach and dune systems while also protecting valued shoreline and upland ecosystems. Others will remove low-lying areas from development that are not regulated under the state's CCCL permitting program because they are in

regions of the state without sandy shores or are bayside areas characterized by saltmarsh or mangrove swamp. One such project, the Big Bend Coast Tract in Taylor and Dixie counties, encompasses much of the area damaged by the March 1993 storm, although the areas proposed for acquisition exclude the developed areas of Dekle Beach, Horseshoe Beach, etc.

CARL projects tend to be large parcels on the order of hundreds to thousands of acres (Gluckman and Henderson, 1991). Because of CARL's general concern with preserving rare and endangered natural resources, there is a sense among members of the DSL staff and the LAAC that the amount of money spent on coastal properties should be balanced to some degree with monies invested in other types of natural communities (Flood, 1993). Greg Brock (1993), environmental administrator for the CARL Program within DEP's Division of State Lands, noted that some 80% of CARL funds have been spent on projects with some coastal attributes. He suggested that through the combined efforts of the SOC and CARL programs the large parcels of statewide significance have been acquired or are on the current priority list. Remaining projects are more likely to be of regional or local significance and, therefore, of lower priority for the CARL Program.

The consensus among those close to the state's land acquisition programs is that the ELMS bill revisions to the P2000 criteria for CARL coastal land purchases will have, at best, a marginal effect in terms of promoting acquisition of parcels for the purpose of storm hazard mitigation. James Farr of the Florida Coastal Management Program (1993) noted that the P2000 acquisition criteria are an overlay to those in the CARL enabling legislation, i.e. they do not redefine the CARL acquisition criteria, they merely add to them. Furthermore, the constitutional authority governing issuance of the P2000 bonds restricts use of the money to acquiring "lands, water areas and related resources ... in furtherance of outdoor recreation, natural resources conservation and related facilities" (§17 Article IX, Constitution of 1885 as amended). Thus, hazard mitigation could not be the sole criterion for acquiring a coastal property. Farr also did not think the political constituencies that

have supported P2000 would support use of those funds for parcels where the primary value was hazard mitigation.

The damage wrought by a coastal storm may alter a parcel to the extent that a CCCL or 50-foot setback construction permit cannot be obtained or may convince the property owner that the site is too risky to build or rebuild upon. Following a coastal storm, acquisition may offer a means of 1) contending with potential takings problems; 2) achieving the broad objective of removing vulnerable property from the development market; and 3) acquiring parcels previously identified as part of a larger project. However, the CARL Program as currently structured is not well-suited to such an application.

Using P2000 CARL funds to finance post-storm acquisitions would probably not be consistent with the selection criteria used by the LAAC in setting priorities for purchases (Brock, 1993). If the lots could no longer be built upon because of regulatory restrictions, the properties would not be vulnerable to development. If the storm damage were sufficient to render the parcel unbuildable, the remaining property probably would have low natural resource value as well. Finally, unless a significant number of adjoining parcels were sufficiently damaged to warrant acquisition, the state would be left holding a number of small parcels that could be difficult to manage and furthermore, would not necessarily be suited to providing increased public recreation opportunities.

The lengthy decisionmaking process employed in the CARL program is also seen as an impediment to employing it in a post-storm situation (Murley, 1993). In the opinion of DNR staff, none of the state's land acquisition programs is able to react quickly enough to take advantage of opportunities that might arise immediately following a severe coastal storm (Florida Department of Natural Resources, Office of Policy and Planning, 1993). James Murley, Executive Director of 1000 Friends of Florida, has suggested (1993) that a mechanism is needed to allow a more expedited acquisition

process under post-storm conditions for parcels already identified, i.e. through county inventories (see discussion under FCT Program).

There are provisions in Chapter 253 FS for expedited acquisition under the CARL Program. Section 253.027 sets forth procedures for emergency acquisition of archaeological properties. Section 253.025(15) permits the Board of Trustees to "waive or modify all procedures" to purchase lands made available from sales by the federal Resolution Trust Corporation (RTC) or to purchase lands that "will be developed or otherwise lost to potential public ownership, or for which federal matching funds will be lost, by the time the land can be purchased under the program within which the land is listed for acquisition." However, such purchases are limited to 15% of the funds allocated under P2000 and the lands to be purchased must already be on the LAAC's acquisition list, or a "significant portion of the lands must contain natural communities or plant or animal species which are listed by the Florida Natural Areas Inventory as critically imperiled, imperiled, or rare, or as excellent quality occurrences." Brock (1993) agreed that this clause might be applied in a post-storm situation but noted that it has, as yet, not been used, even for RTC parcels.

According to Green (1993), DBS developing a procedure for negotiating purchase of parcels prior to actually denying a coastal construction permit. However, DBS does not have an accessible source of funds because such properties usually do not meet CARL acquisition criteria. The only such acquisitions to-date have been following a judicial takings judgment. These were financed with interest accrued in the Beach Management Trust Fund. However, the State Legislature directed this interest back to the General Fund several years ago, so DBS presently has no funds to cover either takings purchases or negotiated purchases prior to a permit denial. Green indicated that if the interest were allowed to accrue to the Beach Management Trust Fund it would generate about $500,000 to $700,000 per year which would be enough to cover takings purchases. The implications are that additional monies would be needed to effect the negotiated purchase strategy.

It appears, therefore, that any initiative to acquire coastal property for storm hazard mitigation, in either a pre-storm or post-storm situation, will probably require a dedicated funding source that is not constrained by the constitutional limitations of Article IX which has served as the authority for all land acquisition bond issues since 1963. It would also require a different political orientation towards land acquisition that would accept a different rationale for using public funds to remove land from the private market. Finally, it would require a management philosophy that did not view parcels that are vulnerable to storm damage as a liability to be avoided.

The 1991 undeveloped beach property survey conducted by DBS could serve as the starting point for an initiative to identify parcels for an acquisition program targeted at reducing storm hazards by removing vulnerable property from the development market. Parcels identified in that study as having 500 feet or more of contiguous undeveloped shoreline could be analyzed to determine their vulnerability to storm damage (flooding, storm surge, and erosion) and the potential impact acquisition might have on altering development patterns and reducing the amount of property and numbers of lives at risk. A project team with the Joint Center for Environmental and Urban Problems at Florida Atlantic University and Florida International University is developing an analogous process for assessing developed parcels that are damaged by coastal storms (see Metzger et al., 1993).

In addition, the 1993 ELMS bill establishes a mechanism for local governments to identify coastal properties to be acquired to achieve storm hazard mitigation objectives. Section 7 of the bill adds language to the local government comprehensive planning statute (§161.3178(8) FS) directing each county to establish a process for identifying and ranking coastal properties for acquisition by the state, including hazard mitigation as one of the criteria. Parallel language in Section 60 of the ELMS bill, adding §380.22(4) and (5) FS, directs DCA, as lead agency for the state coastal management program, to establish a county-based process for identifying and setting priorities for

acquiring coastal properties in coordination with the Land Acquisition Advisory Council (LAAC) and the Interagency Management Council (IMC) so these properties may be acquired as part of the state's land acquisition programs [emphasis added]. Coastal storm hazard mitigation is explicitly recognized as one of the criteria to be used in this prioritization process in the amendment of §380.22(5)(a) FS: "In addition to other criteria ... the following criteria shall be considered when establishing priorities for public acquisition of coastal property: (a) The value of acquiring coastal high-hazard parcels, consistent with hazard mitigation and post-disaster redevelopment policies, in order to minimize the risk to life and property and to reduce the need for future disaster assistance."

James Murley, Executive Director of 1000 Friends of Florida and chair of the ELMS III coastal working group, said that he had envisioned the counties and their municipalities ranking coastal land acquisition for both pre-storm and post-storm circumstances (Murley, 1993). The IMC and LAAC would act as brokers to assist local governments in identifying the appropriate state land acquisition program for accomplishing these objectives. James Farr of the Florida Coastal Management Program staff in DCA suggested that since the LAAC only is involved in the CARL Program, the IMC's role would likely be to act as the broker for other state acquisition programs and could, perhaps, help in ranking the aggregated county lists for CARL and FCT (Farr, 1993).

THE FLORIDA COMMUNITIES TRUST

Overview

The Florida Communities Trust (FCT) is a nonregulatory agency established within DCA in 1991 to assist local governments in implementing the conservation, recreation, open space, and coastal elements of their comprehensive plans (Florida House Committee on Natural Resources, 1993). A land acquisition grants program operated by the Trust constitutes the other major means available for acquiring coastal lands to achieve state storm hazard mitigation policy objectives. This program

qualifies both as an instrument for investing in coastal property and as an economic incentive program since it requires local match for state funds.

Chapter 380 FS directs the FCT to correct undesirable development patterns, restore degraded natural areas, enhance resource values, restore deteriorated or deteriorating urban waterfronts, reserve lands for later purchase, participate in and promote the use of innovative land acquisition methods, and provide public access to surface waters by providing technical and financial assistance to local governments in the state (§§380.502(3)(a); 380.507 FS). The Trust's principal initiative has been to operate a land acquisition grant program with funds allocated from the P2000 bond sales. All P2000 funds must be used only for acquisition of lands by local governments or the state "to help implement the goals, objectives, and policies of the coastal, the conservation or recreation and open space elements of the local comprehensive plan" (§380.510(7) FS as amended by Section 70 of the 1993 ELMS Bill). The FCT governing body, which consists of the secretary of DCA, the executive director of DNR, and three members of the public appointed by the Governor and confirmed by the Senate, has limited grants to local governments whose comprehensive plans have been found to be in compliance with state requirements or who have entered into a stipulated settlement agreement with DCA to bring their plan into compliance (Florida Communities Trust, 1993c).

The evaluation criteria for projects funded under the P2000 program are extensive (§9K-4.008 FAC). They primarily target: 1) furtherance of growth management objectives of the comprehensive plan, including the location and distribution of residential and urban densities, rectifying land use conflicts, and providing outdoor recreation opportunities within the urban service area; 2) furtherance of the natural resources conservation, coastal protection, and outdoor recreation elements of local comprehensive plan, including protection of plant communities, animal species and habitats, ground and surface water quality and quantity, and outdoor recreation opportunities;

and 3) other "innovative, unique, and outstanding elements" such as alternatives to fee-simple acquisition, protection of unique natural features or historic, archaeologic, or cultural sites, neighborhood parks, urban core parks, and greenway networks.

The Trust is explicitly authorized to provide by grant or loan up to 100% of any local government land acquisition costs approved pursuant to the statute. However, the Trust may require local funding participation in projects (§380.507(7) FS). The Trust itself may also acquire interest in lands including fee simple and less-than-fee interests (§380.507(6) FS), but it may hold those interests for no more than five years during which time it is expected to sell those interests to a local government, state or federal agency, or non-profit organization (§380.508(4)(e) FS). Half of the P2000 money must be matched by the local government. An additional tenth of the P2000 funds are to be used for matching grants on an equal basis for acquisitions within designated Areas of Critical State Concern (§259.101(3)(b) FS). The Trust governing body requires all applicants to provide some match except for counties with populations of 50,000 or less and cities with populations of 5,000 or less (§9K-4.0031(6) FAC).

As noted in the preceding discussion of the CARL Program, the 1993 ELMS bill creates a mechanism for local governments to identify and rank coastal properties for acquisition through state land acquisition programs. The bill does not, however, directly amend the P2000 authorizing legislation concerning the FCT program. Thus there is no formal legal linkage between the ranking lists to be developed by local governments and the criteria to be used in awarding FCT grants.

Analysis

Seven of the 21 local land acquisition projects funded under the first round of FCT P2000 grants in 1991 could be considered coastal projects. All but two primarily involved acquisition of wetlands along coastal estuaries, with the intent to preserve valuable natural communities, animal species habitat, or buffer lands to protect estuarine water quality. One of the two projects that acquired

property on the open coast was a project in the Keys that purchased 28.5 acres and 3,300 feet of beach frontage for public recreational use and sea turtle habitat. The second, the Boyce/Wetstone project in Pasco County, constitutes the only initiative that explicitly identified storm hazard mitigation as a project objective: 1800 acres of property fronting the Gulf were acquired to protect natural resources and the natural barrier they provide against hurricane damage as well as to help limit density in the coastal high hazard area, increase public access to the shoreline, and preserve native species. In the second round of FCT P2000 grants, 5 of 26 funded projects can be characterized as coastal. Two were undertaken to protect coastal wetlands and associated upland habitats. The other three were undertaken to provide additional public recreation opportunities or beach access. These ranged in size from 1.14 to 13.2 acres.

Small projects have generally not fared well in the FCT evaluation process, including small public access projects (Farr, 1993). The 21 projects approved during the first application cycle ranged in size from 4 to 2,700 acres with an average of 539 acres and a median of 128 acres. Only one of the projects was less than 10 acres in size (Florida Communities Trust, 1992). In the second funding cycle, average project size was 225 acres. Projects ranged in size from 1.1 to 1400 acres with a median of 108 acres. Three of the 26 projects were less than 10 acres (Florida Communities Trust, 1993b).

James Farr is taking the lead for implementing the ELMS bill provisions governing development of local government priorities for coastal land acquisition and the brokering role of the IMC. He has indicated that 16 counties and one municipality (Boca Raton) have formal land acquisition programs most of which are modelled on the program developed by Volusia County. Most are conservation-oriented; a few include beach access as a priority, and none of them deals with coastal storm hazard mitigation.

Despite the apparent intent of the ELMS III Committee (Murley, 1993), the ELMS bill does not actually alter the criteria to be used in evaluating P2000-funded FCT land acquisition projects to include coastal storm hazard mitigation. The only explicit language that adds storm hazard mitigation to acquisition criteria applies to the CARL Program rather than the FCT (Section 64 amendment of §259.101(4) FS).

Section 64 of the ELMS bill does revise §259.101(3) FS which governs the allocation of P2000 funds to the FCT, but only to state broadly that "To the extent allowed by federal requirements for the use of bond proceeds, the trust shall expend Preservation 2000 funds to carry out the purposes of part III of chapter 380." Coastal storm hazard mitigation is not among the purposes delineated for the trust in Part III of Chapter 380. Section 70 of the ELMS bill also revises §380.510(7) FS which delineates the uses for which P2000 funds allocated to the Trust may be spent to explicitly include acquiring "lands to help implement the goals, objectives, and policies of the coastal, the conservation or recreation and open space elements of the local comprehensive plan." There is, therefore, no explicit language that would suggest that storm hazard mitigation is a legitimate use of FCT P2000 funds.

ACQUISITION OF LESS-THAN-FEE INTEREST IN REAL PROPERTY

Overview

Acquisition of less-than-fee interests in land encompasses the conveyance of conservation easements and development rights by property owners to government entities and private, nonprofit organizations. Ideally, less-than fee interests can be acquired for a price substantially below that of fee-simple interest, thereby extending the purchase power of land acquisition funds.

The ELMS III Committee recommended (Recommendation 171) that the State Legislature "encourage State, regional, and local acquisition programs to utilize less-than-fee acquisition

techniques for preservation purposes ... [including] purchase of conservation easements and the purchase and resale or leaseback of land with restrictions" (Florida Environmental Land Management Study Committee, 1993: 109). While the ELMS bill that was subsequently enacted by the legislature contains no new explicit agency directives concerning less-than-fee simple acquisition, existing statutes do at least provide authority to accomplish some of the types of transactions envisioned by the ELMS Committee and in some cases specifically promote consideration of less-than-fee alternatives.

The Florida Communities Trust (FCT) is explicitly authorized to acquire less-than-fee interests in land (§380.507(6) FS) as is the CARL Program (§253.023(3) FS). The Division of Beaches and Shores in the Department of Environmental Protection is directed by statute to make recommendations to the Governor and Cabinet for the purchase of both less-than-fee and fee-simple interests in lands seaward of the Coastal Construction Control Line (§161.053(14) FS). State laws also define the rules by which less-than-fee interests may be created and acquired, the allocation of ad valorem property tax relief to property owners who have conveyed conservation easements or development rights, and the enforcement of the conditions attached to the transfer of a conservation easement or development right: section 704.06 FS governs the creation, acquisition, and enforcement of conservation easements, while the conveyance of development rights and development restriction covenants is governed by §193.501 FS.

Acquisition of Conservation Easements. A conservation easement is defined as "a right or interest in real property which is appropriate to retaining land or water areas predominantly in their natural, scenic, open, agricultural, or wooded condition; retaining such areas as suitable habitat for fish, plants, or wildlife; retaining the structural integrity or physical appearance of sites or properties of historical, architectural, archaeological, or cultural significance; or maintaining existing land uses and which prohibits or limits any or all of the following: (a) Construction or placing of buildings,

roads, ... on or above the ground.... (b) Removal or destruction of trees, shrubs, or other vegetation. (c) Excavation, dredging, or removal of loam, peat, gravel, soil, rock, or other material substance in such a manner to affect the surface. (d) Surface use except for purposes that permit the land or water area to remain predominantly in its natural condition. (e) Activities detrimental to drainage, flood control, water conservation, erosion control ..." (§704.06(1) FS as amended by ELMS bill).

Conservation easements may take the form of a "restriction, easement, covenant, or condition in any deed, will, or other instrument executed by or on behalf of the owner of the property" (§704.06(2) FS). They may be acquired by any governmental entity or by certain private nonprofit organizations "in the same manner as other interests in property ... except by condemnation or by other exercise of the power of eminent domain." To qualify as a private nonprofit that may acquire a conservation easement, the organization's purposes must include "protecting natural, scenic, or open-space values of real property, assuring its availability for agricultural, forest, recreational, or open-space use, protecting natural resources, maintaining or enhancing air or water quality, or preserving sites or properties of historical, architectural, archaeological, or cultural significance" (§704.06(3) FS as amended by ELMS bill).

Conservation easements constitute "perpetual, undivided interests in property" (§704.06(2) FS). They "run with the land," are "binding on all subsequent owners," and they must allow the holder "to enter the land in a reasonable manner and at reasonable times to assure compliance" (§704.06(4) FS). The holder of a conservation easement is absolved from any liability for any damage or injury that may be suffered by any person on the property or as a result of the condition of the property encumbered by a conservation easement" (§704.06(10) FS).

Acquisition of Development Rights. The conveyance of development rights is restricted to lands

that are "environmentally endangered" or "utilized for outdoor recreation or park purposes." "Environmentally endangered" land is defined in the statute as land which "has unique ecological characteristics, rare or limited combinations of geological formations, or features of a rare or limited nature constituting habitat suitable for fish, plants, or wildlife, and which, if subject to a development moratorium or one or more conservation easements or development restrictions appropriate to retaining such land or water areas predominantly in their natural state, would be consistent with the conservation, recreation and open space, and, if applicable, coastal protection elements of the comprehensive plan adopted by formal action of the local governing body ... or land subject to regulation by the Department of Environmental regulation and defined as submerged lands in regulations adopted pursuant to s. 403.817" (§193.501(6)(h) FS).

The fee-simple owner may convey the development right of such land to a county, authorized municipality, or the state Board of Trustees of the Internal Improvement Trust Fund. The owner may also covenant with the county, authorized municipality, or state Board of Trustees that the land 1) will be subject to one or more conservation restrictions or 2) will be used only for outdoor recreation or park purposes (§193.501(1) FS). The conveyance or covenant must run for no fewer than 10 years.

Conservation restrictions are defined as "a limitation on a right to use the land for purposes of conserving or preserving land or water areas predominantly in their natural, scenic, open, or wooded condition" (§193.501(6)(b) FS). They may also include limitations on the use of land comparable to those that can be applied under a conservation easement as listed in §704.06(1) FS, including the construction of buildings, roads, or other structures, dumping of soil or waste material, removal or destruction of vegetation, excavation of soil or rock, etc.

State law (§193.501 FS) provides for a reduction in property taxes when a property owner

conveys development rights or grants a conservation easement on real property. These provisions are discussed in the section on economic incentives.

Analysis

It appears that the current statutory authorization for conveyance of development rights or development restriction covenants could not be used to obtain development restrictions on property within the coastal high hazard area for the sole purpose of storm hazard mitigation without some revision of the statute because of the limited applicability to environmentally endangered lands and lands used for outdoor recreation and park purposes. Hazard mitigation achieved through conveyance of a conservation easement would also have to be tied to the protection of natural resource, open space, or agricultural values. These constraints are similar to those that limit the applicability of the CARL and FCT acquisition programs to coastal storm hazard mitigation, i.e. storm hazard mitigation policy objectives would be secondary to natural resource preservation or the provision of recreational opportunities.

Even if storm hazard mitigation objectives were made a legitimate basis for conveying conservation easements or development rights, there is some question as to how cost-effective it would be to acquire such less-than-fee interests in coastal properties. Despite statutory authorization to acquire less-than-fee interests under the CARL Program, no such transactions have been made to date (Brock, 1993; Farr, 1993). Purchase of a conservation easement is evidently being considered for several CARL project parcels in central Florida where continued silviculture may be compatible with project objectives of watershed protection. The South Florida Water Management District has evidently acquired flowage easements and may have also done some fee-simple/leaseback acquisition (Murley, 1993).

These applications are consistent with the observations of the ELMS III Committee which

suggested that "[L]ess-than-fee acquisition techniques ... would be especially worthwhile for lands adjacent to CARL projects and existing public lands, where they can provide a buffer between environmentally sensitive areas and the sites of potential development" (Florida Environmental Land Management Study Committee, 1993:109). However, Greg Brock, coordinator of the CARL Program in the Division of State Lands, has observed that less-than-fee acquisition is generally inappropriate where active management, such as controlled burning, is necessary to maintain the natural resources that are being preserved (Brock, 1993). Thus a conservation easement may not be sufficient if action is required to restore or enhance existing dunes or other natural storm hazard mitigation attributes. Brock also noted that acquisition of easements is usually incompatible with efforts to provide opportunities for public recreation.

Purchase of development rights would appear to be a strategy that would be consistent with objectives of limiting development densities within the coastal high hazard area. It is generally acknowledged, however, that less-than-fee property rights often cost almost as much as fee-simple ownership, especially in areas where development pressure is great (Brock, 1993; Gluckman, 1994; Owens, 1983). This would suggest that less-than-fee acquisition would have limited application in most coastal areas of the state.

One option identified by the ELMS III Committee that does not appear to be authorized under state law is the purchase and resale or leaseback of land with restrictions by a state entity. This option represents a compromise between purchase of fee-simple property or development rights, both of which may be capital intensive, and severe regulatory restrictions on development, which may be held to be takings. The FCT is authorized to acquire land in fee-simple and hold it for up to five years, but it must eventually resell or otherwise convey it to a state or local agency or a qualified nonprofit organization (§§380.507(6) and 380.508(4)(e) FS). There is, therefore, no apparent authorization for the FCT to resell or lease land to the private sector with development restrictions,

such as specific setbacks, density restrictions, etc. that might contribute to achieving state storm hazard mitigation objectives.

DEVELOPMENT OF CAPITAL FACILITIES AND INFRASTRUCTURE

State and local government agencies can influence the achievement of storm hazard mitigation policy objectives in several ways through investments in capital facilities and infrastructure. Investments in hard or soft engineered structures can be made to alter the coastal environment so as to reduce the vulnerability of upland property and facilities from storm damage. However, the beach erosion control projects themselves constitute public infrastructure which will require long-term maintenance. State and local decisions to finance the construction of other infrastructure, such as roads, water and sewer lines, and treatment facilities can have a major impact on the rate and direction of development in coastal areas. Once such infrastructure is in place, it also represents a long-term public liability that may be subject to coastal storm damage.

While hard structures, such as seawalls, breakwaters, groins, and jetties may have some undesirable impacts on the littoral sand sharing system, soft engineering, in the form of beach and dune restoration and renourishment, is generally considered less likely to disrupt the recreational and natural storm protective features of coastal shorelines. Beach erosion control projects may be initiated at the state or local level in Florida, and federal funds may be available to offset a significant proportion of the costs. Most projects in the state are jointly funded by the federal government, the state, and one or more local government sponsors.

BEACH EROSION CONTROL PROGRAMS

Overview

The State of Florida, through the Department of Environmental Protection Division of Beaches and

Shores (DBS) and the Board of Trustees of the Internal Improvement Trust Fund, administers a program for paying up to 75% of the costs of beach erosion control projects with funds from the Beach Management Trust Fund. In most instances, these projects also qualify for federal funding under the River and Harbor Act of 1962 (33 USC 426). The federal share is typically 50%. State law also authorizes boards of county commissioners to develop and implement comprehensive beach and shore preservation programs. These initiatives primarily consist of beach restoration and renourishment projects, sometimes referred to as "soft engineering," which serve to alter the coastal environment so as to reduce the vulnerability of upland structures and property to coastal storm damage. Such projects may also reduce the vulnerability of public facilities and infrastructure and help preserve the natural storm protection features of the coastal environment. The availability of state and federal funds can be viewed as economic incentives for local governments to participate in providing the benefits of beach erosion control projects. At the same time, the funding formulas for the federal and state beach erosion control assistance programs, which require a local share, provide a means for allocating the costs of storm hazard mitigation more equitably among those who benefit. Counties are also authorized under state law to create special districts for beach preservation programs in which ad valorem tax rates are based on different benefit zones.

Section 161.101 FS authorizes DBS to propose beach erosion control projects in areas determined to be "critically eroding." Approval for such projects must be granted by the Board of Trustees, which consists of the Governor and Cabinet, and by the State Legislature. DBS is directed by statute to prepare a recommended list of projects as part of a comprehensive, long-term beach management plan, based on criteria enumerated in the statute (§161.161(2) FS). The objectives of such initiatives include erosion control, beach preservation, beach restoration, beach renourishment, and hurricane protection (§161.091 FS). Eligible activities include, among others, beach restoration and renourishment, sand transfer and stockpiling, construction of jetties, groins,

breakwaters, revetments, and sand traps, and dune construction and revegetation (§16B-36.004 FAC).

While the entire Comprehensive Beach Management Plan has not yet been completed, the beach restoration component of the plan was initially completed in 1988 and has subsequently been revised (Green, 1993). It identifies beaches where restoration projects may be economically and environmentally justified and serves as the blue print for expenditures from the Beach Management Trust Fund (Florida Department of Natural Resources, Division of Beaches and Shores, 1993). The plan recommends against state participation in beach restoration in areas with insufficient public access and parking. However, it also includes recommendations for dealing with beach erosion in areas not appropriate for state-funded beach erosion control projects. Thus the plan also serves an educational and technical assistance role for local governments and private property owners who may consider beach erosion control projects without supplemental state or federal funding.

The Beach Management Trust Fund is funded from general tax revenues through annual appropriations. These are presently made based on legislative review of a specific list of proposed projects. DBS regulations state that the maximum state share of a beach erosion control project is 75% regardless of whether the project is federally funded (§16B-36.005 FAC). According to DBS Director Kirby Green (1993), where part of a beach restoration or renourishment project benefits only private riparian owners, the state share is based on a measure of the public benefit of the project. Projects which have been approved have predominantly been those receiving federal funding. In such projects, the state share is usually about 30% (Green, 1993). Approved nonfederal projects typically require that private funds cover the equivalent of both the federal and local shares (Green, 1993). Regardless of the funding sources, DBS regulations require that the project sponsor provide "permanent public access ... at approximate half mile intervals, including adequate vehicle parking areas" (§16B-36.003 FAC).

The Board of Trustees must also designate an "erosion control line" for each approved project to delineate the landward boundary of state sovereign lands (§§161.151; 161.161(4) FS). Title to all lands landward of the line are vested in the riparian owners whose lands either abut the erosion control line or would have abutted the line if it had been located directly on the line of mean high water on the date the Board of Trustees' survey was recorded (§161.191(1) FS). Once the erosion control line is established along any segment of the shoreline, the common law principles governing avulsion and chronic erosion and accretion generally no longer operate to alter the proportions of upland property lying landward of the line unless the public agency responsible for maintaining the erosion control project fails to do so (§§161.191(2); 161.211 FS).

Under circumstances of a "shoreline emergency" declared by the Governor, DBS is authorized to pay up to 100% of the construction and maintenance costs of a beach erosion control project where the state is the upland riparian owner (§161.101(7) FS). Where upland riparian property is not state-owned, DBS is authorized to "spend whatever state funds are available to alleviate shore erosion" in a shoreline emergency (§161.111 FS). While such projects may be considered post-storm redevelopment initiatives, the majority of state-supported beach erosion control projects are the result of long-term planning and evaluation and are more correctly viewed as pre-storm mitigation initiatives.

Part II, Chapter 161 FS authorizes boards of county commissioners to develop and implement comprehensive beach and shore preservation programs for which they may establish special-benefits districts. The statute also directs county commissioners who establish such programs to define benefit categories or zones within which property owners will receive comparable benefits from the beach and shore preservation program (§161.29 FS). An ad valorem tax can be levied within the district for not more than 2 years to defray organizational and administrative costs (§161.31(4) FS). An additional ad valorem tax can be levied on all taxable property within a district

to cover capital, operation, and maintenance costs. This tax is to be in proportion to the benefits each property will derive from the beach and shore preservation program (§161.37 FS). Counties may establish beach preservation districts by other means as well, including creation of municipal service taxing or benefit units pursuant to §125.01(1)(q) FS.

Analysis

Beach erosion control projects that establish a wider sand beach provide increased recreational benefits as well as erosion control benefits. While the erosion control benefits primarily accrue to owners of adjacent upland property, improved recreational opportunities benefit a larger segment of the population if adequate public access is provided. Recognition of the differential distribution of benefits from such projects underlies the willingness of both the federal government and the state to contribute to the costs of beach erosion control projects, even when the abutting property is entirely or primarily privately owned. The minimum local cost-share of 25% was adopted by the State Legislature in recognition that "local beach communities derive the primary benefits from the presence of adequate beaches" (§161.101(1) FS).

To the extent that beach erosion control projects contribute to storm hazard mitigation objectives, it can be argued that the federal/state/local cost-sharing formulas provide a measure of allocating some of the costs of storm hazard mitigation to the private sector in proportion to the benefits they derive from their location in areas subject to coastal storm damage. The provisions of §161.29 FS for the imposition of local ad valorem taxes in proportion to the benefits derived from paying the local share of a beach erosion control project offer a means for further allocating the costs to those who benefit most from such projects. However, experience with the creation of county special districts for beach erosion control projects suggests that such a method has not been politically popular. William Stronge, who has prepared beach preservation district proposals for several municipalities in the state, reports that Captiva Island has established a beach preservation special

district based on benefit zones (Stronge, 1993). They did not, however, do it under the authorization of Part II, Chapter 161 FS. Longboat Key has created a special taxing district in which beachfront property owners are taxed to cover 80% of the costs of a beach renourishment project while the remaining 20% of the project costs are paid by other property owners in the city (Smalley, 1993). Several other jurisdictions have created special taxing districts that consist solely of beachfront property owners (Freshour, 1993; Huber, 1993; Jones, 1993).

While the primary intent of beach erosion control projects is to protect public beaches, private property, and public facilities and infrastructure from coastal erosion and storm damage, the project itself is also a capital facility. Both "hard engineered" erosion control structures, such as seawalls, jetties, groins, breakwaters, and revetments, and "soft engineered" projects, such as beach and dune restoration, remain subject to both long-term chronic erosion and the effects of coastal storms. In areas with a coastal sediment deficit, such as downdrift of an inlet, beach restoration projects will generally require regular renourishment (National Research Council, 1990). DBS regulations stipulate that projects must include a maintenance program of at least 10 years (§16B-36.002(3) FAC). Thus public financing of beach erosion control projects may increase the amount of public infrastructure subject to coastal storm damage. The formal project review criteria contained in DBS's regulations do not require an analysis of the net costs and benefits of investing in beach erosion control infrastructure to protect upland private property and public facilities and infrastructure (§16B-36.008 FAC). However, such an analysis may be implied by the economic analyses proposed in the beachfront post-storm redevelopment policy developed by the FAU/FIU Joint Center for Environmental and Urban Problems (Metzger et al., 1993).

Several authors have suggested that beach and dune restoration projects may encourage coastal development (Godschalk, Brower, and Beatley, 1989; Schmahl and Heatewole, 1989). The same may be said of "hard engineered" erosion control structures such as seawalls and revetments. We

have found no data to document the extent to which undeveloped land has been the beneficiary of state-supported beach erosion control projects. However, the state's decisionmaking criteria for financing such projects imply that priority will be granted to projects that protect threatened property that is already developed (§161.161(2) FS). Furthermore, DBS ranks areas as critically eroding where substantial upland development is threatened by erosion and potential flooding and storm damage.

There appears to be some inconsistency in state policy governing the precedence of relocation versus beach restoration as strategies for contending with severe beach erosion problems. The State Land Development Plan calls for relocation options to be exhausted **before** beach renourishment or shore protection projects are undertaken (Florida Department of Community Affairs, 1989). However, there are no parallel criteria reflected in either the enabling statute (§161.091 FS) or DBS's regulations (§16B-36 FAC) for beach erosion control projects, nor is relocation discussed as an option in the state Beach Management Plan (Florida Department of Natural Resources, Division of Beaches and Shores, 1993). The beachfront post-storm redevelopment policy proposed by the FAU/FIU Joint Center (Metzger et al., 1993) presents relocation as the strategy of last resort, when beach restoration is not economically justified, rather than a strategy that should be followed **before** undertaking beach restoration. The FAU/FIU Joint Center approach implies that restoration will be economically justified where benefits exceed those accruing to upland property owners. This seems consistent with the policy objectives stated in Chapter 161 FS and, therefore, more appropriate than the unconditional rule included in the State Land Development Plan.

STATE COASTAL INFRASTRUCTURE POLICY

Overview

Florida has had a formal policy concerning the use of state funds for public infrastructure in areas

prone to coastal storm damage since 1981 when Governor Bob Graham issued Executive Order 81-105. Analogous policies were articulated in several pieces of state legislation in 1985 which generally linked state decisions on coastal infrastructure to the provisions of the coastal elements of local comprehensive plans. The 1985 initiatives included limits on state financing of bridges to coastal barrier islands and a statement of state coastal infrastructure policy (§380.27 FS), a formal policy in the State Comprehensive Plan (Chapter 187 FS), and mandates governing preparation of the coastal element of local comprehensive plans (Chapter 163 FS). These were further elaborated by DCA in the 9J-5 FAC rules for preparing local plans.

The state's coastal infrastructure policies have the potential to reduce development in areas prone to coastal storm damage and thereby contribute to achieving state policy objectives of minimizing threats to public safety, property, and natural resources. If less development occurs in such areas, the public costs of planning for, responding to, and mitigating storm damage will also be reduced, and there will be less public investment in infrastructure that is directly at risk of storm damage. If private funds take the place of state funds withheld through these policies, public costs of disaster planning and response will remain, but the costs of damage to infrastructure will have been shifted to those in the private sector who choose to occupy hazardous coastal areas.

Governor Graham's Executive Order directed state agencies to limit expenditures of state funds and federal grants on coastal barriers to "those coastal areas which can accommodate growth, where there is need and desire for economic development, or where potential danger to human life and property from natural hazards is a minimum" (Graham, 1981). The order further stated that "[s]uch funds shall not be used to subsidize growth or post disaster redevelopment in hazardous coastal barrier areas." The affected state agencies included the departments of Commerce, Health and Rehabilitative Services, Transportation, and Veteran and Community Affairs, and the Governor's Office of Planning and Budgeting.

Implementation of the Executive Order was complicated by enactment of §380.27 FS in 1985 which includes two specific policies governing expenditure of state funds in coastal infrastructure. Section (1) states that no state funds are to be used to construct bridges or causeways to coastal barrier islands[4] which were not already accessible by bridges or causeways on October 1, 1985. Section (2) links state agency capital expenditure decisions to local comprehensive plans: "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 ... projects which increase the capacity of infrastructure unless such expenditure is consistent with the approved coastal management element."

The barrier island bridge policy remains in effect and is implemented by the State Department of Transportation (Florida Department of Community Affairs, 1993a). The Section (2) policy has been interpreted as applying to all forms of financial assistance including grants and loans as well as direct appropriations (Florida Department of Community Affairs, 1992). This policy does not apply, however, until the coastal element of a local government's comprehensive plan has been approved. About 9 out of 195 local governments required to prepare coastal elements did not have their comprehensive plans approved as of January 1994 (Conger, 1994).

The provisions of Chapter 163 FS, which govern preparation of the coastal elements of local comprehensive plans, promote a policy similar to that contained in the 1981 Executive Order. The geographic scope, however, is somewhat different: while the Executive Order targets coastal barriers, the Chapter 163 directives focus on "high-hazard coastal areas." The relevant sections of Chapter 163 and the regulations promulgated pursuant to them are summarized in the earlier section of this chapter entitled "Local Coastal Planning Mandates." Infrastructure is defined in these regulations to include sewage disposal systems, potable water systems and wells, solid waste disposal sites or retention areas, stormwater systems, utilities, piers, docks, wharves,

breakwaters, bulkheads, seawalls, bulwarks, revetments, causeways, marinas, navigation channels, bridges, and roadways (§9J-5.003(43) FAC). Elsewhere in the rule governing the inventory of existing infrastructure (9J-5.012(2)(h) FAC), local governments are directed to include " beach renourishment projects."

Prior to enactment of the ELMS Bill during the 1993 legislative session, "coastal high hazard areas" were defined as (9J-5.003(14) FAC) "[A]ll 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 ... and inlets which are not structurally controlled."

Section 7 of the ELMS bill amends §163.3178(2)(h) FS to read: "high-hazard coastal areas, ... **for uniformity and planning purposes herein, are defined as Category 1 evacuation zones. However, application of mitigation and redevelopment policies, pursuant to s. 380.27(2), and any rules adopted thereunder, shall be at the discretion of local government."**

Governor Graham's subsequent letter to the state agencies (Graham, 1986) spelled out how the agencies should behave until approved local comprehensive plans are in place. The letter stipulated the following:

1) "State funds for infrastructure and economic development should be denied for any barrier island without a bridge or causeway."
2) "The State should not pay to expand infrastructure or economic development in any designated unit of the Federal Coastal Barrier Resources System."
3) "[A]gency heads shall not permit payment by the state for new or expanded infrastructure projects seaward of Coastal Construction Control Lines, in Federal Emergency Management Agency designated V zones, in areas damaged or

undermined by coastal storms, or at inlets without structural controls." Agency heads are also constrained from authorizing projects in areas further landward that are within the Coastal Building Zone defined under Part III, Chapter 161 FS. They may only do so where "the potential danger to human life and property from natural hazards is minimal and consideration has been given to hazard mitigation standards, including flood-proofing and evacuation." Exceptions are allowed "where a crucial need is found to alleviate dangerously overcrowded roads or replace defective waste water facilities violating water quality standards."

4) State funds can be used to repair or replace storm-damaged facilities only where "such action is in the overall long-term public interest and hazard mitigation ... is fully evaluated." However, no increase in capacity of the facility is allowed.

5) State expenditures in coastal areas must also be consistent with the approved resource and management plans and comprehensive plans of the individual state agencies.

Analysis

The achievement of state policy objectives concerning investments in growth-inducing infrastructure in hazardous coastal areas is largely contingent on local policy under §380.27 FS, with the exception of the barrier island bridge policy and those instances where the federal government provides direct financial assistance to local governments or special districts. In jurisdictions without approved comprehensive plan coastal elements, the 1981 executive order technically remains in effect. While issues have been raised concerning the transition from the executive order to implementation of §380.27(2) FS, the major issues concern the vast differences in achievement of storm hazard mitigation objectives that result from decentralization of the state's coastal infrastructure policy.

Coastal Island Bridge Policy. The barrier island bridge policy (§380.27(1) FS) provides clear, although narrow, direction to the Department of Transportation to limit state infrastructure spending irrespective of local comprehensive plans. According to DCA's most recent Coastal Infrastructure Policy Report, the policy has effectively prevented the expenditure of state funds for constructing new bridges or causeways to unbridged barrier islands (Florida Department of Community Affairs, 1993a). However, decisions on state funding for expansion of existing bridges or causeways, or construction of bridges or causeways to barrier islands already connected to the mainland, remain tied to the provisions of local comprehensive plans under §380.27(2) FS. Construction of bridges to interior islands is also subject only to the constraints imposed under §380.27(2) FS. Chapter 163 FS does not require local governments to adhere to such limits, so local comprehensive plans need not prohibit funding of bridges or causeways to unbridged islands.

DCA (1993a) has recommended that the barrier island bridge policy be extended to include "all unbridged coastal islands." This would expand the scope of the policy to include sheltered islands that do not directly front on the open waters of the Gulf, the Atlantic, Florida Bay, or the Straits of Florida. Limitation of the current policy to islands that qualify as barrier islands does not provide equal protection to all hazardous coastal islands. In areas such as the southwest coast, for instance, the storm surge and wind damage vulnerability of many sheltered islands is not significantly different from that of barrier islands that front the Gulf.

DCA (1993a) has also recommended that the barrier island bridge policy be further expanded to cover all infrastructure on all unbridged coastal islands. This approach essentially discards the principles of home rule that underlie the linkage of state coastal infrastructure policy to local comprehensive plans set forth in §380.27(2) FS and E.O. 81-105, but only for islands. Following such a strategy would not provide similar constraints on state infrastructure spending on mainland coastal areas that could be subject to similar levels of hazard from more severe storms, e.g.

Category 3 or higher, nor would it offer consistent policy for those areas of the state where there are not extensive coastal islands, such as the Big Bend area.

Federal Consistency with the State's Coastal Infrastructure Policy. Two cases reviewed by DCA in its 1991 report on implementation of the state's coastal infrastructure policy (Florida Department of Community Affairs, 1991) suggest that the current policy has no direct influence over federal loans or grants made directly to local governments for infrastructure improvements or expansions within hazardous coastal areas that are not within federally designated Coastal Barrier Resources System (CBRS) units. While E.O. 81-105 addresses federal grants administered by state agencies, neither the executive order nor the provisions of §380.27 FS address direct grants or loans from the federal government to local governments.

In the two cases reviewed by DCA (1991), a local government or special improvement district had sought a loan from the federal Farmers' Home Administration (FmHA) to expand infrastructure to serve an area interpreted by DCA as including the coastal high hazard area. In one case, DCA's comments were evidently ignored, and in the second, DCA subsequently withdrew its comments because of the lack of formal state policy on which to base them. In each case, the local government's comprehensive plan had not yet been adopted, but this evidently was not an issue. While DCA claims that its comments "were not given much weight" in the first case, the FmHA subsequently denied both loan applications for other reasons. Nevertheless, each project went forward. In the first case, St. John's County sold revenue bonds to extend water and sewer lines to areas of two coastal barrier islands. In the second, a nonprofit water supplier financed expansion of water supply treatment plant and distribution system serving portions of Taylor County's coast through other means.

While the lack of an effective state policy governing direct federal assiseance for infrastructure

projects within the CHHA appears to be demonstrated by these cases, it may be the state could argue that such actions would be inconsistent with the intent of Chapter 163 FS and should be constrained under the federal consistency requirements of the federal Coastal Zone Management Act. However, to make such an argument, the state needs to add Part 163 FS to the networked statutes that comprise Florida's federally approved coastal zone management program. If any additional initiatives are taken to define a formal and consistent state coastal infrastructure policy, these should also be included in the statutes comprising the state's coastal zone management program.

These cases also illustrate the limited extent to which denial of federal and state financial assistance can actually influence infrastructure investment decisions: in both cases, the projects went ahead, financed by other means. Local governments have a variety of options for financing infrastructure including local option tourist development tax funds, motor fuel taxes, local option gas taxes, transportation capital funds, and transportation improvement funds, as well as general revenues (Florida Department of Community Affairs, 1990). Infrastructure can also be financed locally by community development districts, special districts, and by developers, utilities, and non-profit associations. However, where these alternative sources are relied upon, those who choose to take the risks of occupying coastal areas prone to storm damage are paying a more equitable share of the costs of developing such areas.

Transition from the Executive Order to Section 380.27(2) FS. There is evidently some uncertainty over what conditions must be met before the 1981 Executive Order, as amended by Graham's 1986 letter, is no longer to be heeded. The opening of Graham's 1986 letter refers to the need for policies to guide agency actions during the "phase-in period of new growth management measures." However, the closing of the letter states that "[t]hese policies ... shall remain in effect until local governments implement plans, programs, and regulations that conform with or exceed

the measures outlined above."

A conflict could conceivably arise where the coastal element of a local comprehensive plan has been approved, thus invoking the provisions of §380.27(2) FS governing infrastructure expenditures by state agencies, but the provisions of the local plan and its implementing regulations do not "conform with or exceed" the stipulations of E.O. 81-105. An agency that followed the executive order to the letter might deny funds that would be allowed under §380.27(2) FS. However, DCA (1993a) observes that an executive order does not have the force of law and if conflict occurs between an executive order and a statute, the statute should prevail. DCA has suggested elsewhere, however, that the provisions of §380.27(2) are permissive, i.e. that state agencies are authorized to provide state funding for infrastructure projects in the CHHA where there is an approved coastal element, but the agencies retain discretion to withhold that state funding under the Executive Order (Florida Department of Community Affairs, 1990). Whether this discretion would be retained depends on how the conditions governing phasing out of the executive order are interpreted.

DCA suggests in its most recent Coastal Infrastructure Policy Report that it is up to the Governor's Office to interpret and determine when Executive Order 81-105 should be phased out (Florida Department of Community Affairs, 1993a). Evidently no such initiative has been taken (Knight, 1994). Furthermore, there is no formal process established for monitoring or coordination of coastal infrastructure policy decisions by the various state agencies, nor is there a means for assuring consistency among state agencies in making such decisions. While the State Coastal Management Program within DCA is charged with preparing an annual report on the status of the state's coastal infrastructure policy, they have no means of formally monitoring such decisions (Knight, 1994).

Impacts of Linking State Infrastructure Policy to Local Plans. Aside from the confusion over

transition from following the directives of E.O. 81-105, reliance on the provisions of §380.27(2) FS will lead to vastly different impacts on 1) minimizing coastal storm hazard risks to public safety, private property, and natural resources; 2) minimizing public costs of planning for, responding to, and mitigating coastal storm damage; and 3) reducing the vulnerability of public facilities and infrastructure. The principal issues concerning the decentralization of the state's coastal infrastructure policy center on 1) differences in the extent to which the two policy instruments (§380.27(2) FS and E.O. 81-105) achieve state policy goals concerned with storm hazard mitigation and post-storm redevelopment and 2) inconsistency among local government policies in their treatment of coastal infrastructure policy.

Differences in achieving storm hazard mitigation goals. The scope of E.O. 85-101 and that of §380.27(2) differ in several respects including the following: 1) focus on post-storm redevelopment; (2) treatment of federally-designated Coastal Barrier Resources System (CBRS) units; and 3) the geographic reach encompassed by the policy.

The executive order and §380.27(2) FS differ greatly on the matter of guiding state agency decisions under post-storm circumstances. While the executive order explicitly includes post-storm redevelopment in its constraints on state agency expenditures for coastal infrastructure, §380.27(2) FS only governs "projects which increase the capacity of infrastructure." Thus as the provisions of E.O. 81-105 are phased out, state agencies will only be constrained from supporting post-storm replacement of infrastructure where the replaced facilities are intended to have increased capacity that might induce further growth that is consistent with that called for in a local government's comprehensive plan.

CBRS units are segments of barrier islands designated as "undeveloped" by the U.S. Department of Interior pursuant to the Coastal Barrier Resources Act (CBRA) of 1982. CBRA prohibits new federal

expenditures or financial assistance within designated CBRS units for most types of infrastructure, community development, post-storm redevelopment, and non-emergency disaster relief as well as the issuance of new flood insurance for any new construction or substantial improvement of a structure (see discussion in Chapter 2). Governor Graham's 1986 letter extended the reach of the 1981 executive order by explicitly stating that "[t]he state should not pay to expand infrastructure or economic development in any designated unit of the federal Coastal Barrier Resource System." The state has also nominated areas for inclusion in the CBRS system as a means of providing partial protection to areas on the state's land acquisition priority lists (Brock, 1993).

Full reliance on the provisions of local comprehensive plans to achieve the state's coastal infrastructure policy objectives under §380.27(2) FS leaves federally-designated Coastal Barrier Resource System (CBRS) units in the lurch except to the extent that the barrier island bridge policy under §380.27(1) FS operates to prevent bridges from being built to islands containing CBRS units. Neither Part 163 FS nor Chapter 9J-5 FAC contains any explicit reference to CBRA in specifying the scope and content of local comprehensive plans. The State Land Development Plan[6] includes an operating policy that restricts new development on federally designated CBRS areas that "will need to utilize infrastructure traditionally subsidized by federal and state funds unless the development or local government can demonstrate their independent financial ability to construct, operate, and maintain such facilities throughout the expected lifetime of the development" (Florida Department of Community Affairs, 1989:45). The policy implies that state funds should not be used for infrastructure within CBRS units, but also makes it clear that the state will not restrict the right of local governments to choose to subsidize such infrastructure itself.

In its most recent Coastal Infrastructure Policy Report, DCA reports that none of the 19 coastal counties containing CBRS units includes policies in their coastal element limiting expenditures on infrastructure within CBRS units (Florida Department of Community Affairs, 1993a). Our review of

18 county and municipal comprehensive plan coastal elements revealed only one jurisdiction with a plan containing an explicit policy concerning development within designated CBRS units: Bay County's plan states that the capacity of infrastructure shall not be increased on CBRS units "over current capacity except to serve existing and committed uses" (Bay County, 1991). The City of Naples plan also evidently includes a policy that applies special zoning designations for the CBRS unit (Keewaydin Island) within its jurisdiction (Florida Department of Community Affairs, 1990).

There is, therefore, nothing in either federal or state law that prohibits the expenditure of local government or private funds for infrastructure within CBRS units. However, phasing out of E.O. 81-105 will leave decisions about state spending within CBRS units linked to the provisions of local comprehensive plans, except to the extent that state agencies choose to rely on the provisions of the State Land Development Plan. To the extent that those provisions are interpreted as conflicting with the intent of §380.27(2) FS, the statute would evidently prevail.

While the transition from the provisions of E.O. 81-105 to the provisions of local comprehensive plans appears to relinquish any explicit policy concerning CBRS units, it also alters the geographic scope of the infrastructure policy from a focus on barrier islands to one on coastal high hazard areas (CHHAs). The provisions of Chapter 163 governing the content of the coastal element of local comprehensive plans clearly target the CHHA rather than barrier islands per se. This focus is also explicit in §380.27(2) FS.[6] As noted in the previous discussion of the barrier island bridge policy, a focus on only barrier islands excludes hazardous coastal areas on other islands and the mainland. Thus the geographic scope of E.O. 81-105 does not provide consistent policy for all areas with comparable vulnerability to coastal storms. However, the linkage of state infrastructure policy to local comprehensive plans offers even less consistency because the definition of the CHHA pursuant to §163.3178(2)(h) FS and 9J-5.003(14) FAC, is entirely a matter of local discretion.

In its 1991 Coastal Infrastructure Policy Update, DCA documents the variety of local government definitions of the CHHA: 25 out of 100 counties and municipalities surveyed based it solely on the FEMA V-zone[7]; 11 based it on the V-zone and some other criterion (areas damaged by previous storms, inlets not structurally controlled, Category 1 storm evacuation zones)[8]; 33 based it on the V-zone and the state Coastal Construction Control Line (CCCL); 6 defined it only in terms of the CCCL; 2 defined it solely in terms of evacuation zones; 11 used other definitions; and 12 had no explicit definition of the coastal high hazard area although required to do so (Florida Department of Community Affairs, 1991).

According to T.Y. Chiu (1993) of the Florida Beaches and Shores Research Center, the CCCL is typically located further landward than the V-zone. In an analysis of the relative positions of V-zones, the CCCL, and categorical storm SLOSH surge zones in seven counties (Duval, Brevard, Dade, Monroe, Collier, Sarasota, and Wakulla), we found the CCCL to be further landward than the V-zone for 28 of 34 measurements (82%) along coastlines fronting on the Atlantic Ocean or Gulf of Mexico.[9] (Note that there is no CCCL in Monroe or Wakulla counties; in these areas we compared the relative positions of the V-zones and SLOSH storm surge zones.) The CCCL is designed to demarcate the area of beach that will be impacted by a 100-year storm which is roughly comparable to a Category 3 storm on the Saffir/Simpson hurricane scale (Chiu, 1993). Dr. Chiu indicated that the CCCL also tends to be further landward than the Category 1 storm surge zone. We found that this was the case at about half of our measurement sites (17 of 31). However the Category 1 storm surge zone was further landward than the typical V-zone at 24 of 33 sites (73%). The Category 3 storm surge zone is generally further landward than the CCCL except in some areas with seawalls. Thus the typical pattern is:

LAND - CATEGORY ZONE - CATEGORY 1 ZONE - CCCL - V-ZONE - SEA

or

LAND - CATEGORY 3 ZONE - CCCL - CATEGORY 1 ZONE - V-ZONE - SEA

Because CCCLs are drawn only along the open coast, in areas where barrier islands are present, the CCCL will be limited to the open sea side of the barrier island while storm surge zones and V-zones may occur on the sound or lagoon side of the barrier island or extend onto the mainland. Interior islands, i.e. those within sounds or lagoons protected by barrier islands, have no CCCLs. Neither do areas without sandy shores, including all of the Big Bend counties from Pasco to Wakulla counties plus Monroe County. Collier County illustrates the pattern in the low-lying areas of the southwest coast: all the coastal islands are covered by the tropical storm and Category 1 storm surge zones, and the Category 1 zone extends inland a distance of 0.50 to 0.75 mile. The Category 3 zone extends an additional 4 to 8 miles inland. The higher topography and greater water depths along portions of the Atlantic coast result in a much different profile. In Brevard County, for instance, the CCCL was further landward than the Category 1 zone at 6 of 7 measurement sites and further landward than the Category 3 zone at 5 sites. For a stretch of some 12 miles or more along the barrier island there is no Category 1 or 3 storm surge zone along the Atlantic shore because of a seawall, but there are more extensive Category 1 and 3 storm surge zones on the Indian River lagoon side of the barrier island as well as along the shore of the mainland.

The correspondence between categorical storm evacuation zones and SLOSH storm surge zones varies substantially among the counties. Most of the seven counties we surveyed evacuate their entire barrier islands for a Category 1 or higher storm. This is true for Brevard County where substantial portions of the barrier island system are subject only to a Category 3 or 5 storm surge, as well as for the southwestern counties of Collier and Sarasota where all of the islands would be inundated by a tropical or Category 1 storm. Outside of the barrier islands, evacuation zones tend to correspond to storm surge zones, although they sometimes vary for practical reasons. For

example, in Collier County south of Naples, all areas seaward of US Route 41 are evacuated in the event of a Category 1 storm although some portions of this area are within the Category 2 storm surge zone (Pineau, 1993). Monroe County's policy calls for evacuating all mobile homes and tourists from the Keys in the event of a Category 1 or 2 storm and other residents of the Keys depending on the storm track (Coats, 1993). All of the Keys would be evacuated in the event of a Category 3 storm. The SLOSH maps for Monroe County do not designate a Category 1 zone, but almost all of the Keys, except for areas immediately adjacent to portions of US Route 1, are within the Category 2 surge zone. Wakulla County, where the Category 1 storm surge zone extends inland as far as 5 miles and the Category 3 zone as much as 9.5 miles, has no fixed evacuation zones keyed to storm intensity (Murray, 1993). Local shelters are not opened if the storm intensity exceeds Category 2.

Thus in most areas of the state, a CHHA based on the CCCL will be more protective along the open coast than one based solely on the FEMA V-zone. In some areas, a CHHA based on the CCCL will be more extensive along the open coast than one based on a Category 1 or Category 3 storm surge zone, but a CHHA limited to the area defined by the CCCL excludes areas subject to storm surge on interior islands and along the sounds and lagoons that lie between barrier islands and the mainland.

The ELMS bill amendment of the CHHA definition in §163.3178(2)(h) FS suggests uniform use of the Category 1 evacuation zone, but this is not binding on the most important planning issues tied to the CHHA: mitigation, redevelopment, and coastal infrastructure. According to Murley (1993) and Flack (1993), the evacuation zone was recommended by the ELMS Committee because local officials are more conversant with these demarcations than with the SLOSH storm surge zones upon which they are based. There was also a sense that a more extensive zone would not be politically acceptable. Reference to the Category 1 evacuation zone in the ELMS III bill also reflects

recommendations made by DCA (see, for example, Florida Department of Community Affairs, 1990: 48; 1991: vii).

Our analysis indicates, however, that not all counties have formal evacuation zones keyed to the storm surge zones. Furthermore, a CHHA tied to the Category 1 storm surge or evacuation zone will, in some instances, be less protective than one based on the CCCL or the FEMA V-zone. As noted above, the Category 3 storm surge zone, which is roughly equivalent to the 100-year storm impact zone, is often far more extensive than the Category 1 zone. DCA stated as early as 1990, in its infrastructure policy implementation report, that it considered the Category 1 storm surge impact area as "a reasonable compromise for a hazard mitigation planning area for infrastructure" (Florida Department of Community Affairs, 1990: 48). The author suggested that "[p]lanning for a catastrophic event which has a long recurrence interval is not practical from a political or financial perspective." Yet the 100-year storm has been widely accepted as a legitimate threshold for natural hazard policies including the National Flood Insurance Program and the Florida CCCL permit program.[10] State and local storm hazard mitigation policies linked to a CHHA based on the Category 1 evacuation zone rather than the Category 3 storm provide far less protection of public health and safety and expose local and state government to much greater costs associated with coastal storms.

ECONOMIC INCENTIVES

Two of the policy instruments reviewed in the preceding sections include economic incentives the state offers to local governments that may encourage local initiatives that further the state's storm hazard mitigation policy objectives: 1) the matching grants provided under the Preservation 2000 land acquisition bond program through the Florida Communities Trust; and 2) the state beach erosion control assistance program administered by the DEP Division of Beaches and Shores.

Four others are discussed here: 1) state requirements that local property appraisers grant property tax relief to property owners who grant conservation easements or convey development rights to state or local governments or qualified non-profit organizations; 2) state law which authorizes transfer of development rights as a means of altering land development patterns; and two initiatives taken during the 1993 session of the state legislature; 3) the Hurricane Catastrophe Fund; and 4) the Emergency Management, Preparedness, and Assistance Trust Fund.

TAX INCENTIVES FOR CONVEYANCE OF CONSERVATION EASEMENTS AND DEVELOPMENT RIGHTS

Overview

As noted in the discussion of acquisition of less-than-fee property interests, state law requires local property appraisers to reduce the appraised value of property which has been restricted by an easement or development rights covenant. When such a conveyance of development rights or covenant has been made, the lands are to be assessed by the property appraiser based only on their use as restricted by the conveyance or covenant (§193.501(3) FS). If the property owner obtains a reconveyance or release from the covenant during the term of the agreement, the property owner is required to pay the deferred tax liability (§193.501(4) FS). Section 39 of the ELMS bill amended §193.501 FS allowing property appraisers to reduce the assessed value of property which is subject to the sale of development rights or a conservation easement to a charitable corporation or trust. Previous statutory language was "not clear or consistent in regard to the ad valorem tax treatment of lands subject to a conservation easement."

Analysis

We have been unable to locate any statistics from state agencies that document the extent to which local governments or nonprofit organizations have been successful in using these tax incentives to promote sale or donation of development rights or conservation easements in the state. As noted in the discussion of acquisition of less-than-fee property interests, these

instruments are currently limited by the fact that they must be applied to lands that are environmentally endangered or are to be used for outdoor recreation and park purposes. David Gluckman (1994) suggests that less-than-fee acquisition has been most successfully applied to agricultural or silvicultural lands where the current tax liability is already low. Thus tax relief is not likely to be a major consideration for the property owner.

TRANSFER OF DEVELOPMENT RIGHTS

Overview

Transfer of development rights (TDR) refers to the process by which a land use regulatory agency permits the transfer of development density authorization from one parcel of land to another. In a regulatory sense it is exclusively a prerogative of local government to effect such transfers by permitting increased densities in the receiving area in exchange for reduced densities in the sending area. In theory, TDR can be used to reduce development densities in areas most prone to coastal storm damage, thereby contributing to the objectives of minimizing the threats and costs of coastal storms. Reduced densities may also help limit the vulnerability of public facilities and infrastructure to storm damage. TDR can operate as an economic incentive where it allows a would-be developer to realize higher densities in the receiving area than would otherwise be permitted.

Florida counties and municipalities have the authority within their general powers to enact local land development regulations (Chapter 125 FS and §166.041 FS) that initiate TDR programs (Peery, 1994). The ELMS Bill contains language authorizing the FCT "to provide technical assistance to local governments to establish transfer of development rights programs within their jurisdictions" (§380.511 FS as amended by Section 72 of the ELMS bill). FCT Executive Director Anne Peery (1994) reports that the Trust has provided such assistance in the past where it was sought by local governments with whom they have worked. However, the FCT's authority to acquire title to land appears too restrictive to allow it to broker TDRs as has been done by the

California Coastal Conservancy (see Chapter 5).

Analysis

The ELMS Committee found that TDR "is not generally understood or widely used in our state, ... [a]lthough some municipalities in Florida have authorizing ordinances and even used TDRs in a few instances" (Florida Environmental Land Management Study Committee, 1993:109). The committee found that obstacles to the use of TDR include "a lack of understanding about ... TDR theory, a lack of success where TDR programs have been attempted due to shortcomings in the enabling ordinances, and no direction or financial assistance from the State." They recommended that the State Legislature encourage local TDR programs and that the Florida Communities Trust assist local governments in establishing them.

Several contacts verified the lack of significant application of TDR within Florida. Peery (1994) observed that TDR is not an attractive option to property owners when they can readily obtain variances to zoning ordinance density restrictions. Gluckman (1994) indicated that Collier County had made some limited use of TDR for wetlands, but otherwise he was not aware of any successful application of the concept in the state. Peery reports that Marion County is actively researching a potential TDR program and that Palm Beach County is pursuing a TDR strategy to preserve some agricultural lands.

HURRICANE CATASTROPHE FUND

Overview

During the 1993 special session of the State Legislature a bill was enacted (CS/HB 31-C) which added section 215.555 to the Florida Statutes creating a state catastrophic hurricane reinsurance trust fund. The fund will be used to reimburse insurers for a portion of their catastrophic hurricane losses from individual policies written for residential and commercial structures and contents. The

trust fund is to be financed by annual premiums paid by those insurers that contract with the State Board of Administration for coverage under the fund. Insurers will pay these premiums by raising the premiums for individual insurance policies. The resulting increases in insurance policy premiums will increase the costs of residing and conducting business in areas at greatest risk of hurricane storm damage. A state grants program is to be financed from surpluses that may accumulate in the fund for non-recurring projects that protect local infrastructure from potential hurricane damage.

Reimbursement contracts between insurers and the State Board of Administration will provide for 75% reimbursement of losses in excess of two times an insurer's gross direct written premium from covered policies for the preceding year where the insurer has a surplus as to policyholders in excess of $15 million. For insurers with a surplus of $15 million or less, the fund will reimburse for 75% of losses in excess of 1.5 times the insurer's gross direct written premium for the preceding year. Reimbursement premiums are to be based on a formula determined from the insured value covered under policies written by the insurer within individual zipcodes. The formula is being developed by consultants under contract to the State Board of Administration who will analyze 70+ simulated storm events to predict damage estimates based on wind speed, angle of approach, terrain, types of construction, and other factors (Nicholson, 1993).

The initial reimbursement premium formula is to be adopted by the Board of Administration by March 1, 1994, but the consultant study is not expected to be completed until April. As a result, no firm estimates have been made of the impact of the fund reimbursement premiums on premiums paid for individual policies. Jack Nicholson of the Department of Insurance said he "hoped" that average insurance policy premiums would not increase any more than 50% (Nicholson, 1993). He anticipates that insurers will raise premiums in accordance with the exposure/risk zones used to set the reimbursement premium formula. Nicholson guessed that insurance premium increases may range from 30 to 100%.

If no covered events occur in a given year, up to two% of the premium collected in that year is to be made available the following year for making legislative appropriations for grants to local governments, state agencies, and nonprofit charitable organizations to support non-recurring projects that protect local infrastructure from potential hurricane damage.

Analysis

The Hurricane Catastrophe Fund has the potential to bring property insurance premiums into closer accord with actual risks incurred by residing or conducting business within areas vulnerable to hurricane storm damage. In this sense, the fund may provide an economic incentive that deters development within the coastal high hazard area. To the extent that premiums for individual policies are adjusted to reflect actual risks, the fund also has the potential to more equitably distribute the costs of insuring property owners against storm damage; i.e. those who incur the greatest risk will pay higher premiums rather than spreading the risk among all policy holders.

Higher insurance premiums are an imperfect policy instrument for several reasons. First, not all properties vulnerable to damage from coastal storms are insured. Thus not all property owners will be influenced by changes in insurance premiums. Furthermore, significant increases in property insurance premiums may motivate some owners to drop their insurance coverage. Third, to the extent that development is limited by the availability of insurance, creation of the fund serves to promote continued development within hurricane-prone areas so long as the development market is willing to pay the higher insurance premiums. Creation of the fund is also intended to assure more rapid settlement of storm damage claims. It may, therefore, accelerate the rate at which property owners rebuild after a storm and may reduce opportunities for state or local governments to purchase storm-damaged properties and remove them from the development market.

The grants that may be available through the fund to protect local infrastructure will contribute to

the objective of reducing the vulnerability of public infrastructure to storm damage. However, they may also support continued occupancy of the coastal high hazard area unless conditions are placed on the grants that encourage relocation. The grants may be subject to the provisions of §380.27(2) FS if they are administered by a state agency, although the statute refers only to "legislative appropriations for grants" (§ 215.555(7)(c) FS). E.O. 81-101 likewise may not apply since it does not apply to the State Legislature, and the Department of Insurance was not named as one of the state agencies subject to the executive order. However, if the reimbursement premiums paid by contracting insurers are derived from increased policy premium rates that are linked to risk levels, the grants offer an indirect means for property owners who are most directly served by coastal infrastructure to pay a more equitable share in the maintenance of that infrastructure.

EMERGENCY MANAGEMENT, PREPAREDNESS, AND ASSISTANCE TRUST FUND

Overview

During the regular 1993 session, the State Legislature created a state trust fund to enhance state and local emergency preparedness programs with monies raised through an annual surcharge imposed on residential and commercial property insurance policies (Chapter 93-128 FS). The annual surcharge is $2 on residential policies and $4 on commercial policies. Annual expendable revenues for 1993 are estimated at $11.8 million after substraction of the state service charge of 7.3% (Starrett, 1993).

Twenty percent of the monies in the fund are to be used for state relief assistance for non-federally declared disasters. An additional 20% is to be used for grants and loans to state, regional, or local agencies and private organizations to implement projects to enhance emergency preparedness, response, and recovery, including public education. The remaining 60% is to be allocated for implementing and administering state and local emergency management programs. Twenty percent of this money is to go to the Division of Emergency Management in the State Department of

Community Affairs, 64% to county emergency management agencies, and 16% to municipal emergency management offices. The majority of these monies are to be allocated as base grants to county emergency management agencies (§9G-19.005 FAC). The funds for municipalities are to be allocated through a second competitive grants process (§9G-19.007 FAC).

Analysis

The fund as designed serves merely to supplement existing state and local resources for preparing for and responding to coastal storms and all other emergencies. This contributes to goals of protecting public safety and property but will not directly contribute to storm hazard mitigation unless some funds are used to reduce the vulnerability of response systems and facilities to storm damage. Hazard mitigation is not among the purposes explicitly listed in the statute (Chapter 93-128, §3(1)(c)) or the grant award categories listed in the regulations promulgated for implementing the grants program (§9G-18.007(5) FAC). It is mentioned, however, in the regulatory definition of a "project" (§9G-18.002(12) FAC) and in the discussion of demonstrating state or local emergency management needs in the 1993-94 Application Packet (Florida Department of Community Affairs, 1993b).

The insurance premium surcharge concept could be altered to provide incentives to avoid activities in risky locations such as the coastal high hazard area. For example, the surcharge rate structure could be modified to reflect the relative risk of living or conducting business in areas vulnerable to coastal storm damage. Properties located in Category 1 storm surge zones would be charged a higher surcharge than those in Category 3 zones, or Category 5 zones, or those outside the storm surge zones entirely. However, the surcharge would undoubtedly have to be considerably greater than $2 or $4 per year to motivate changes in land use. The potential 30 to 100% premium increases likely to result from the reimbursement premiums imposed on insurers under the Hurricane Catastrophe Fund are likely to have a much greater impact.

A surcharge rate structure based on relative risk would also make financing of state and local emergency management programs more equitable: property owners whose insured structures are more vulnerable to coastal storm damage and who are more likely to require state and local emergency assistance would be paying a larger share into the trust fund. If the fund were altered so that it financed existing state emergency management activities that are directed toward preparedness for, response to, and recovery from coastal storms, the surcharge would be considerably greater and paying for those services would be more equitable than through the current practice of funding such activities through the General Revenue Fund. The limits to relying on higher insurance premiums to effect storm hazard mitigation goals are discussed in the section on the Hurricane Catastrophe Fund.

EDUCATION AND INFORMATION

Several policy instruments described in preceding sections include technical assistance efforts by state agencies that facilitate achievement of the state's storm hazard mitigation policy objectives. These include the training workshops and deemed-to-comply manual for local building inspectors sponsored by the Department of Community Affairs under the Coastal Zone protection Act of 1985 and the State Beach Management Plan prepared by the Division of Beaches and Shores. State initiatives connected with federal programs are discussed in Chapter 2. One other bears formal discussion here, the mechanism by which residents within the area delimited by the Coastal Construction Control Line (CCCL) are notified of the location of the line.

CCCL PUBLIC NOTICE PROCEDURES

Overview

One of the public education and information strategies that has been promoted as a means of attaining natural hazard mitigation objectives is the alerting of affected persons to the presence of

natural hazards in specific areas (Godschalk, Brower, and Beatley, 1989). Where governments initiate regulatory actions to protect public health and welfare in hazardous areas, there are also requirements for public notice of pending regulatory actions that are usually contained in state laws governing general administrative procedures. Governments may also choose to disclose regulatory constraints on property use as a way of fending off subsequent takings claims, since many courts have applied a standard of reasonable development expectations in making judgments about whether regulations have unreasonably denied property owners economically beneficial use of their property.

Florida law (§161.053(2) FS) requires the Department of Environmental Protection (DEP) to provide public notice of the regulations governing property seaward of the CCCL in two ways. First DEP must conduct public hearings, with formal published notice, in each county, prior to setting a CCCL, and a hearing must also be held by the Governor and Cabinet. Second, DEP is required to record the CCCL in public records of each affected county and municipality and to provide a copy of the survey of the line to the clerk of the circuit court in each county.

Analysis

While the public notice and formal recording of the CCCL accomplish some measure of informing the public, the emphasis of current Florida requirements appears to be on meeting the requirements of the state administrative procedures law (§120.54 FS) and on putting property owners on notice of the regulations rather than alerting them to the hazards of occupying the area demarcated by the CCCL. Other states have initiated hazard disclosure procedures tied to real estate transactions that are more directly targeted at alerting prospective property owners of the potential risks posed by natural hazards. Several examples are discussed in the next chapter.

ENDNOTES TO CHAPTER 3

1. Effective soil depth is the depth of slightly or moderately limited soil material at an onsite sewage disposal system drainfield site [§10D-6.042(20) FAC].

2. Class I is potable water supplies; Class IV is agricultural water supplies, and Class V is navigation, utility, and industrial use.

3. Basis wind speeds are the fastest-mile speeds at 33 feet above ground for open terrain associated with an annual probability of 0.02 (50-year return interval).

4. Coastal barrier islands are defined as in the Coastal Zone Protection Act of 1985 (§161.54(2) FS): "geological features which are completely surrounded by marine waters that front upon the open waters of the Gulf of Mexico, Atlantic Ocean, Florida Bay, or Straits of Florida and are composed of quartz sands, clays, limestone, oolites, rock, coral, coquina, sediment or other material, including dredge spoil, which features lie above the line of mean high water. Mainland areas which are separated from the mainland by artificial channelization for the purpose of assisting marine commerce shall not be considered coastal barrier islands."

5. The State Land Development Plan is one of three so-called translational plans designed to provide interim guidance between the State Comprehensive Plan and the plans of individual state agencies, regional planning councils, and local governments. The plan adds objectives and agency operating policies, but it is not used to judge the consistency of local plans with the State Comprehensive Plan (Florida Department of Community Affairs, 1989).

6. Section 380.27(2) FS cross references §163.3178 FS, and, therefore, links to §163.3178(2)(h) FS which spells out the requirement that local governments designate "high-hazard coastal areas" that will be subject to the state infrastructure policy set forth in §380.27(2) FS. DCA has maintained in its recent coastal infrastructure policy reports that the state's infrastructure policy applies to the entire coastal area (1991:6; 1992:5; 1993a:4). This appears to be based on an imprecise interpretation of the cross-reference to §163.3178 FS rather than the more precise specifications of §163.3178(2)(h) FS.

7. The V-zone or velocity zone is the area estimated to be subject to at least a three-foot breaking wave during a 100-year storm. It is determined by the National Flood Insurance Administration of the Federal Emergency Management Agency (FEMA).

8. Coastal storm evacuation zones are established by county emergency management agencies for storms of different intensities as measured by the Saffir/Simpson hurricane scale which differentiates 5 categories of hurricanes plus tropical storms based on wind speed and storm surge ranges. Most counties base their categorical storm evacuation zones on storm surge maps prepared using the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model developed by the National Weather Service. County evacuation zones for landfalling storms tend to be at least as wide as the area predicted to be affected by a storm surge striking perpendicular to the coast (McDonald, 1993).

9. Recall that the CCCL is based on beach and dune erosion predicted to result from a 100-year storm rather than inundation from storm surge.

10. The study, contained in Appendix A, analyzed the relative position of the V-zone, CCCL, and the SLOSH model categorical storm surge zones for seven counties selected to

represent different topographic and geographic situations in the state. No panhandle counties west of Wakulla County were analyzed because up-to-date SLOSH maps were not available. Measurement points were selected to represent significant shifts in the position of one of the zones relative to the first measurement made for a county.

CHAPTER 4

A REVIEW OF LOCAL COASTAL MANAGEMENT PLANS: HOW WELL DO LOCAL PLANS MEET HAZARD MITIGATION AND POST-STORM REDEVELOPMENT OBJECTIVES?

INTRODUCTION

Florida's comprehensive planning system is based on a set of integrated planning goals and policies that begin at the state level and carry through to the regional and local levels. State planning goals and policies, as codified in Chapter 187 FS, are intended to provide guidance for the development of regional policy plans authorized under Chapter 186 FS. Local planning policies, authorized under Chapter 163 FS, are, in turn, to be consistent with both state and regional goals and policies, thereby creating a system that moves from the more general to the more specific as is appropriate to the changing geographical focus and scope of each plan.

The degree to which state policy goals and objectives for coastal areas are realized is, in this system, very much dependent on the manner and degree to which local jurisdictions reflect and operationalize policies initiated at higher levels. Since land use and development decisions are, for the most part, made at the local level, the local policies that guide permitting and development decisions will determine if and how state goals and objectives are realized. Additionally, state action within local jurisdictions is very much dependent on local policy and cannot act independent of local planning objectives. Florida statute (Chapter 380.27 FS) requires that once a local jurisdiction has an approved coastal management plan, state spending for infrastructure within the coastal area must be consistent with this local plan.

Under these conditions, of vital importance to the state is the degree to which local plans responsibly interpret state goals, objectives, and policies and adapt them to the local context. To help insure that this occurs, the state has specified the required minimum content of local

comprehensive plans and evaluates plans for compliance with these minimum requirements. These minima are spelled out in Rule 9J-5 FAC. Coastal communities (counties and incorporated cities) are required to produce, as part of their local comprehensive plan, a coastal management element. The requirements for this element are specified in Rule 9J-5.012.

In the following sections we evaluate a small sample of these local coastal management plans in the attempt to address the question of how well state objectives are met at the local level. A review of local coastal management elements also provides an inventory of local policy alternatives and may suggest unique and innovative approaches to coastal management that should be promoted by the state.

THE STUDY

The Department of Community Affairs (DCA), as the state agency with lead responsibility for reviewing local comprehensive plans, has developed a review format that closely follows the requirements as specified in Rule 9J-5 FAC. Our interests overlap those of the DCA review only in part; in the interests of highlighting the most significant coastal planning issues we have focused on a subset of the requirements for the coastal management element as specified in Rule 9J-5.012. The issues on which we focus are concerned with the coastal high hazard area, hazard mitigation, and post-storm redevelopment issues only. These topics are shown in Table 4.1 along with a cross-reference to the corresponding section of Rule 9J-5, where appropriate. Since we are also interested in the development of innovative policies for hazard mitigation, we have gone beyond the DCA review format to include review of the set of policy instruments discussed in Chapter 1.

The review procedure incorporates three components: review of the DCA report titled Objections, Recommendations and Comments (ORC report); review of the adopted coastal management

redevelopment plan.

The review of the ORC report is done to gain some background to DCA's official response to the proposed version of the plan. In each case the adopted version is subsequent to the ORC report and we expect that issues raised in the DCA review will have been addressed in the final plan submission.

The review of the coastal management element of the adopted plan was done to determine if the local community had addressed the issues listed in Table 4.1. We did not, however, evaluate the extent to which the issues are addressed or whether the policies proposed are strong and likely to be effective, except to the extent that they are properly addressed. This means that inventories, analysis, and objectives/policies were required to be sufficiently specific. Where the requirement is to inventory infrastructure within the CHHA, then an inventory that did not specifically address the CHHA was deemed as not satisfying the requirement. Similarly, where we are concerned with the use of development regulation for hazard mitigation, regulations that are not done for the purposes of mitigation, even vaguely defined, but for other purposes (such as species protection) were not judged as satisfying the requirement. Some considerable degree of vagueness and incompleteness, however, was tolerated. Thus, for example, some communities may provide a reasonably thorough inventory of infrastructure within the coastal high hazard area while others do little to inventory infrastructure other than to provide vague statements about the general types that exist. Similarly, a variety of definitions exist for the CHHA, many of which do not meet the definitional requirements stipulated by DCA. Nevertheless, if the issue is addressed, this was noted and reported as such in our tabulations. Only in a small number of instances is the wording of a local policy so vague that it was entirely unclear what was meant and the entry was coded as absent. The analysis also includes an instance of double counting that makes local regulation appear more

Table 4.1: Review of Coastal Management Element

A. Data and Analysis: Does the plan include the following tasks relating to post disaster redevelopment?

5.012(2)(e)2 1. Inventory of **existing and proposed land uses** in CHHA
5.012(2)(e)2 2. Inventory of structures with **history of repeated damage**
5.012(2)(e)2 3. Inventory of **infrastructure** in CHHA
5.012(2)(e)2 4. Analysis for **relocation of threatened infrastructure**
5.012(2)(e)2 5. Inventory of **beach and dune conditions**
5.012(2)(e)2 6. Inventory of coastal and shore **protection structures**
5.012(2)(e)2 7. Analysis of **measures to reduce exposure** to hazards (relocation, structural modification, public acquisition)

B. Objectives and Policies: Does the plan include objectives or policies that address the following issues:

1. Coastal High Hazard Areas

5.012(3)(c)7 a. **Designation** of CHHA
5.012(3)(c)7 b. **Limit development** in CHHA
5.012(3)(c)7 c. **Relocate/replace infrastructure** away from CHHA
5.012(3)(b)5 d. **Limit public expenditures** that subsidize development in CHHA
5.012(3)(b)6 e. **Direct population away** from CHHA

2. Hazard Mitigation

5.012(3)(c)3 a. **General policy** for hazard mitigation
b. HM using the following **policy instruments**[1] ...

regulation
* construction and site development
* land use
investment
* land acquisition
* capital facilities, infrastructure, services
incentives
* economic
* education and information

5.012(3)(c)3 c. Incorporate the **hazard mitigation annex** and interagency hazard mitigation reports

(continued)

Table 4.1 continued...
Review of Coastal Management Element

	3. **Post Disaster Redevelopment**
5.012(3)(b)8	a. Policy to prepare post disaster redevelopment plan
	b. Identify regulatory/mgt techniques for post-disaster redevelopment that -
5.012(3)(c)5	1. Distinguish between long term repair and redevelopment
5.012(3)(c)5	2. Address removal, relocation, structural modification of damaged infrastructure
5.012(3)(c)5	3. Address limiting redevelopment in areas of repeated damage
	c. Status of post storm redevelopment plan

[1] From the perspective of local government there are no mandates imposed on lower levels of government. This category of policy instrument is omitted.

forceful than it is in reality. Rule 9J-5 requires communities to include a policy statement regarding limitations on public expenditures that subsidize development within the CHHA; i.e. locating infrastructure within the area. Communities that failed to include this policy had this noted in their ORC report and eventually all of the sampled plans included an appropriately worded policy. This automatically qualified each community to also be scored positively on the issue of whether capital facilities programming was used for the purposes of hazard mitigation. Because of difficulties in interpretation, however, we recognize that different evaluation outcomes are possible and that different analysts may reach slightly different conclusions.

After review of the plan we telephoned each local community that had indicated a policy to prepare a post storm redevelopment plan to inquire about the status of the plan. In most cases the date at which the community intended to have this plan adopted is specified as part of the community redevelopment policies. We inquired as to whether the plan had been prepared and, if so, whether it had been given official status by being incorporated within the local comprehensive plan. The

basis for selecting the local jurisdictions that are included in our review rests on the intersection of a number of criteria: geographic location, development scale, and geophysical conditions of the coast. Geographic location is operationalized in terms of five regions: Panhandle, Gulf, ocean - north, ocean - central/south, and Keys. Within each region we selected two counties that differed, to the extent possible, on geophysical conditions and development scale. Geophysical conditions of the coastal area were defined in terms of beach erosion and accretion rates, using the highest reported rates for each county organized into high, medium, low, and none categories. Development scale was defined by the metropolitan versus non-metropolitan distinction (i.e.,

Table 4.2: Local Communities Selected for Review of Coastal Management Element

Location	Geophysical Conditions		Largest Place
	erosion	accretion	
1. Panhandle			
Bay	high	medium	Panama City
Franklin	medium	medium	Apalachicola
2. Gulf			
Sarasota	high	none	Sarasota
Lee	medium	medium	Cape Coral
3. Ocean - North			
Duval/Jax[1]	high	none	Jacksonville Beach
St. Johns	low	low	St. Augustine
4. Ocean - Central/South			
Brevard	medium	medium	Palm Bay
Palm Beach	high	none	W. Palm Beach
5. Keys			
Monroe	none	none	Key West

[1] Duval County and the City of Jacksonville are incorporated as one unit. Jacksonville Beach was selected as an alternative.

however, it was not always possible to also differentiate counties within the same region on the whether the county is a part of a metropolitan area.) In attempting to meet the geophysical criteria, however, it was not always possible to differentiate counties within the same region on the basis of the metropolitan distinction. On these bases we have selected for review nine counties, shown in Table 4.2. In addition, we also selected the largest coastal city as of 1990 (i.e., of those cities designated coastal and required to complete a coastal management element) within each of these counties, thereby adding an urban dimension. This was necessary because in some highly urbanized counties the amount of coastal high hazard area that exists in the unincorporated area is small and the attention given to the CHHA in the plan is relatively minor.

RESULTS: CORRESPONDENCE TO STATE PLANNING MANDATES

The tabulated results of the review are shown in Table 4.3 both in terms of the number of communities satisfying the requirement and the percent. In some instances the base upon which the percent is computed does not include the entire set of 18 places because the particular issue or requirement is not applicable (e.g., there is no CHHA in Panama City.)

Table 4.3 shows that the proportion of communities that responded appropriately to each item varies considerably and only in a few instances is there universal coverage of an item. For example, in the Data and Analysis section, most (88%) of the places addressed the requirement for an inventory of coastal and shore protection structures, but less than half (47%) of the places provided an inventory of existing and proposed land uses in the CHHA. A number of communities for which this land use inventory was missing did provide this information for the coastal zone in general, but failed to do so for the smaller CHHA.

The proportions associated with the required objectives and policies for the CHHA show that all

(100%) communities included a policy that addressed the limitations on public expenditures for new infrastructure in the CHHA, although in many instances there are significant qualifiers to these policies. Moreover, the seriousness of purpose with which communities treat the infrastructure issue may be better indicated by how many communities also address other infrastructure related content. Thus we see that only 65% inventoried infrastructure within the CHHA; only 53% performed an analysis of the potential for the relocation of infrastructure out of the CHHA; and only 18% adopted policies that address the issue of relocating or replacing existing infrastructure out of the CHHA. Dealing with the latter issue, moreover, does not necessarily mean that a relocation policy has been adopted; in each instance relocation is predicated on damage and the need for redevelopment rather than being addressed independently.

Objectives and policies that address the issue of hazard mitigation are relatively weak. Less than half (44%) of the jurisdictions include a general policy in support of hazard mitigation, and the majority of places rely on the relatively standard approaches of construction and site development regulations (78%), the regulation of development (83%) and the location of infrastructure and public facilities (100%). While development regulation can be a powerful and creative method for addressing hazard mitigation, in many communities it is not handled as such. The weakest examples are those that simply indicate that they will continue to enforce existing codes and land use regulations which provide for hazard mitigation, but fail to specify the content of these regulations or to describe a logical connection between the action and expected results. Objectives and policies for post disaster redevelopment are similarly mixed. Most revealing is that while 72% of the communities indicated a policy for preparing a post disaster redevelopment plan, none of those communities whose dates of adoption are specified as 1993 or before have done so by the time of this report (although two indicate that draft plans have been prepared and adoption is expected later this year.)

Table 4.3: Summary of Coastal Management Elements

	number	percent
A. Data and Analysis		
1. Inventory of existing and proposed land uses in CHHA	8	47
2. Inventory of structures with history of repeated damage	9	53
3. Inventory of infrastructure in CHHA	11	65
4. Analysis for relocation of threatened infrastructure	9	53
5. Inventory of beach and dune conditions	14	82
6. Inventory of coastal and shore protection structures	15	88
7. Analysis of measures to reduce exposure to hazards	15	83
B. Objectives and Policies		
1. Coastal High Hazard Areas		
a. Designation of CHHA	13	76
b. Limit development in CHHA	11	65
c. Relocate/replace infrastructure away from CHHA	3	18
d. Limit public expenditures in CHHA	17	100
e. Direct population away from CHHA	12	72
2. Hazard Mitigation		
a. General policy for hazard mitigation	8	44
b. HM using the following policy instruments ...		
construction and site use	14	78
regulation of land use	15	83
land acquisition	8	44
capital facilities/infrastructure	18	100
economic incentives	5	28
education and information	3	17
c. Incorporate hm annex/interagency reports	13	72
3. Post Disaster Redevelopment		
a. Policy to prepare post disaster redvlpmt plan	13	72
b. Identify regulatory/mgt techniques that address -		
long term repair and redevelopment	14	78
removal, relocation, structural modification	12	67
limiting redevelopment	9	50
c. Status of post storm redevelopment plan	0	0

Beyond the proportions reported in Table 4.3 is the strength of the specified policies. Clear, focused, and direct policies that are likely to be effective responses to the issues of hazard mitigation and post-storm redevelopment do exist in some communities, but in many the policies are vague and unsatisfactory. A common problem appears to be the failure to specify management or implementation devices. Hence, a community may state that it will control development within

Table 4.4: Required Items Included in Coastal Mgt. Element by Place

Place	#	%
Palm Beach	8	44
W. Palm Beach	13	72
Lee	13	72
Cape Coral	11	61
Duval/Jax	10	56
Jax Beach	12	67
Sarasota	13	72
Sarasota City	6	33
Bay	15	83
Panama City[1]	5	83
St. Johns	10	56
St. Augustine	13	72
Monroe	9	50
Key West	16	89
Franklin	15	83
Apalachicola	15	83
Brevard	16	89
Palm Bay	5	28

[1] Panama City contains no CHHA; only 6 of the required items are applicable.

the CHHA but will not specify how this control is to be done. Related to this, communities often do not specify, to a sufficient degree, how a management tool will be used to achieve an outcome. Thus, some places simply indicate that the jurisdictions will use land use regulations to limit development or the placement of infrastructure but fail to make a logical connection between means and ends by indicating what the content of the regulations will be and what types of development limitations are intended. In some instances communities further diminish the intent of the regulations by adopting policies that specify only an intent to examine an issue, such as by stating a policy to study the potential for removing infrastructure from the CHHA. None of the communities of our sample include all of the required items from Table 4.1 (i.e., those items that have a reference to Rule 9J-5.) There are 18 such items listed; the number addressed for each place, as shown in Table 4.4, varies from 5 (28%) to 16 (89%).

Since our interests in this review are to both evaluate the quality of coastal management policies as well as to determine the extent to which innovative policies are in force for hazard mitigation it is instructive to summarize the range of mechanisms that are used. Accordingly, Tables 4.5a-g show an important part of the policy content of each community with respect to hazard mitigation. These entries are a close paraphrase of the policies as they exist in the comprehensive plan and so reasonably show the range of quality that exists. In most instances where multiple policies were relevant, the strongest and clearest was selected for presentation. Comments on each table are given below.

Table 4.5a: Construction and site use regulation. A majority of communities include some reference to building and construction regulations. In some instances the reference is minimal, as when a community commits to the minimum building codes required under the flood insurance program or references state building standards. A number of communities establish conditions for the redevelopment of damaged structures, but the criteria also do not go beyond the minimum

specified by the flood insurance program. No community in the sample has adopted a standard for repair to code that is based on successive degrees of damage cumulated over time (e.g., over a 5 year period.) In total there appears to be no innovation in the set of policies.

Table 4.5b: Regulation of land use. Almost all jurisdictions include objectives and policies that regulate development, although the intent of the regulation to provide for hazard mitigation is not always clear or stated. In a number of instances communities are included because they addressed the Rule 9J-5.012(3)(c)7 requirement to limit development within the CHHA, but did not address development controls in conjunction with their hazard mitigation policy statement.

The regulation of development is the single largest set of policies reviewed. Whereas for other policy types, such as acquisition or economic incentives a, jurisdiction may incorporate only a single policy statement, the coastal management plans are likely to provide for a number and variety of development regulation statements, all of which are difficult to summarize in this format. Table 4.5b is meant to show a sample of these statements, and across the jurisdictions, the range of mechanisms that are employed.

As in the other policy areas, the range of statements varies from the general to the specific, and includes policies that reference actions as well as only the intent to take action. A number of statements are relatively meaningless; they reference regulations that will be enforced without specifying the content or significance of the regulation. Other statements reference state regulations that have little to do with the local community. The mechanisms most frequently used are the zoning ordinance and associated land development regulations limiting the type of development and development densities. In a small number of instances strong policies are articulated, such as those prohibiting redevelopment in areas of recurrent storm damage, calling for the use of the eminent domain power to insure that structures are not rebuilt, or the use of density

transfers among parcels within the CHHA.

Table 4.5c: Acquisition of coastal property. Eight communities consider acquisition as a mitigation measure. In five of the communities the policies are worded to allow for the consideration of acquisition after storms. In three instances the policies refer only to establishing guidelines, investigating acquisition programs, or preparing a proposal for debate. The policies can be compared to that of the City of Palm Bay, which is not included in the set of eight because its acquisition program is focused on improving public access and not hazard mitigation. Nevertheless, it creates a forceful contrast to the above. It states "The City will actively work toward to acquisition of vacant shoreline, pursuing funding sources as needed. (emphasis added)"

Table 4.5d: Capital facilities and infrastructure. Policies exist for all 18 sample places. This is due, however, to an analytic decision that allowed us to count policies in one of two places as contributing to hazard mitigation through the use of infrastructure. Places that included a policy to limit infrastructure development within the CHHA, as required in Rule 9J-5.012(3)(b)5, along with those that were specifically written for hazard mitigation, were taken as relevant to this section. In reality, this decision was overly expansive. Many places satisfied the 9J-5 requirement to limit infrastructure expenditures within the CHHA without reference to hazard mitigation objectives. The wording of these policies is fairly uniform throughout and appears to mimic DCA requirements rather than a creative policy. In some instances even this position is compromised by allowing the development of private infrastructure, and by providing for public infrastructure when other conditions are met (e.g., W. Palm Beach allows the development of infrastructure for economic development.)

Another aspect of capital facilities investments used for hazard mitigation is the use of sea walls, jetties, etc., versus natural dune systems. Six communities maintain this type of policy, generally in

favor of natural protective systems over additional investment in hardening of the coast. The communities are Lee County, Duval/Jacksonville, Jacksonville Beach, St. Augustine, Brevard County, and Palm Bay.

Table 4.5e: Economic incentives. Creative and innovative mechanisms are utilized. These include impact fees, special assessments or taxes, and the transfer of development rights as means of influencing the fiscal dimensions of development decisions. Only St. Johns and Brevard County commit to these mechanisms; the others adopt policies that involve investigation and consideration. Palm Beach County includes a policy which states that they will establish a disaster trust fund. The policy exists under the objective of post disaster redevelopment but it is not specified as being for the purposes of hazard mitigation and no indications are given as to how the fund will be used.

Table 4.5f: Education and information. These are relatively easy policies to implement and are designed to make residents and property owners aware of the hazards and the additional costs of locating within the flood hazard area. Only three places include these policies.

Table 4.5a: Construction and Site Use Regulations

Lee:	Regulations and incentives will be examined for... floodproofing of utilities, structural wind resistance and floodplain management; all development regulations shall be revised to require that the vulnerability of future development in the A-zone be reduced.
Cape Coral:	The City will revise its land use and development regulations to indicate that structures damaged more than 50% of their assessed value can be rebuilt provided they comply with building code requirements for floodproofing.
Duval/Jax:	If rebuilt, structures which suffer damage in excess of 50% of appraised value shall be rebuilt to meet all current building and code requirements.

Jax Beach:	The City shall adopt and enforce design and construction standards specified in the Southern Standard Building Code; all new construction, substantial improvements, or reconstruction, redevelopment, repair of damaged structures shall comply with the provisions of the existing coastal zone requirements.
Sarasota City:	The potential for storm damage shall be minimized through development compliance with the Coastal Construction Code, Sarasota Zoning Code, and the Engineering Design Criteria Manual.
Bay:	All new or redeveloped shoreline land use shall be constructed to conform to coastal construction building codes.
Panama City:	The city will use regulation of construction practices in flood prone areas as specified in the City's Flood Damage Prevention Ordinance; all habitable structures shall be designed and constructed in conformance with the Flood Damage Prevention Ordinance.
St. Johns:	The County shall adopt policies to redirect long term redevelopment that utilize improved construction site development practices to reduce the risk of recurrent damage.
St. Augustine:	The City will enforce ordinances which regulate construction within the flood zones; structures that sustain damage greater then 50% of value due to a storm shall be required to rebuild using current coastal construction standards.
Monroe:	Monroe shall review its current building code and as appropriate adopt structural standards and site alteration restrictions to meet the minimum FEMA requirements; and, in the event of a disaster, shall consider the recommendations of the interagency hazard mitigation report.
Key West:	Upon adoption the City shall enforce more restrictive land use controls within the CHHA including performance criteria which shall mandate that all development and redevelopment comply with state and local construction codes regulating construction activity in coastal areas.
Franklin:	All land development applications within the CHHA obtain approval pursuant to a site plan review, to ensure that development is compatible with site characteristics. Applications will be reviewed for compliance with all applicable flood control regulation requirements. The County's Floodplain Management Ordinance shall reference the building elevations of the Flood Insurance Rate Maps, the building requirements of the National Flood Insurance Program.
Apalachicola:	The City's Floodplain Management Ordinance shall reference the building elevations of the Flood Insurance Rate Maps, and the building requirements of the National Flood Insurance Program. In coastal areas needing redevelopment, structures which suffer damage in excess of 50% of appraised value shall be rebuilt to meet current requirements.

Brevard:	Structures seaward of the CCCL in need of repair that is greater than 50% of market value shall be reconstructed to coastal zone construction standards.

Table 4.5b: Regulation of Land Use

Palm Beach:	The County shall continue to enforce regulations and codes which provide for hazard mitigation. These include land use regulations.
Lee:	All development regulations shall be reviewed and revised to require that the vulnerability of future development in the A zone be reduced; mobile homes or recreational development shall not be permitted on barrier islands or the CHHA.
Cape Coral:	The City will establish programs of incentives and regulation that prevent the placement of private or public investment in locations of high risk damage or destruction from the effects of tropical storms and hurricanes.
Duval/Jax:	All land development regulations shall be reviewed and revised to reduce the vulnerability of any existing development within the CHHA; all land development applications within the CHHA must be planned and obtain approval pursuant to a site plan review process to ensure that development is compatible with site characteristics; development within areas of the CHHA which have sustained recurring hurricane related damage shall be prohibited.
Jax Beach:	Undeveloped lands within the CHHA shall be designated "conservation-protected areas" on the future land use map; construction projects within designated redevelopment areas shall be in accordance with adopted land uses specified in the Community Redevelopment Plans; land use plan amendments shall not be approved within Category 3 hurricane vulnerability zones unless the change is for a lower density or a requested increase in density is offset in another part of the zone.
Sarasota:	Utilize the County's power of eminent domain and regulatory authority to relocate threatened and/or damaged structures and infrastructure landward of the CHHA.
Sarasota City:	The potential for storm damage shall be minimized through development compliance with the Sarasota Zoning Code.
Bay:	Limit population density in the coastal area to 15 dwelling units/acre; the density in the CHHA shall be limited to one dwelling unit per parcel unless a greater density is approved; development shall be prohibited in all areas that have received repeated storm damage.
Panama City:	The City shall use specific regulatory and management techniques for general hazard mitigation including providing specific and detailed standards in the land development regulations for shoreline construction; post disaster

	redevelopment shall be undertaken in conformance with this plan, including attendant land development regulations.
St. Johns:	The City shall adopt land development regulations and policies to direct long term redevelopment activities within storm damaged areas; relocation of habitable structures which have incurred damage from a disaster, where damage is greater than 75% of assessed value, to new locations outside the CHHA provided that sufficient land is available on the subject parcel for such relocation.
St. Augustine:	Developments seaward of the CCCL shall be in strict compliance with state guidelines; the city shall not increase densities in the CHHA should redevelopment occur.
Key West:	The City shall adopt amended land development regulations which shall include performance standards regulating development activities in a manner which minimizes the danger to life and property occasioned by hurricanes; upon plan adoption the City shall enforce more restrictive land use controls within the CHHA including reduced maximum density for development.
Franklin:	County shall limit the density of new residential development within the CHHA to a maximum of one dwelling unit/acre; maximum density of new commercial development within the CHHA shall be limited to the lowest density for those areas as provided for in the Future Land Use Element. The County will promote, through land development regulations, where a project is located in the CHHA, the clustering of uses.
Apalachicola:	The City shall, through its land development regulations, restrict density of the CHHA to the lowest level of service establishment for the respective land use category. The City shall prohibit new mobile home projects within the CHHA; the City shall prohibit the siting of new acute care medical facilities with the CHHA and existing medical facilities will be discouraged from expanding.

Table 4.5c: Acquisition of Coastal Property

Palm Beach:	County shall investigate programs for acquisition in areas where buildings experience over 50% damage and cannot be rebuilt.
Lee County:	Staff will prepare a proposal for a county run land acquisition program; the post disaster strategic plan shall establish guidelines for determining acquisition priorities.
Cape Coral:	The City will establish guidelines for determining priorities for acquisition of storm damaged properties.
Duval/Jax:	The City will identify structures in the CHHA, inventory their assessed value, judge the utility of the land for public access or resource protection, and make recommendations for acquisition during post storm recovery.

Jax Beach:	Same as Duval/Jax
Sarasota City:	(In the context of a post disaster redevelopment plan...) acquisition of coastal properties subject to damage will be considered.
Franklin County:	County will identify structures in the CHHA, inventory their assessed value, judge the utility of the land for public access, and make recommendations for acquisition when post disaster opportunities arise.
Apalachicola:	Same as Franklin

Table 4.5d: Capital Facilities and Infrastructure

Palm Beach:	The County shall not use funds for infrastructure expansion or improvements or development subsidization in CHHAs unless such funds are necessary to provide services to existing development; provide for adequate evacuation; provide recreational needs; and natural resource restoration/enhancement.
W. Palm Beach:	The City shall limit public expenditures in the CHHA to repair/replacement, public access, economic development projects, enhancement of natural resources.
Lee:	Public expenditures in areas particularly subject to repeated destruction by hurricanes shall be limited to necessary repairs, public safety needs, services to existing residents, and recreation and open space uses.
Cape Coral:	The City will require that all public facilities except for recreational facilities, shall not be located within the CHHA.
Duval/Jax:	The City shall limit the expenditure of public funds in CHHAs to the restoration or enhancement of natural resources and the replacement and renewal of existing facilities which may be expanded and imported.
Jax Beach:	City funded public facilities shall not be built in the CHHA unless the facility is for public access or resource restoration.
Sarasota:	The construction or reconstruction of County funded facilities or infrastructure in the CHHAs shall be prohibited except for passive recreation facilities and those necessary to ensure public health and safety.
Sarasota City:	The expenditure of public funds on infrastructure in the CHHA shall be limited to restoration/enhancement of natural resources, passive recreation, public safety.
Bay:	The capacity of infrastructure shall not be increased on Coastal Barrier Resources over current capacity; public facilities shall not be located or improved in the CHHA unless they are necessary to protect the public safety or to restor/enhance natural resources.

Panama City:	The City shall not locate infrastructure facilities, except for water dependent facilities, in the 100 year flood zone.
St. Johns:	Public expenditures within the CHHAs shall be limited.
St. Augustine:	The City will limit public expenditures that subsidize development in the CHHA except to restore/enhance natural resources.
Monroe:	The County shall identify infrastructure needs according to the projected population and shall implement a review program which explores alternatives to infrastructure placement within the CHHA.
Key West:	Publicly funded infrastructure shall not be built within the CHHA unless the facility is for the protection of public health and safety.
Franklin:	County funding for public facilities in the CHHA shall be prohibited unless a crucial need is demonstrated .
Apalachicola:	City funded public facilities shall not be built in the CHHA unless the facility is for public access or resource restoration; the City will establish a lower priority for the expenditure of City funds for infrastructure within the CHHA.
Brevard:	Public facilities, except for recreational facilities, shall not be located by Brevard County within the CHHA.
Palm Bay:	Limit public expenditures for infrastructure in high hazard or storm surge areas of the coastal zone.

Table 4.5e: Economic Incentives

Palm Beach:	In areas where building failure is equal to or greater than 50%, the County shall investigate the use of transfer of development rights.
Lee:	The County shall consider impact fees and/or a hazard mitigation municipal service taxing unit to cover the public costs of hazard mitigation, flood proofing, evacuation, search and rescue, acquisition of hazard prone properties, reconstruction of public facilities, construction or improvements to shelters, and similar needs.
Sarasota City:	Special high hazard area taxing zones will be created to help pay for the relocation landward of the CHHA, the reconstruction and/or protection of storm damaged public infrastructure and facilities, and shelters.
St. Johns:	The County shall adopt policies to direct long term redevelopment activities within storm damaged areas. The policies shall address... requirements for additional impact fees or surcharges for CHHA infrastructure to ensure that the costs are completely paid for by projects within the CHHA and not by the general public; and use special assessments within the CHHA to recoup expenditures for repair of damaged infrastructure.

Brevard:	The County shall continue to implement its transfer of development rights program which has been established to transfer density from transfer districts within the CHHA to receiving districts outside of the CHHA.

Table 4.5f: Education and Information

Lee:	The County, in cooperation with local news media, educational institutions, public service groups, and other agencies shall implement a program of education and information describing the risks of hazards and actions necessary to mitigate the dangers which these hazards present.
Bay:	The County will make available to the public a map depicting the CHHA; the County will notify owners of property in the CHHA of property designation to increase public awareness of hurricane hazard and post-disaster redevelopment policy.
St. Johns:	The County shall adopt policies to direct long term redevelopment activities within storm damaged areas. The policies shall... require notification to residents and businesses within the CHHA that specific standards and/or additional costs may be associated with locating within the CHHA.

CONCLUSIONS: THE WEAKNESSES OF LOCAL PLANS

Our conclusion regarding the content of the coastal management elements within our sample is that they are generally weak. No single community meets all of the surveyed requirements of Rule 9J-5, and in many instances the requirement is met with a policy that suggests the intent to consider or study the policy issue. Many of the policies reference ordinances and regulations whose content remains unspecified so that it is impossible to determine whether the referenced document appropriately addresses the policy subject. Statements that reference state requirements, such as the state permitting process within the CCCL, because they are not subject to local discretion or control, are inappropriate for inclusion within the plan. Most plans, moreover, are relatively uncreative. While almost all incorporate construction and site use regulation for hazard mitigation

and post-disaster redevelopment, most are void of policies that address any other mechanisms. Some of these other mechanisms, moreover, are relatively simple and inexpensive -- such as the range of policies under the subject of education and information. Their absence is taken as a reflection of the seriousness of purpose with which the subjects of hazard mitigation and post storm redevelopment are taken.

The general weaknesses of the coastal management element are mirrored in the responses obtained to our telephone interviews. We had originally anticipated an extensive interview schedule in which we would explore with each community the status of all hazard mitigation and post storm redevelopment policies, including experiences in implementation. A number of test interviews showed, however, that local staff were not always knowledgeable about the content of the element and whether policies had been implemented and with what results. Often we received the rather general response that a policy was being continually implemented, or was continually under study, without the provision of specific information. We regarded this as unreliable and reduced our interview to a focus on the single issue of having adopted a post storm redevelopment plan in those communities that had specified this policy. Even here, however, we experienced vagueness and a lack of knowledge. Some staff members were unaware of the stated policy while others confused the policy for a redevelopment plan with an emergency preparedness plan in which responsibility and procedures for emergency services are established.

It is clear from our review that the system of translating state objectives and policies for the coastal area to local jurisdictions is not working well. In many instances the weaknesses of the coastal plans have been recognized by DCA staff and have been included in the ORC report to the local jurisdiction. Nevertheless, many of the issues identified in the ORC report have gone unattended by the local communities and plans with these deficiencies have been subsequently approved and held in compliance with state requirements. This procedure of approving local plans

that are weak and deficient in the ways in which they address hazard mitigation and post storm redevelopment issues creates other difficulties. Under the current system of integrated state-regional-local plans, local plans that are approved and determined to be in compliance with state requirements receive a considerable degree of authority in regulating coastal development, to the extent that state authority is diminished. Where the local plan is weak the necessary coastal protections are lost both by virtue of the plan's deficiencies and the constraints that are placed on the authority of the state.

It is not entirely clear how and why this situation has developed, and informants have suggested a variety of reasons for explaining it (Busacca, 1993; McKay, 1993; Nave, 1993). Communities with coastal management elements were the first set of places required to submit plans for state review and approval. Early in the process the policies guiding the review process were not firmly developed and this may have resulted in both inconsistent and lax reviews. The review process also relies on the technical comments made by other state agencies, and these comments are particularly important where the expertise within DCA is limited. It has been suggested that the cooperation of other state agencies in this review process has not always been forthcoming.

A number of informants suggest, however, that a significant reason for the weaknesses of these elements is that coastal management has not been a DCA priority. In facing the political battles surrounding comprehensive plan approval, DCA adopted particular issues that it deemed most important and on which it sought to establish hegemony. Policies of land use, sprawl, and concurrency have been dominant themes while the issues of hazard mitigation and post storm redevelopment have never been important issues within the state. Since DCA must grant approval of plans as a whole, it is inevitable that tradeoffs would be made between securing compliance with valued policies versus forgiveness on less valued ones.

The current regulations, moreover, do not suggest that this situation is easily corrected. Once the plan is held in compliance, DCA no longer maintains the authority to review comprehensively the plan or the associated land development regulations. Thus, in spite of DCA policy that requires communities to complete their post-storm redevelopment plans within one year of approval of the comprehensive plan, no follow thorough has been initiated because of the lack of statutory authority to do so (Woodcock, 1993.) Alternatively, plan amendments must be submitted to DCA for comment, but this will not focus attention on those issues that are not the subject of a plan amendment. Thus, for example, only amendments that address the post-storm redevelopment plan will cause DCA to scrutinize this policy. Ironically, since many of the existing post storm redevelopment policies are weak or non-existent, DCA is most likely to have the opportunity to comment only when a jurisdiction attempts, through the amendment process, to improve the treatment of the issue.

These findings and interpretations are consistent with those offered by other analysts. Burby and Dalton (1993) argue that the rationales offered for state planning mandates to local communities in pursuit of state goals is fraught with difficulties. There are problems of monitoring and enforcement (DeGrove, 1984) as well as commitment by local communities to using mandated plans in order to manage development. Burby and Dalton's study of the effectiveness of state planning mandates on local adoption of methods for hazard mitigation indicates that while these mandates are important for the production of local plans, they appear to have little effect on the adoption and implementation of mitigation programs and the commitment of local planning staff to mitigation objectives.

> "The lack of a robust link between recommendations contained in plans and the development management measures actually adopted by local governments should ... be of concern to state policy makers, since development management, not paper plans, is the ultimate objective of state planning programs. To strengthen that link, states could pay more attention to enforcing requirements for consistency between plans and development management ..." (Burby and Dalton, 1993:13).

CHAPTER 5

IDEAS FROM OTHER STATES AND OTHER NATURAL HAZARDS SITUATIONS

INTRODUCTION

We followed two main approaches to identify policy innovations from other states that might be considered for application in Florida. First, we consulted recent literature reviews of state storm hazard and natural disaster mitigation programs (Godschalk, Brower, and Beatley, 1989; Platt et al., 1992; Berke and Beatley, 1993a; Berke and Beatley, 1993b; Berke and French, forthcoming) and recent issues of the Natural Hazards Observer newsletter published by the Natural Hazards Research and Applications Information Center, University of Colorado, Boulder. Second, we used a networking approach through national associations and federal agencies to locate states exemplary storm hazard mitigation or post-storm redevelopment programs or in the process of developing such programs. Organizations we contacted include the federal Office of Coastal Resources Management, the Federal Emergency Management Agency, the Coastal States Organization, the Association of State Floodplain Managers, and the National Emergency Management Association.

State agencies we contacted directly include the following: California's State Coastal Conservancy, Connecticut's Coastal Resources Management Division, Delaware's Shoreline and Waterway Management Section, the Massachusetts Office of Coastal Zone Management, Michigan's Great Lakes Shorelands Section, the North Carolina Division of Coastal Management, South Carolina's Coastal Council, and the Virginia Marine Resources Commission. Additional information about state programs was obtained from Platt et al. (1992), Godschalk, Brower, and Beatley (1989), and a recent report prepared by Florida DNR's Office of Policy and Planning, titled Beach Redevelopment (1993).

Our survey confirmed that Florida has one of the broadest arrays of state policies and programs that

directly or indirectly contribute to achieving state policy goals and objectives concerned with coastal storm hazard mitigation. The survey revealed a few ideas for changes in current Florida policies or programs but no dramatic innovative ideas for radical change. Recent literature reviews of state mitigation initiatives taken for other natural hazards (Berke and Beatley, 1993b) also show that policies are generally more advanced for hurricanes and severe storms than for other natural disasters such as earthquakes. Our findings are presented in sections that correspond to the different state storm hazard mitigation policy instruments defined in Chapter 1.

REGULATION OF CONSTRUCTION AND SITE DEVELOPMENT

Most of the states contacted had regulatory programs governing construction above the mean high water line (MHWL) that were similar in design to Florida's CCCL and 50-foot setback permit programs. However, several states have substantial damage thresholds that are lower than Florida's thus offering more opportunities in post-storm circumstances to bring existing structures into conformance with state regulations governing coastal construction.

Most of the states contacted require that structures damaged beyond the substantial damage threshold be relocated behind a construction baseline or as far landward as possible. In a few states an undamaged habitable structure must be relocated if it intrudes on the public trust beach, i.e. the wet sand beach below the MHWL. Florida is one of the few states, however, that imposes construction design standards that are intended to reduce the vulnerability of habitable structures to wind, wave, and storm surge.

Delaware, Michigan, North Carolina, and South Carolina have coastal construction regulations that are similar in many respects to Florida's CCCL and 50-foot setback permitting programs under Part I, Chapter 161 FS. Most construction is prohibited seaward of some baseline. In Delaware, the line is

based on topographic elevation. In Michigan it is based on defining a "zone of active erosion" or a specific topographic contour. In North Carolina development is generally prohibited seaward of the crest of the primary dune or the first line of stable natural vegetation. In South Carolina the baseline is defined by the location of the primary dune crest or by the sand volume of an idealized beach profile.

Delaware generally prohibits construction seaward of its "building line" and requires permits in the "beach area" landward of the line. In Michigan, North Carolina, and South Carolina, construction of habitable or permanent structures landward of the baseline is restricted within a zone defined by a multiple of the average annual erosion rate: 30 for small structures and 60 for large structures in Michigan and North Carolina; 40 in South Carolina. Michigan requires that small structures located between the 30-year and 60-year setback lines must be "readily movable" if there is access to the site for moving equipment. All four states have variance provisions where strict adherence to the regulations would preclude use of a parcel for a single-family residential structure.

Delaware has recognized that the buffer established by their construction line, which was surveyed in 1981, has been reduced by progressive erosion (Pratt, 1993). However, they are awaiting the outcome of proposed amendments to the National Flood Insurance Act before resurveying since one version would require FEMA to map 30- and 60-year erosion lines.

All four states have substantial damage thresholds that are lower than Florida's. (Under §161.053 FS, major habitable structures may be rebuilt so long as the original foundation is not substantially damaged and the new structure does alter the foundation footprint). Delaware requires a permit from the state for rebuilding a structure when 75% of the structure has been destroyed or when 50% of the foundation is unsuitable for incorporation into the reconstructed structure (§ 2.07 Regulations Governing Beach Protection and the Use of Beaches). Delaware's substantial damage threshold has

never required a close call according to Pratt (1993). Damage has either been so great that it was obvious the threshold was exceeded, or so little that it was not an issue. Pratt says if there is a question, they tend to rely on judgment of the applicant's engineer. (They require applicants to employ a licensed engineer to prepare plans for construction permits.) He thought the state would hire an engineering consultant of their own on a case-by-case basis if a close call were necessary.

North Carolina's threshold is 50% of the pre-storm physical value of the structure (Metzger et al., 1993). South Carolina's substantial damage threshold is higher than that required for continued insurance of damaged structures under the National Flood Insurance Act (66.67% rather than 50%). However, the basis is different than under the NFIA. This basis was altered after Hugo. The former system was based on building components that evidently excluded the foundation. The new system results in more frequent "wipe outs" (Hernandez, 1993).

Delaware, South Carolina, and North Carolina require that rebuilt habitable structures, i.e. those damaged beyond the state's substantial damage threshold, must be relocated to a point landward of the construction baseline or setback line, or to a point as far as landward as possible. In South Carolina, structures approved via special permit to be built seaward of the baseline must subsequently be relocated if a storm event or long-term erosion causes the structure to become located on the "active beach" (seaward of the beach escarpment or the first line of stable vegetation).

Virginia, however, has a unique relocation requirement designed to move structures before they interfere with public use of the wet-sand beach. The Barrier Island Policy of the state's Marine Resources Commission requires oceanfront property owners on barrier islands of the state to submit a relocation plan when the MHWL approaches to within 10 times the average annual erosion rate. The state cannot compel a property owner to move a structure until it is below the MHWL, but the plan requirement is designed to encourage relocation prior to that point (Frye, 1994). To date the policy has

been invoked in only three cases. One property owner has moved a structure further back on the same lot. Two others are developing plans.

In Michigan, a property owner must comply with all the requirements governing a new structure if an existing structure is damaged to the extent that it is declared a total loss for insurance purposes (§R 281.22 (15) Michigan Administrative Code). If the cost of restoring a damaged structure is more than 60% but less than 100% of its replacement value, the property owner may reconstruct the structure if damage was not caused by erosion, the rebuilt structure would be at least 20 feet landward of the erosion hazard baseline, and the reconstructed structure is "readily moveable." Structures sustaining damage of 60% or less of replacement value may be restored to their original condition.

South Carolina maintains a data base that contains the assessed value of each coastal property within the regulated coastal area and follows an explicit procedure for assessing structural damage. They do not rely on local building inspectors in any way to implement this program. Following a storm, a windshield survey is performed by department staff. Where the status of a structure is not obvious, one of several structural engineers on contract with the agency is called in to perform a detailed assessment.

Recent experience in Massachusetts illustrates the difficulties of enforcing state policies in a post-storm situation. In January 1992, following two severe storms in 1991, the Massachusetts Department of Environmental Protection (DEP) issued an official post-storm rebuilding guidance policy that was to be implemented through two existing regulatory programs that are primarily implemented by local governments: 1) the state wetlands law and 2) the state health code governing onsite sewage disposal systems (Massachusetts Department of Environmental Protection, 1992a). The state wetlands act regulates construction on beaches and dunes with the primary objective of preserving the ecologic and storm protection benefits of the beach and dune system. The law does not include any setback

provisions, but DEP will override a local wetlands act or sanitary sewage disposal system permit if the proposal calls for placing a non-elevated "solid structure" in a FEMA V-zone or A-zone on a barrier beach, coastal dune, or coastal beach (Massachusetts Department of Environmental Protection, 1992b).

The essence of the post-storm rebuilding policy is that structures substantially damaged by a storm must be rebuilt to current codes governing new structures. The state applies the FEMA damage threshold of 50% of pre-storm market value of the habitable structure. However, onsite sewage disposal systems sustaining any damage are generally required to be repaired or replaced with systems meeting current state health code standards.

Following the two 1991 storms it was anticipated that owners of 100 to 200 lots would not be able to rebuild in compliance with the policy (Benoit, 1993). However, the policy was not successfully implemented. The major problem was that many people initiated rebuilding immediately after the storm before local code enforcement officers could inspect and monitor what was going on. This led to great pressure to grant waivers for those people who did wait for permission. Although state agencies had authority to review any waivers granted to the state policies and applicable regulations, they did not have enough personnel to thoroughly review all the proposed waivers. The net result was that virtually all of the damaged structures were rebuilt, many in violation of the provisions of the state storm rebuilding policy.

Benoit reported that the state has convened a post-storm policy group and has also initiated action to codify the policy in the septic tank and wetlands regulations. Benoit feels the major deficiency in the policy was the lack of a two- to three-week rebuilding moratorium that would enable local officials to adequately inform property owners of the applicable rules governing rebuilding.

PLANNING AND REGULATORY MANDATES

Only two of the states we contacted reported use of state planning or regulatory mandates to accomplish explicit state storm hazard mitigation objectives. South Carolina uses a combination of mandates and economic incentives to encourage local governments to address storm hazard mitigation planning. They use the carrot of state funding for beach renourishment projects to encourage local governments to prepare beach management plans that address a variety of issues including zoning and land use controls in the area seaward of the state 40-year setback line, an analysis of beach erosion control alternatives, and post-disaster plans (§48-39-350 Code of Laws of South Carolina). The State Coastal Council is also empowered to impose and implement the State Comprehensive Beach Management Plan where local governments fail to establish and enforce a local plan.

North Carolina's Coastal Area Management Act of 1974 requires 20 designated coastal counties to prepare land use plans in conformance with guidelines promulgated by the state Coastal Resources Commission (CRC). These plans must be reviewed and approved by the CRC, and where a county refuses to prepare a plan, the Commission is directed by statute to prepare one for it. Municipalities within coastal counties have the option of preparing such plans. Plans must include a number of specific storm hazard mitigation policies and post-storm redevelopment policies (§T15A: 07B.0203(6) North Carolina Administrative Code). Permits are required for specific actions within several different "areas of environmental concern" (AECs) designated by the North Carolina CRC. Permits for major actions are administered by the CRC. Permits for minor actions may be administered by local governments that have approved land use plans.

ACQUISITION OF COASTAL PROPERTY

Two principal means of achieving storm hazard mitigation through land acquisition have been exercised

by the states: 1) fee-simple acquisition through Section 1362 of the National Flood Insurance Act; and 2) fee-simple acquisition using state funds. California's Coastal Conservancy has used several more innovative techniques including acquisition of less-than-fee property rights and a program to replatt and resell lands to achieve lower development densities.

STATE PROMOTION OF SECTION 1362 OF THE NFIP

Most states we contacted reported little participation in the Section 1362 program for reasons which are discussed in Chapter 3, namely low levels of federal funds available, lack of interest by individual property owners in selling their property, and reluctance by the state or local governments to assume title to the land. Two exceptions bear mention: 1) the Town of Scituate, Massachusetts and 2) Baytown, Texas.

Jeff Benoit, Director of the Massachusetts Coastal Management Program, related the history behind use of Section 1362 funds to acquire 10 parcels in Scituate, Massachusetts, and nearby areas following the Blizzard of 1978 (Benoit, 1993). Following the 1978 blizzard, FEMA initially approached the town about accepting title to several parcels. The town was not interested in owning disaggregated properties, in part because they did not want to create public access to their beaches. FEMA then approached the state and they willingly pursued the effort. This brought the town around - they preferred managing public coastal property themselves rather than having the state do it. Eventually, it was agreed that the state would accept title to the parcels, but the land would be managed under a joint program with the town. In recent years, management has been turned entirely over to the town.

Benoit also indicated that 1362 funds are being used to pursue purchase of another 9 or 10 parcels that were recently damaged by Hurricane Emily. Evidently part of the reason for successful application of the 1362 program in the state has been active promotion by the regional FEMA office located in

Boston.

Section 1362 funds were also used in Baytown, Texas, following Hurricane Alicia in 1983, to remove storm-prone property from the real-estate market (Godschalk, Brower, and Beatley, 1989). A total of 177 damaged homes within the Brownwood subdivision were purchased with about $550,000 and turned over to the City of Baytown to manage as a city park and open space. In this case, the city took the initiative to use the 1362 funds. However, an additional 120 structures within the subdivision were not acquired using the 1362 funds either because they were not covered by federal flood insurance, and therefore not eligible, or because owners refused to sell. Two hundred undeveloped parcels within the subdivision also remained in private ownership following the storm. By 1987, however, the city had managed to acquire all but about 55 vacant lots and 40 developed parcels.

Baytown prevented rebuilding in the subdivision by refusing to rebuild the public sewer and water system and requiring that damaged structures be built to comply with FEMA V-zone elevation standards. Godschalk, Brower, and Beatley do not describe any direct state participation in the Baytown case other than actively enforcing the state Open Beaches Act which prohibits construction between the mean low tide line and the natural vegetation line.

The National Flood Insurance Reform Act of 1993 (S.1405), sponsored by Senator John Kerrey of Massachusetts, would repeal Section 1362. However, similar initiatives would be possible through a newly created funding program for state and local mitigation activities under Title IV of the act, the State and Community Mitigation and Assistance Program. The federal share of such initiatives would be 75%, rather than 100% under Section 1362.

STATE-FUNDED COASTAL LAND ACQUISITION PROGRAMS

None of the states we contacted currently has a publicly-funded land acquisition program explicitly

designed to achieve storm hazard mitigation objectives. Those states that do have coastal land acquisition programs (California, Massachusetts, North Carolina) tend to target lands intended to increase public access to the shore or to protect specific natural features such as dunes or wetlands.

North Carolina

North Carolina initiated its Coastal and Estuarine Water Beach Access Program in 1981 to acquire shorefront property along the Atlantic Ocean and estuarine waters of the state to increase public access to beaches. According to Owens (1985) a secondary objective was to provide a means of buying out property owners whose lots were rendered undevelopable by the state regulations imposing construction setbacks in areas subject to coastal erosion.

Under the North Carolina program, priority for acquisition was to be given to "lands which, due to adverse effects of coastal natural hazards, such as past and potential erosion, flooding and storm damage, are unsuitable for the placement of permanent structures, including lands for which a permit for improvements has been denied under rules adopted pursuant to State law" (§113A-134.3 North Carolina General Statutes). Letters were sent to some 500 property owners with potentially unbuildable lots, but the Division of Coastal Management was subsequently directed to stop promoting the program after several property owners contacted the Governor's Office arguing that their property had been unjustly confiscated (Owens, 1991). Shaw (1993) reported that the state has not actively promoted this program since the original solicitation. Some offers were evidently made by the state following the initial solicitation but they generated little interest because the price offered was too low.

Massachusetts

The Massachusetts Coastal Management Office has tried unsuccessfully to promote legislation that would create a state post-storm acquisition fund analogous to Section 1362 (Benoit, 1993). The most recent draft would authorize the state Department of Capital Planning and Operations to acquire fee-

simple title to property from willing sellers that is located in areas subject to coastal or riverine flooding and on which buildings are or were located that have been substantially and repeatedly damaged by severe weather. State acquisition is to be funded through bond sales. Acquired parcels may be managed by local governments under agreements with the state.

California

Land acquisition efforts of the California Coastal Conservancy have been directed towards 1) public beach access; 2) protecting and restoring wetlands, estuaries, open space, and watersheds; and 3), to a lesser, extent, preservation of prime coastal farmlands (Grenell, 1993). A large number of their coastal acquisition projects have been multi-purpose projects that combined objectives of flood control with wetlands preservation, however, storm hazard mitigation has never been a major criterion in selecting or ranking projects.

The Conservancy has used several less-than-fee techniques (Grenell, 1993). Easements on coastal parcels have been acquired primarily to preserve farmland and to allow public access to the shore. In one case along the San Mateo coast, the Conservancy purchased 1300 acres of coastal property in fee-simple. They transferred the lands to a nonprofit organization which is now reselling the upland portion (about 1270 acres) with restrictions limiting land use to agriculture. The remaining land is being held in fee to provide open space, public access to two beaches, and a link to a regional trail network. In another case, where several parcels were being purchased to preserve a beach and dune habitat system, one owner wanted to retain the underlying title, so the CCC purchased a conservation easement to preserve a dune and freshwater pond system.

The Conservancy has used a form of transfer of development rights (TDR) to achieve two objectives in the Malibu and Santa Monica mountains region: 1) remove substandard lots from the development market; and 2) allow development of more appropriate lots without increasing the total residential

development potential of the area (Grenell, 1989). The program is coupled with regulations that require purchase of "development credits" prior to approval of new subdivisions and, therefore, is a hybrid policy instrument that spans regulation, land acquisition, and economic incentives.

Development credits can be obtained in two ways. First, a would-be developer can purchase development credits directly from the owner of an undeveloped lot in the area where the state wishes to preclude development of marginal land. The second option, which has been used the most in practice, has been for the Conservancy or a nonprofit land trust to purchase the marginal lots, impose development restrictions on them through easements or other means, and then sell the development credits to would-be developers for other subdivisions. The lots with retired development credits are then disposed of in several ways including sale to adjacent property owners to enlarge their side yards and conveyance to a private nonprofit organization or public agency for management as open space or park land.

Another technique used by the California Conservancy has been to purchase undeveloped, subdivided land and resubdivide it at a lower density. In a sense, this amounts to purchasing the development rights represented by the higher density of the original subdivision. According to Grenell (1993), the current issue is whether to have the Conservancy continue in a similar role on a larger scale statewide, i.e. go beyond the demonstration projects to a long-term program. This would require major funding, e.g. a state bond issue.

The California Conservancy has also encountered the problem of managing isolated parcels of land. Grenell reports that they generally have been unsuccessful in convincing local governments to assume management responsibilities for these parcels. They typically seek out a nonprofit organization instead.

DEVELOPMENT OF CAPITAL FACILITIES AND INFRASTRUCTURE

STATE COASTAL INFRASTRUCTURE POLICIES

Massachusetts is the only state besides Florida to our knowledge that has a state policy limiting state investment in growth-inducing infrastructure in coastal areas subject to storm damage. North Carolina and South Carolina restrict the placement of public infrastructure under their construction setback programs, but the setback zones are so narrow that they rarely affect major utilities such as water and sewer lines. The most frequently affected public structures are roads.

Massachusetts led the way on coastal barrier infrastructure policy with an executive order in 1980 that predated the Federal Coastal Barrier Resources Act (CBRA) by two years and Florida's E.O. 81-105 by one year. The order prohibits the expenditure of state discretionary funds for sewers, water supply, and other projects, including such things as elderly housing and redevelopment projects, in areas designated as barrier beaches. Benoit (1993) reports that the state's definition of coastal barriers differs somewhat from that in CBRA, but only at the margins, i.e. there are a few CBRA units that do not qualify as state coastal barriers and a few state areas that do not qualify as CBRS units.

Implementation of the Massachusetts E.O. is coordinated by the State Coastal Management Program - they interpret the application of the E.O. and take the heat. They initially established memoranda of agreement with applicable state agencies and also published guidelines for the agencies to use in implementing the E.O. Benoit reports that the program has run smoothly through three gubernatorial administrations. While some formal evaluation was done early on, none has been performed recently.

Several years ago, the state contracted with Stephen Leatherman to develop maps depicting average annual erosion rates for coastal lands. They plan to incorporate these data in a geographic information system (GIS) system that will also include FEMA V-zones and barrier beach boundaries. Benoit

anticipates that this integrated GIS data base may serve to support a new executive order that extends the state's infrastructure policy to other coastal high hazard areas beyond barrier islands.

BEACH RESTORATION PROGRAMS

Beach restoration and renourishment programs represent another form of coastal infrastructure, in this case, however, investments are made to restore the recreational benefits afforded by beaches and to reduce the vulnerability of upland property to storm damage by enhancing the protective value of the beach and dune system. Only Delaware identified its beach restoration program as a component of its overall storm hazard mitigation policies.

Delaware's coastal management program recently completed an analysis of options for contending with coastal erosion entitled Beaches 2000 (Beaches 2000 Planning Group, 1988). The report analyzed three options: 1) retreat; 2) armoring; and 3) beach nourishment. The state dismissed armoring except for extreme individual cases. Primary emphasis is on beach restoration and nourishment, but implementation has been limited to some extent by funding constraints. Retreat is seen as the ultimate strategy, but specific mechanisms have evidently not been articulated.

The Beaches 2000 report was accompanied by an economic analysis of the distribution of benefits from beach restoration and renourishment projects. On the basis of that analysis, the coastal program staff recommended a 90%/10% local/state cost-share formula. However, subsequent bonding legislation for a state initiative included a provision for a 50%/50% formula for one particular community, so the Governor's policy has been to use a the latter formula throughout the state. Meanwhile, the State Legislature passed an increase in the accommodations (hotel/motel) tax and dedicated those funds to paying the local share. As currently operated, local governments front their 50% share and then get paid back from revenues from the accommodations tax. The net result is that the storm protection and recreational benefits of the beach to local property owners are subsidized by

other state residents.

ECONOMIC INCENTIVES

Two forms of economic incentives to private property owners were identified by some of the states we contacted: 1) promotion of the Upton-Jones provisions of the national Flood Insurance Program; and 2) provision of tax relief for donation of property rights to coastal land.

UPTON-JONES PROVISIONS OF THE NATIONAL FLOOD INSURANCE PROGRAM

One of the principal post-storm redevelopment incentives available is the option for holders of federal flood insurance policies to relocate or demolish their insured structures using insurance payments. This Upton-Jones program may be administered directly by FEMA or the state can become involved by certifying structures as subject to "imminent collapse" and, therefore, eligible for the Upton-Jones program.

Michigan and North Carolina are the only states we contacted that actively promote Upton-Jones. Michigan operated a program from 1985-1986 that preceded Upton-Jones and served as a partial model for it. North Carolina was also active in promoting the national program: Congressman Upton is from Michigan; Jones is from North Carolina. The Michigan program was operated with surplus state funds left-over from the match for a Corps of Engineers high water diking project. The state provided emergency loans to property owners along the Great Lakes shoreline to relocate or elevate imminently endangered structures. Once the funds were allocated, the program was discontinued.

According to Martin Janereth with the state's Department of Natural Resources, while property owners are generally aware of the federal program, they typically are not sufficiently familiar with the details to make decisions without additional information (Janereth, 1993). The state is authorized by FEMA

to certify structures as subject to imminent collapse. They use the NFIA criteria rather than conventional condemnation standards. Once the state has certified a structure they send the certification to the insured property owner. It is the insured who must take the initiative to obtain compensation for relocation or demolition under their flood insurance policy. The state does not formally track outcomes, but Janereth said there are numerous instances where insureds do not follow through with a claim.

Richard Shaw of the North Carolina Division of Coastal Management reported that North Carolina has been vary aggressive in promoting Upton-Jones through distribution of public information and through work of Sea Grant extension agents conferring with individual property owners (Shaw, 1993). The Division of Coastal Management is authorized by FEMA to certify structures as subject to imminent collapse. Their staff use both the FEMA criteria for defining imminent collapse (i.e. within some minimum distance of the natural vegetation line or the normal high tide line) as well as conventional condemnation criteria. The state has not arranged for any local governments to become authorized to certify structures.

As in Michigan, once the state certifies a structure as subject to imminent collapse, property owners must take the initiative through their insurance carrier to obtain compensation. In Dare County (Nags Head area) which is subject to high levels of annual erosion, 70% of the processed claims have been for demolition rather than relocation. Following Hurricane Hugo, some 300 to 400 applications for certification were processed. However, relatively few property owners subsequently sought Upton-Jones payments. Shaw suggested that many changed their minds when local governments initiated beach bulldozing and dune rebuilding. (This is the maximum permitted under state law governing post-storm conditions, i.e. major beach restoration projects require long lead times and shoreline armoring is not permitted.)

Benoit (1993) indicated that the major impediment Massachusetts has encountered with implementing Upton-Jones has been the reluctance of local building inspectors to condemn structures that were still habitable, i.e. the condemnation threshold under Upton-Jones is much lower than that traditionally used by building inspectors. Benoit said he also had the impression that a number of property owners had been put off by long delays in the administrative process involved.

According to Anthony Pratt of the Delaware Department of Natural Resources and Environmental Control, the built-out condition of Delaware's coast has been an impediment to participation in the Upton-Jones program (Pratt, 1993). Relocation is unattractive because open lots are several blocks from the beach and represent a major loss of both use value and market value. Property owners therefore are inclined to stay on their oceanfront lots as long as is possible.

The State and Community Mitigation and Assistance Program, which would be established under National Flood Insurance Reform Act sponsored by Senator Kerrey would also replace the Upton-Jones program for making advance payments for relocation or demolition of imminently endangered structures. Here again, funding would be split 75%/25% between the federal government and the state or local government. Apparently one reason for this change is that most Upton-Jones claims have been submitted for demolition rather than relocation (Metzger et al., 1993). Demolition payments can be for 110% of the insured value of the structure while relocation payments cannot exceed 40%. Thus local or state governments would apparently have to bear some of the costs of relocation or demolition.

TAX INCENTIVES

North Carolina has provided credits against individual and corporate income taxes as an inducement for property owners to convey real property to the state, a local government, or a nonprofit organization for a variety of purposes including public beach access (Shaw, 1993). Property owners can obtain a tax credit of 25% of the market value of the property up to a limit of $25,000. The credit

may be applied against tax liability over a period of five years. The conveyance can include fee-simple title or less-than-fee interests such as conservation easements. The state has acquired fewer than 6 coastal parcels by this method. The parcels are not actively managed and essentially provide informal public access. Shaw said this has not been aggressively promoted; most of the cases arose because property owners approached the state wanting to sell their land under the beach access acquisition program, i.e. they were not aware of the tax concession opportunity. The properties have been unsuited for developed beach access facilities, but the state has offered the alternative of the tax concession.

INFORMATION AND EDUCATION

We did not pursue in detail all of the technical assistance and public education initiatives of the various states we contacted. Two states, Delaware and North Carolina, mentioned specific technical assistance efforts they have or plan to undertake that are focused on storm hazard mitigation. These are summarized here.

The principal policy instrument we explored is the concept of a natural hazard disclosure requirement. Strategies applying this concept have varied. California has an earthquake hazard disclosure requirement tied to real estate transactions. Massachusetts has proposed a similar requirement for formal notification of prospective purchasers of property subject to coastal hazards. North Carolina and South Carolina have notification requirements tied to their coastal construction permitting programs. These go beyond the current practice in Florida which is limited to the convening of public hearings prior to setting Coastal Construction Control Lines (CCCLs) and procedures for recording the location of the CCCL with affected local governments.

STORM HAZARD MITIGATION TECHNICAL ASSISTANCE

In its 1984 guidelines for local government coastal comprehensive plans, the North Carolina Coastal Resources Commission requires plans to include both pre-storm and post-storm mitigation planning components. The state does not have any leverage over subsequent implementation, nor does it actively monitor such activity. However, the state has provided financial and technical assistance under its program for local coastal planning and management grants, to 5 to 10 communities who wished to develop such plans (Shaw, 1993). One example is the Nags Head post-storm redevelopment plan which has received national recognition.

Delaware is also developing a state storm hazard mitigation program that will include both technical and financial assistance. Using federal funds available under the 1990 amendments of the Coastal Zone Management Act, the state plans to hire a coastal engineer in 1995 to perform storm hazard risk analyses for each coastal community based on an inventory and analysis of individual structures and infrastructure. Based on this analysis, the engineer will prepare a strategy for each community designed to upgrade design and construction of individual public facilities and private structures. No specific plans have been made for how these plans will subsequently be implemented, but the state plans to attempt to come up with some state money to help finance the improvements (Pratt, 1993).

EARTHQUAKE HAZARD DISCLOSURE

Berke and Beatley (1993a) report on a real estate reporting requirement in California established by the Alquist-Priolo Special Studies Zone Act. An analysis of the effectiveness of this measure by Palm (1981) concluded that it had little effect on prospective home buyers' decisions. This was attributed in part to the imprecision of the information provided and the late stage in the real estate transaction process at which it was provided. Real estate agents or individuals selling property within the Alquist-Priolo fault zone were required to disclose the fact that the property was within the zone. Apparently the disclosure could simply take the form of a statement in the purchase contract that the property

was in the Alquist-Priolo Zone. The disclosure was not made until the prospective purchaser had already made a commitment to buy the property.

THE MASSACHUSETTS PROPOSAL

The Massachusetts Coastal Management Program has sponsored state legislation requiring notification of prospective purchasers of residential real estate of coastal flooding and erosion hazards by sellers and real estate agents. It is designed to avoid the shortcomings of the Alquist-Priolo Act. The notice is to include copies of applicable flood insurance rate maps, flood hazard boundary maps, and state shoreline erosion maps, and is to be provided prior to the signing of a purchase agreement. If the notice is not provided at least 10 days prior to signing the purchase agreement, the prospective purchaser can rescind the purchase agreement within 10 days of receiving the notice. Sellers or real estate agents who fail to comply can be held liable for ensuing flooding or erosion damage. According to Jeff Benoit, Director of the Massachusetts Coastal Management Program, no action has been taken on this bill as yet (Benoit, 1993).

NOTICE TIED TO COASTAL CONSTRUCTION REGULATORY ZONES

South Carolina has statutory provisions which require that a disclosure statement be included in all real estate transactions located in whole or in part seaward of the state setback line. The disclosure must state that the property is or may be affected by the setback line and baseline record and must include the local erosion rate as established by the State Coastal Council (§48-39-330 Code of Laws of South Carolina). This serves as notice to property owners that they are subject to regulation as well as alerting them to the nature of the erosion hazard they face (Hernandez, 1993).

North Carolina's regulations governing permits for development activities in "Ocean Hazard Areas" (§T15A: 07H.0306(j) North Carolina Administrative Code) require the state's Coastal Resources Commission (CRC) to obtain written acknowledgement from the permit applicant of their awareness

of the risks associated with developing on the proposed site and the limited suitability of the site for permanent structures. This provision appears to have been intended at least in part to limit the liability of the CRC.

CHAPTER 6

FINDINGS, CONCLUSIONS, AND POLICY OPTIONS

INTRODUCTION

Our purpose in this final chapter is to bring together the separate parts of the discussion and analysis to arrive at a set of options available to the state for achieving storm hazard mitigation policy objectives. This final chapter is written to be able to stand alone; i.e., it can be read in conjunction with the introductory chapter to this report for a relatively complete picture of our approach and findings. However, the chapters intermediate to the first and last contain significant details, insights, and findings that support our conclusions and which the interested reader may wish to pursue.

The chapter is organized around a number of themes. We begin with a review of the array of policy instruments as they are implemented within the state by various levels of government and how they contribute to the state's several goals and objectives for mitigating coastal storm hazards. We then assess the constraints to effecting changes in current policies, followed by an analysis of the gaps and deficiencies in current policies and a presentation of options for new state policy initiatives. We conclude with a discussion of how the several options can be configured to achieve various levels of reform that balance the state's three goals of protecting coastal environmental resources, protecting life and property, and minimizing the public costs of storm damage.

SUMMARY OF CURRENT POLICY INSTRUMENTS

Tables 6.1 and 6.2 present an overview of how federal, state, and local policies and programs operating within the State of Florida contribute to the achievement of the state's storm hazard mitigation policy goals and objectives. Table 6.1 is a matrix of policy instruments and goals and

objectives into which each of the specific programs, mechanisms, and means discussed within the body of the report is included. Table 6.1 organizes the current policy efforts extant within the state and provides a basis for perceiving which policy objectives are most heavily served and which policy instruments are most broadly applied. Table 6.2 parallels Table 6.1 but is organized by policy instruments and implementing jurisdiction. This table illustrates the roles of the three levels of government jurisdiction in implementing the different policy instruments that can contribute to achieving state policy goals and objectives for storm hazard mitigation.

In the following sections, we discuss how specific local, state, and federal policies within each of the policy instrument categories can or does contribute to achieving specific storm hazard mitigation goals and objectives.

REGULATION OF CONSTRUCTION AND SITE DEVELOPMENT

Policies and programs governing construction and site development in areas subject to coastal storm damage include the state's regulations governing construction above and below the mean high water line along open sandy shores of the state, state regulation of dredge and fill activities within state coastal waters, state regulation of onsite sewage disposal systems, and local building codes governing construction of habitable structures within the Coastal Building Zone and federally designated flood and velocity zones. These policy instruments contribute to all of the state's storm hazard policy objectives listed in Table 6.1 except "allocate public costs to private sector by risk."

The state's regulations governing structures below the mean high water line (MHWL), which are administered by the Department of Environmental Protection (DEP), Division of Beaches and Shores (DBS) under §161.041 FS, restrict the use of coastal armoring (seawalls, revetments, etc.) to protect upland structures from erosion and storm damage because of the potential impacts such structures can have on long-term maintenance of the beach and dune system. They strike a balance between the

Table 6.1: State Storm Hazard Mitigation Policy Instruments, Goals, and Objectives Matrix

Policy Instruments	Protect Coastal Environmental Resources: Preserve Natural Storm Protection Features	Protect Coastal Environmental Resources: Alter the Coastal Environment	Protect Life and Property: Reduce Vulnerability of Buildings & Facilities	Protect Life and Property: Manage Development to Minimize Threats
Regulation				
Regulation of construction and site development	- Coastal armoring permits - CCCL permits - 50-ft. setback permits - 30-year setback - Dredge & fill permits	- Coastal armoring permits	- CCCL permits - 50-ft setback permits - Local building codes	- CCCL permits - 50-ft setback permits - 30-year setback - Onsite sewage permits - Dredge & fill permits
Regulation of land use	- Local land development regulations - State ACSC land development regulations	- Local land development regulations - State ACSC land development regulations	- N/A	- Local land development regulations - State ACSC land development regulations
Mandates				
Planning mandates	- Protect coastal wetlands - Protect and restore beaches and dunes - Coastal land acquisition & ranking system - §409 state hazard mitigation plans - DRA state hazard mitigation plans	- §409 DRA hazard mitigation plans - DRA state hazard mitigation plans	- §409 DRA hazard mitigation plans - DRA state hazard mitigation plans	- Designate CHHA - Limit development in CHHA - Relocate infrastructure away from CHHA - Limit public expenditures in CHHA - Direct population away from CHHA - Adopt hazard mitigation policies - Prepare post-storm redevelopment plan - Identify regulatory techniques for post-storm redevelopment - Coastal land acquisition & ranking system - §409 DRA hazard mitigation plans - DRA state hazard mitigation plans
Regulatory mandates	- N/A	- N/A	- Coastal Building Zone codes - State minimum building code	- N/A
Investment				
Acquisition of coastal property	- §1362, NFIA - CCCL takings purchases - CARL - FCT - Less-than-fee acquisition	- N/A	- N/A	- §1362, NFIA - CCCL takings purchases - CARL - FCT - Less-than-fee acquisition

(continued)

Policy Instruments	Protect Coastal Environmental Resources: Preserve Natural Storm Protection Features	Protect Coastal Environmental Resources: Alter the Coastal Environment	Protect Life and Property: Reduce Vulnerability of Buildings & Facilities	Protect Life and Property: Manage Development to Minimize Threats
Development of capital facilities and infrastructure	- Federal/state/local beach erosion control	- Federal/state/local beach erosion control	- N/A	- E.O. 81-105 - Barrier island bridge policy - CHHA infrastructure policy - CBRA
Incentives				
Economic incentives	- Upton-Jones, NFIA - Property tax concessions for less-than-fee rights - CRS, NFIA - §1362, NFIA - §404 DRA hazard mitigation grants - FCT land acquisition matching grants - Federal & state beach erosion control assistance	- CRS, NFIA - §404 DRA hazard mitigation grants - Federal & state beach erosion control assistance	- NFIA building codes - CRS, NFIA - DRA public assistance program - DRA §404 hazard mitigation grants	- Upton-Jones, NFIA - Property tax concessions for less-than-fee rights - Local TDR programs - CRS, NFIA - §1362, NFIA - DRA public assistance program - §404 DRA hazard mitigation grants - FCT land acquisition matching grants
Education and information	- DCA facilitation of local government acquisition of coastal lands - DBS Beach Mgmt Plan	- DBS Beach Management Plan	- DCA training for building inspectors - DCA deemed-to-comply manual	- NFIA lender notice - CCCL public notice

(continued)

Policy Instruments	Minimize Public Costs of Storm Damage: Manage Development to Minimize Costs	Minimize Public Costs of Storm Damage: Reduce Vulnerability of Public Infrastructure	Minimize Public Costs of Storm Damage: Allocate Public Costs to Private Sector by Risk
Regulation			
Regulation of construction and site development	- CCCL permits - 50-foot setback permits - 30-year setback - Onsite sewage permits - Dredge & fill permits	- Coastal armoring permits	- N/A
Regulation of land use	- Local land development regulations - State ACSC land development regulations	- Local land development regulations - State ACSC land development regulations	- N/A
Mandates			
Planning mandates	- Designate CHHA - Limit development in CHHA - Relocate infrastructure away from CHHA - Limit public expenditures in CHHA - Direct population from CHHA - Adopt hazard mitigation policies - Prepare post-storm redevelopment plan - Identify regulatory techniques for post-storm redevelopment - Coastal land acquisition & ranking system - §409 DRA hazard mitigation plan - DRA state hazard mitigation plan	- Designate CHHA - Limit development in CHHA - Relocate infrastructure away from CHHA - Limit public expenditures in CHHA - Direct population from CHHA - Adopt hazard mitigation policies - Prepare post-storm redevelopment plan - Identify regulatory techniques for post-storm redevelopment - Coastal land acquisition & ranking system - §409 DRA hazard mitigation plan - DRA state hazard mitigation plan	- N/A
Regulatory mandates	- N/A	- N/A	- N/A
Investment			
Acquisition of coastal property	- §1362, NFIA - CCCL takings purchases - CARL - FCT - Less-than-fee acquisition	- CARL - FCT - Less-than-fee acquisition	- N/A

(continued)

Policy Instruments	Minimize Public Costs of Storm Damage: Manage Development to Minimize Costs	Minimize Public Costs of Storm Damage: Reduce Vulnerability of Public Infrastructure	Minimize Public Costs of Storm Damage: Allocate Public Costs to Private Sector by Risk
Development of capital facilities and infrastructure	- E.O. 81-105 - Barrier island bridge policy - CHHA infrastructure policy - CBRA	- Federal/state/local beach erosion control - E.O. 81-105 - CHHA infrastructure policy	- Local beach preservation districts- - E.O. 81-105 - Barrier island bridge policy - CHHA infrastructure policy - CBRA
Incentives			
Economic incentives	- Upton-Jones, NFIA - Property tax concessions for less-than-fee rights - Local TDR programs - CRS, NFIA - §1362, NFIA - DRA public assistance program - §404 DRA hazard mitigation grants - FCT land acquisition matching grants	- Property tax concessions for less-than-fee rights - Local TDR programs - CRS, NFIA - DRA public assistance program - §404 DRA hazard mitigation grants - Hurricane Catastrophe Fund grants - EMPAT Fund grants	- N/A
Education and information	- NFIA lender notice - CCCL public notice	- DBS Beach Management Plan	- N/A

Key to Abbreviations

ACSC = Area of Critical State Concern

CARL = Conservation and Recreation Lands Program

CBRA = Federal Coastal Barrier Resources Act

CCCL = Coastal Construction Control Line

CHHA = Coastal High Hazard Area

CRS = Community Rating System

DBS = Florida Division of Beaches and Shores

DRA = Federal Disaster Relief Act (Stafford Act)

EMPAT = Emergency Management, Preparedness and Assistance Act

E.O. = Executive Order

FCT = Florida Communities Trust

N/A = Not Applicable

NFIA = National Flood Insurance Act

TDR = Transfer of Development Rights

Table 6.2: Coastal Storm Hazard Mitigation Policy Implementation Matrix

	Regulation		Mandates	
Implementing Jurisdiction	Construction and Site development	Land Use	Planning	Regulatory
State	- Coastal armoring permits - CCCL permits - 50-ft. setback permits - 30-year setback - Dredge & fill permits	- State ACSC land development regulations	- N/A	- N/A
State/Federal	- N/A	- N/A	- DRA state hazard mitigation plans - §409 DRA hazard mitigation plans	- N/A
State/Local	- Onsite sewage permits	- N/A	- Designate CHHA - Limit development in CHHA - Relocate infrastructure away from CHHA - Limit public expenditures in CHHA - Direct population away from CHHA - Adopt hazard mitigation policies - Prepare post-storm redevelopment plan - Identify regulatory techniques for post-storm redevelopment - Coastal land acquisition & ranking system - Protect coastal wetlands - Protect and restore beaches and dunes	- Coastal Building Zone codes - State minimum building code
State/Federal/Local	- N/A	- N/A	- N/A	- N/A
Local	- Local land development regulations	- Local land development regulations	- N/A	- N/A
Local/Federal	- N/A	- N/A	- N/A	- N/A
Federal	- N/A	- N/A	- N/A	- N/A

(continued)

Implementing Jurisdiction	Investments: Acquisition of Coastal Property	Investments: Development of Capital Facilities & Infrastructure	Incentives: Economic	Incentives: Education & Information
State	- CARL Program - FCT - CCCL takings purchases	- E.O. 81-105 - Barrier island bridge policy	- N/A	- CCCL public notice
State/Federal	- N/A	- N/A	- Upton-Jones, NFIA	- N/A
State/Local	- Less-than-fee acquisition	- CHHA infrastructure policy	- Property tax concessions for less-than-fee rights - FCT land acquisition matching grants - Hurricane Catastrophe Fund grants - EMPAT Fund grants	- DCA training for building inspectors - DCA deemed-to-comply manual - DBS beach management plan - DCA facilitation of local land acquisition
State/Federal/Local	- §1362, NFIA	- Beach erosion control projects	- §1362, NFIA - §404 DRA Hazard mitigation grants - DRA public assistance program	- N/A
Local	- Local land acquisition programs	- Local coastal infrastructure policies - Local beach preservation districts	- Local TDR programs	- N/A
Local/Federal	- N/A	- N/A	- CRS, NFIA	- N/A
Federal	- N/A	- CBRA	- N/A	- NFIA lender notice

Key to Abbreviations

ACSC = Area of Critical State Concern

CARL = Conservation and Recreation Lands Program

CBRA = Federal Coastal Barrier Resources Act

CCCL = Coastal Construction Control Line

CHHA = Coastal High Hazard Area

CRS = Community Rating System

DBS = Florida Division of Beaches and Shores

DRA = Federal Disaster Relief Act (Stafford Act)

EMPAT = Emergency Management, Preparedness and Assistance Act

E.O. = Executive Order

FCT = Florida Communities Trust

N/A = Not Applicable

NFIA = National Flood Insurance Act

TDR = Transfer of Development Rights

state's policy objectives of preserving the natural storm protection features of the coastal environment and altering the coastal environment to protect private property and public facilities and infrastructure.

The state's regulations governing coastal construction above the MHWL, including the CCCL and 50-foot setback permitting programs and the 30-year setback (§§161.052 and .053 FS), also contribute to maintaining the natural storm protection attributes of the beach and dune system by requiring that structures not interfere with natural shoreline fluctuations or the ability of the natural system to recover from storm-induced erosion. The storm buffering value of coastal wetlands is protected through the state's dredge and fill regulations (Part VIII, Chapter 403 FS).

The CCCL and 50-foot setback permitting programs and the 30-year setback also reduce the vulnerability of buildings and facilities through location and construction standards. The Interagency Hazard Mitigation Team Report on Hurricane Andrew (United States Federal Emergency Management Agency, 1992) reports that structures built to these standards on Key Biscayne suffered little or no damage. Parallel standards are required to be enforced through local building codes under the Coastal Zone Protection Act of 1985 within a Coastal Building Zone which covers an area that extends further landward than that defined by the state CCCL and includes areas subject to storm hazards that do not have sandy shorelines (Chapter 161, Part III, FS). As is discussed more fully in the section on gaps and opportunities, these local building codes are not uniform nor are they consistently enforced. Many are less stringent than the construction standards imposed under the state's coastal construction permitting programs.

The 30-year erosion setback that is imposed on structures regulated within the CCCL zone, can serve to reduce the threats to people and property from storm damage by ensuring a substantial distance separates habitable structures from the MHWL. State regulations governing onsite sewage disposal systems, which are administered by the Department of Health and Rehabilitative Services (HRS) in

cooperation with local governments under §381.0065 FS, may also help reduce the vulnerability of people and property to storm damage by restricting how shoreline property is developed or redeveloped. While the primary intent is to protect coastal water quality, the requirements for minimum lot size, setback from the MHWL, and vertical separation from ground water, combined with DEP limits on dredging and filling surface waters of the state and state restrictions on building on sovereign tidal lands, help to limit construction of habitable structures or post-storm reconstruction on the immediate shore.

In areas with a nonsandy shore on open or interior coastal waters, which are not covered by 30-year erosion setback requirements, these regulations are the major constraint to building at the water's edge. Their strict enforcement in Taylor, Dixie, and Levy counties following the March 1993 storm has prevented rebuilding on some 97 parcels. Nonetheless, these regulations do not necessarily prevent a property owner from building a habitable structure closer to the shore than a septic system, nor do they have any influence in areas served by public sewers other than to preclude building a habitable structure below the MHWL.

These several regulatory programs will also contribute to the objective of minimizing public costs of planning for, responding to, and mitigating coastal storms in two ways: 1) by reducing the level of damage likely to be sustained by private structures in areas subject to coastal storm damage (due to construction design standards, setbacks, and preservation of the natural protective features of the coastal environment); and 2) by limiting the absolute numbers of people and private structures exposed (where development is absolutely precluded on a given parcel).

Effectively enforced design and construction standards for wind load and flood elevation of habitable structures reduce the number of people requiring emergency food and shelter services, the number of permit applications that must be administered for post-storm reconstruction, and the amount of

property destruction and resultant debris removal costs incurred by local and state governments. Where coastal construction regulations result in lower development densities, they may reduce costs of local and state disaster response and recovery activities including evacuation, shelter, public safety protection measures, small business bridge loan programs, and debris removal. Lower development densities and greater setbacks within areas subject to coastal storm damage may also result in reduced vulnerability of public infrastructure (roads, water and sewer systems) that is maintained to serve residential and commercial land uses.

While all of these regulations apply to new development, post-storm conditions may provide an opportunity to apply them to nonconforming properties or structures that may have been grandfathered when the applicable statutes were adopted. Several of the state's storm hazard policies and programs specifically apply to post-storm redevelopment circumstances. Most are linked to some threshold of "substantial damage" or "substantial improvement."

The state's coastal armoring regulations require that erosion control structures that no longer function as designed must be reconstructed in conformance with current standards. If changes in the beach profile or shape cause an erosion control structure to interfere with natural sand movement, DBS can require redesign, relocation, or removal of the structure. Section 161.061 FS also permits DBS to declare any structure below the MHWL a nuisance and require its alteration or removal.

Under building codes adopted pursuant to the National Flood Insurance Act and the state Coastal Zone Protection Act of 1985, local governments can require conformance with construction standards for new structures when existing habitable structures are substantially damaged (damage exceeds 50% of market value). The damage threshold for requiring conformance of rebuilt structures with state construction standards is considerably higher. DBS is authorized to require nonconforming structures to meet the state construction and setback standards for new structures under the CCCL and 50-foot

setback permit programs only where post-storm reconstruction involves major repair or modification of the original foundation. This significantly limits opportunities to substantially reduce the vulnerability of habitable structures that were originally built prior to the effective date of the CCCL and 50-foot setback permit programs.

REGULATION OF LAND USE

Land development regulations (LDRs) adopted by local or state government can potentially contribute to all of the state's storm hazard mitigation policy objectives. Regulations which limit the types and density of land uses in areas prone to coastal storm damage can minimize the number of people, the amount of private property, and the amount of public infrastructure put at risk. Such limits in turn will reduce the public costs of planning for, responding to, and mitigating storm damage. LDRs can also minimize the likelihood that the natural storm protection features of the coastal environment will be impaired by incompatible land uses. Where LDRs impose special requirements necessary to minimize the risks of damage from coastal storms and these requirements raise the costs of development in areas prone to coastal storm damage, they contribute to the objective of internalizing the public costs of storm damage in proportion to the risks taken by private developers and property owners.

Regulation of land use is almost entirely a function of local governments who have the authority to restrict types of land uses and the density of development through promulgation of local LDRs such as zoning and subdivision ordinances. The state does not directly regulate land use except under limited circumstances where a local government fails to adopt LDRs consistent with development guidelines developed by the state for designated Areas of Critical State Concern.

The state does not statutorily mandate adoption of specific local LDRs, but it indirectly influences the content of local LDRs governing coastal land use through the planning mandates concerning storm hazard mitigation that are set forth in Chapter 163 FS and Chapter 9J-5 FAC and through its limited

authority to review LDRs that are challenged as being inconsistent with the approved comprehensive plan. However, the state does not have authority to review local LDRs as a set for the purposes of mandating or suggesting changes that would make the regulations more effective. Thus, localities may avoid serious regulation of coastal land use by virtue of local regulations that are consistent with the local plan, but which are problematic in design, administration, or impact.

PLANNING MANDATES

Chapter 163 FS and Chapter 9J-5 FAC set forth specific requirements for local comprehensive plans that address storm hazard mitigation policy objectives. Planning requirements targeted at protecting coastal wetlands, beaches, and dunes contribute to the objective of preserving the natural storm protection features of the coastal environment. As shown in Table 6.1, most of the planning requirements for the coastal elements of local comprehensive plans have the potential to influence the development process and thereby minimize both the threats to public safety and private property of coastal storm damage as well as the public costs of responding to such damage. The vulnerability of public infrastructure is directly reduced through requirements that address relocation of infrastructure or reduction in public expenditures in the coastal high hazard area (CHHA), and indirectly reduced to the extent that such planning mandates reduce land uses that require supportive infrastructure.

The 1993 ELMS bill added a requirement that local governments develop a coastal land acquisition and ranking system that includes storm hazard mitigation as an acquisition criterion. This planning mandate has the potential to facilitate the use of fee-simple and less-than-fee simple acquisition strategies to preserve the natural storm protective features of the environment. Such acquisition initiatives can also remove vulnerable property from the real estate market and, if done at an appropriate scale, can influence patterns of development in areas subject to coastal storm damage. In this way, this planning mandate can contribute to the policy objectives of minimizing threats to life and property, reducing the public costs of coastal storm damage, and limiting the amount of public infrastructure that is vulnerable

to damage.

Our review of the storm hazard mitigation elements of 18 county and municipal comprehensive plans reveals, however, that many local plans do not meet the intent of the state's planning mandates. No single community was found to meet all of the 9J-5 requirements, and in many instances the requirements were met only with broad and general statements referencing an intent to consider a policy at some future date. Similarly, where requirements were deemed to be met they often were done so with language that was vague or by references to ordinances and regulations whose content was left unspecified. Most plans, moreover, were found to be uncreative; they often included simple and common regulatory mechanisms, such as construction regulations, but lacked policies that go beyond basic regulation. Thus, for example, less than half of the plans contained policies that addressed the instruments of land acquisition, economic incentives, or the use of education and information for the purposes of hazard mitigation. We conclude from this review of local coastal plans that the system of translating state policy objectives for hazard mitigation to localities is not working well and that considerable leverage for the purpose of achieving state policy objectives has been lost.

Planning mandates also exist to the state, from the federal government, under the Disaster Relief (Stafford) Act. Given a presidential disaster declaration, the state is obliged to prepare a §409 hazard mitigation plan for the area covered by the declaration. The plan is intended to evaluate the natural hazards within the designated areas and to design appropriate actions to mitigate these hazards. In addition, the state is encouraged to prepare a more general statewide comprehensive hazard mitigation plan which transcends the specifics of each disaster declaration and which provides an overall policy framework within which the separate hazard mitigation plans are constructed.

Since the content of the disaster-specific and the statewide hazard mitigation plans is not specified, but is intended to focus on the issues and mitigation efforts appropriate to the locale or state, the plans

have the potential to contribute to each of the state's policy objectives in an integrated and coordinated manner. Unfortunately, this potential has not been realized. Disaster-specific hazard mitigation plans have tended to be little more than reports in which mitigation recommendations are derived from damage assessments. The recommendations for mitigation are done without reference to a larger policy framework, and are made without regard to priorities, integration, and coordination. The draft state plan has been criticized for these same reasons. Mitigation options are suggested for specific types of hazards but not in association with a careful consideration of integrated policy objectives and priorities among objectives and policy instruments.

REGULATORY MANDATES

Local building codes that specify construction standards for wind loads, floodproofing, and building elevation constitute the primary policy instrument for reducing the vulnerability of privately owned buildings and facilities to coastal storm damage outside the areas regulated under the state's CCCL and 50-foot setback permitting programs.

Local building codes for habitable structures that may be susceptible to coastal storm damage are influenced by two state regulatory mandates. Throughout the state, regardless of location, local governments that assume responsibility for regulating construction are required to adopt one of four model state minimum building codes under Part VII, Chapter 553 FS. These vary in their specifications for hurricane wind load resistance. Within areas defined as the Coastal Building Zone, local governments are required under the Coastal Zone Protection Act of 1985 (Part III, Chapter 161 FS) to adopt wind load standards that are more stringent than several of the model codes included under the state minimum building code as well as floodproofing and flood elevation standards that conform to the requirements of the National Flood Insurance Program. However, as discussed in the preceding section on regulation of construction and site development these standards are not as stringent as those currently imposed by the state in areas subject to the CCCL and 50-foot setback permitting

programs.

While the State Administration Commission has the authority to withhold state funding to local governments that do not comply with the Coastal Zone Protection Act, there is no formal state monitoring of compliance, and no sanctions have been imposed. Staff of the State Department of Community Affairs (DCA) indicate that very few local governments failed to file documentation for adopting the requisite building code provisions.

ACQUISITION OF COASTAL PROPERTY

Public programs that acquire storm-prone properties and thereby remove them from the real estate market may help to preserve the natural storm protection features of the coastal environment by precluding activities that damage or impair the functions of wetlands or the beach and dune system. While the state's dredge and fill and coastal construction regulations are designed to accomplish such protection, the constraint of avoiding a constitutional takings of property without just compensation necessitates compromises that allow some economically "beneficial" use of land by the property owner. Fee-simple acquisition or purchase of conservation easements or development rights provide direct compensation for prohibiting activities that threaten the protective features of the natural coastal environment.

Public acquisition of coastal property also contributes to the policy objectives of managing development to 1) minimize threats to public safety and property and 2) minimize public costs of planning for, responding to, and mitigating coastal storm damage because it removes hazardous property from the development market thereby exposing fewer persons and less property to the threats of storm damage. If sufficient quantities of land are removed from the development market through fee-simple acquisition or purchase of easements or development rights, local development patterns can also be affected. This will especially be the case where such purchases influence decisions about public expenditures for

growth-inducing infrastructure such as roads, bridges, sewers, and water supply systems. The net result may also be to minimize the extent to which public investments in capital facilities and infrastructure are put at risk by being installed to serve development in areas prone to severe storm damage. Acquisition of coastal land does not directly contribute to the policy objectives of altering the coastal environment to reduce vulnerability to storms, reducing the vulnerability of private buildings and facilities to storm damage, or allocating the public costs of storm hazards to the private sector in proportion to risk incurred.

State land acquisition under the Conservation and Recreation Lands (CARL) Program and the former Save Our Coasts (SOC) Program has contributed to all these goals by facilitating the purchase of large tracts of coastal lands along open and interior coastlines of the state. The local government land acquisition matching grants program operated by the Florida Communities Trust (FCT) has also contributed to preserving the storm protection value of beach, dune, and wetland systems and to removal of storm-prone property from the development market. A few small parcels have been purchased by the State Division of Beaches and Shores in anticipation of or following denial of coastal construction permits. Such purchases will not affect development patterns or infrastructure decisions in the short-run but do contribute to protecting natural storm protection features and to removing hazardous property from the market.

State agencies have made little use of less-than-fee acquisition alternatives, evidently because few opportunities have arisen where easements or conveyance of development rights would accomplish the principal objectives of an acquisition project. There are no data on the extent to which these methods have been employed by local governments or qualifying private nonprofit organizations in the state.

The federal Section 1362 program for purchasing property insured under the National Flood Insurance

Act that is repeatedly flooded is the only true post-storm property acquisition program that could potentially operate in the state. It can be effective as illustrated by the two cases in Massachusetts and Texas described in Chapter 5. However, it has evidently not been aggressively promoted in Florida by the state, its local governments, or, apparently, the regional FEMA office due to a number of constraints including low levels of federal funding. The few instances of its application in Florida have involved noncoastal properties subject to repeated riverine flooding. As with the individual lot purchases under the state CCCL permit program, these acquisitions are not likely to influence overall development patterns or public capital investment decisions. Proposed amendments to the National Flood Insurance Act would eliminate the Section 1362 buyout program and substitute a broader federal grants program that would include purchase of repeatedly damaged property as an eligible state or local activity. The federal share of such grants would be 75%.

DEVELOPMENT OF CAPITAL FACILITIES AND INFRASTRUCTURE

Florida has two types of policy instruments involving development of capital facilities and infrastructure that can contribute to the achievement of storm hazard mitigation policy objectives. Publicly-financed beach erosion control projects help preserve the natural storm protection features of the coastal environment and serve to reduce the vulnerability of upland structures and property, including other public facilities and infrastructure, by altering the coastal environment. The state has also adopted several policies designed to limit state expenditures for growth-inducing infrastructure in areas subject to coastal storm damage. These have the potential to influence the development and redevelopment process so as to limit the amount of property and numbers of lives at risk. In so doing, they also have the potential to minimize the public costs of preparing for, responding to, and mitigating coastal storms and to minimize the numbers of publicly-financed capital facilities that are vulnerable to storm damage.

The state's coastal infrastructure policies include Governor Graham's 1981 executive order (E.O. 81-105), state restrictions on the financing of bridges and causeways to previously unbridged barrier islands (§380.27(1) FS), and a policy linking state expenditures for infrastructure in coastal high hazard areas (CHHAs) to the provisions of local government comprehensive plans (§380.27(2) FS). The federal government also has a policy limiting expenditures for infrastructure in coastal areas under the Coastal Barrier Resources Act (CBRA) of 1982. This contributes to the state's objectives of minimizing the threats and costs of coastal storms by influencing the development and redevelopment processes. CBRA applies to undeveloped portions of barrier islands which are designated by the federal government as Coastal Barrier Resources System (CBRS) units. Thirty-three such units have been designated in Florida.

Beach erosion control projects, which may include "hard engineered" structures such as seawalls, groins, and breakwaters, or "soft engineering" in the form of beach and dune restoration and renourishment, are typically financed from a combination of federal, state, and local funds based on federal and state cost-sharing formulas designed to allocate costs in a manner that somewhat reflects the distribution of resulting benefits among local, state, and federal publics. Federal law limits the maximum federal share to 50%, while Florida law requires that local governments contribute a minimum of 25% to such projects. These programs can address the policy objective of allocating public costs to the private sector in proportion to risk if local governments employ some mechanism for financing the local share that is linked to the benefits obtained by different property owners. Florida law authorizes local governments to create several types of special districts in which ad valorem taxes can be assessed based on some measure of the benefits derived from a municipal service, including beach erosion control projects. The few local governments that have employed such a strategy have used very simple allocation schemes such as establishing a special district consisting of all beachfront properties or having beachfront property owners pay the larger share of the local costs.

Where local governments or private developers choose to finance infrastructure in the absence of federal or state financial assistance, policy objectives of limiting development in hazardous coastal areas will be undermined. However, state responsibility for repairing and reconstructing such infrastructure may be reduced, and the costs of initially constructing and subsequently repairing such infrastructure will be more equitably borne by those who choose to take the risks of occupying areas prone to coastal storm damage.

While it has been alleged that beach erosion control projects may allay property owners' concerns with storm damage risks, it seems unlikely that the federal and state programs for financing such projects have any significant impact on initial development in areas subject to coastal storm damage. Virtually all such federal and state projects are undertaken in reaction to storm damage that has occurred to areas that have already been developed. One of the criteria used by the Florida Division of Beaches and Shores in assessing the critical nature of shoreline erosion is the extent of developed property that is threatened (Florida Department of Environmental Protection, Division of Beaches and Shores, 1993).

The state's CHHA infrastructure policy (§380.27(2) FS) is designed to supersede E.O. 81-105 once the comprehensive plan of a coastal local government has been approved. There are some significant differences in how the state's storm hazard policy objectives are met under the executive order and the CHHA infrastructure policy. Some of these stem from differences in the two policies, but most result from the inconsistent content of local government comprehensive plans and the failure of many local governments to fully address the relevant requirements, as is discussed in the preceding section on planning mandates. These differences are discussed in the later section on gaps and opportunities. Only about 9 out of 195 local governments required to prepare coastal elements did not have their comprehensive plans approved as of January 1994. However, there is also some uncertainty over what conditions must be met before the executive order is no longer to be heeded by state agencies.

The barrier island bridge policy has effectively prevented the expenditure of state funds for constructing new bridges or causeways to unbridged barrier islands. However, decisions on state funding for expanding existing bridges or causeways, or constructing new bridges or causeways to interior islands or barrier islands already connected to the mainland, are tied to the provisions of local comprehensive plans under the state's CHHA infrastructure policy.

ECONOMIC INCENTIVES

Table 6.1 includes a considerable number of policy instruments in the category of economic incentives. Some, such as the Upton-Jones provisions of the National Flood Insurance Act, state property tax concessions for conveyance of easements and development rights, and local transfer of development (TDR) programs are targeted at private property owners. The remaining economic incentives are federal and state programs designed to motivate initiatives by lower levels of government that contribute to achieving storm hazard mitigation policy objectives.

Private Sector Incentives

The Upton-Jones Program permits property owners to collect insurance claims to demolish or relocate structures insured under the National Flood Insurance Program when they are "imminently endangered" rather than waiting until they are damaged by coastal erosion or flooding. By removing such structures from the coast, the program can reduce damage to the beach and dune system that would result if the structure were to remain on the active beach. Relocation will reduce the vulnerability of the structure and its inhabitants to future storm damage and reduce the public costs of subsequently responding to damage to the structure. The program has been aggressively promoted in Michigan and North Carolina, but there has been little activity in Florida. Experience in other states suggests the program will have little impact unless states assume the role of certifying structures as subject to imminent collapse and actively educate property owners about the opportunities available. Proposed amendments to the NFIA would repeal Upton-Jones and provide federal funds under a

75%/25%, federal/nonfederal, cost-sharing grants program that could be used for similar purposes as well as for accomplishing other objectives.

Florida law (§193.501(3) FS) requires local property appraisers to reduce the appraised value of property which has been restricted by an easement or development rights covenant. Presumably such tax relief may motivate property owners to sell or donate easements or development rights to a government entity or qualified nonprofit organization. Where such initiatives result from the tax relief incentives, they will contribute to the same policy objectives ascribed to the use of less-than-fee acquisition techniques: preserving the natural storm protection features of the coastal environment, managing the development and redevelopment processes so as to minimize threats and costs of storm damage, and reducing the vulnerability of public facilities and infrastructure. The potential impact of such tax relief is limited, however, by both the limited circumstances under which less-than-fee acquisition has been used and the relatively low tax liability of the property typically involved in such transactions.

Transfer of development rights programs, which are primarily the prerogative of local governments in Florida, have the potential to be used to reduce the threats and costs of storm damage by reducing densities in areas most prone to coastal storm damage. A secondary result may be to also limit the extent of public infrastructure at risk from storm damage. While counties and municipalities in Florida have the legal authority to implement TDR programs, there has been little successful application of this strategy in the state. Experience in California may suggest a role for the Florida Communities Trust which is discussed in the section on gaps and opportunities.

Incentives to Other Levels of Government

Economic incentives represent the major category of policy instruments available to the federal government for influencing state and local government behaviors. These incentives operate in both the

NFIP and the Federal Disaster Relief (Stafford) Act (DRA) and can contribute to several of the state's storm hazard policy objectives. Florida also provides economic incentives to local governments that promote storm hazard mitigation initiatives. These include matching grants for land acquisition through the Florida Communities Trust, and direct grants for storm hazard mitigation under the recently established Hurricane Catastrophe Fund and the Emergency Management, Preparedness, and Assistance Trust (EMPAT) Fund. The federal government and the state also share the costs of beach erosion control projects with local governments.

The mainstay of the NFIP is the availability of flood insurance to property owners in communities that elect to participate in the program. The obligation of community participation is the adoption of federally specified construction standards in local building codes governing development in flood hazard areas. These standards are designed to reduce the vulnerability of structures to flood hazards and are applied to all structures within flood zones, not just to those structures whose owners have purchased insurance. Because of this, and because community participation in the program is near universal within the state, the program represents a significant contribution toward the state policy objective of reducing the vulnerability of buildings and facilities to storm damage.

The flood insurance program includes other incentives for state or local governments. Under the Community Rating System (CRS), communities are encouraged to adopt programs and standards that surpass the minimum construction codes required for the availability of flood insurance, and property owners are given a discount on insurance premiums according to the range and strength of the mechanisms put into place by the community. A variety of alternative mechanisms are possible, giving rise to the potential for CRS to contribute to each of the state's policy objectives under the goals of protection of the natural environment and protection of life and property. Our data indicate, however, that this incentive program is not working well. Only 52% of coastal communities (cities and counties) within the state participate in CRS, and the level of participation across the most powerful of the

allowable activities is relatively small. This is in spite of the state-mandated planning system under Chapter 163 FS that is intended to encourage adoption of many of the same programs.

The Section 1362 program, which has been mentioned in the discussion of land acquisition policy instruments, also serves as a federal incentive to state and local governments. All Section 1362 transactions are contingent on a state or local agency accepting ownership of the property acquired and managing the property in an undeveloped state as open space or for recreational use. As previously noted, this program has the potential to contribute to policy objectives under the goals of protecting coastal environments and protecting life and property. Unfortunately, only one property has been purchased under Section 1362 and transferred to public ownership, and it was not a coastal parcel.

The federal government provides economic incentives to state and local governments through two programs under the Disaster Relief Act: the public assistance program and the Section 404 hazard mitigation grant program. The public assistance program is relatively narrowly constructed, making funds available on a 75%/25% cost-sharing basis, for the purposes of dealing with damaged public facilities. These facilities may be repaired or replaced, or an alternative project may be funded, if warranted. Options other than repair are generally not selected, however, and mitigation has focused on reducing the vulnerability of buildings and facilities.

The Section 404 hazard mitigation grant program is more broadly constructed; projects need not focus on specific sites or specific damages. The grants are available to states, and through them, to localities, on the basis of the hazard mitigation projects specified in the section 409 hazard mitigation plan. The grants represent a 50% federal cost sharing and a substantial incentive for states to give appropriate attention to the development of the hazard mitigation plan. To date, however, the potential for this grant program has not been realized by the state; funds available under the program have gone

unused. While the state is now in the process of more actively using this program, we anticipate that without a clear and focused set of hazard mitigation policies, projects, and priorities, these funds will not be used effectively.

State matching grants for local land acquisition projects through the FCT offer incentives for local governments to acquire and manage lands for conservation and recreational purposes. A number of these projects have included coastal properties and have, therefore, had the potential to contribute to several storm hazard mitigation policies including preservation of the natural protective features of coastal environments and managing the development process to minimize the threats and costs of storm damage. The matching formula under the FCT program varies. Sixty percent of the funds, which are derived from the Preservation 2000 bond program, must be matched on a 50/50 basis. However, small counties and municipalities may not have to contribute any match at all.

The Hurricane Catastrophe Fund and the Emergency Management, Preparedness, and Assistance Trust (EMPAT) Fund were both enacted in 1993. The "Cat" fund is a reinsurance fund for private carriers of residential and commercial property insurance that is funded by premiums collected from the insurance companies operating in the state. A state grants program is to be financed from surpluses that may accumulate in the fund for non-recurring projects that protect local infrastructure from potential hurricane damage. Because the rules have not yet been written for the grants program, it is not clear whether it will operate on matching basis. However, it will have the potential to contribute to the policy objective of reducing the vulnerability of public infrastructure to storm damage.

The EMPAT Fund is financed by flat-rate surcharges on individual residential and commercial property insurance premiums. Some of the monies in the fund will be available to counties and municipalities through two grants programs for projects that may include disaster mitigation. It is not clear at this time what types of hazard mitigation projects may be eligible for funding. It is possible, however, that

projects to reduce the vulnerability of public infrastructure may be fundable under this program as well.

As noted in the discussion of developing capital facilities and infrastructure, both the federal government and the state share the costs of beach erosion control projects with local governments where some measure of public benefit can be expected from restoring, renourishing, or otherwise protecting the beach and dune system. The individual projects contribute to both of the state's policy objectives under the goal of protecting coastal environmental resources.

These cost-sharing programs can be viewed as economic incentives designed to stimulate local governments to participate in providing the storm-hazard mitigation and other benefits of beach erosion control projects. The minimum nonfederal share for federally supported projects is 50%, while the minimum local contribution for state-supported projects is 25%. Both programs require the provision of public access as a condition of financial support.

EDUCATION AND INFORMATION

Education and information initiatives can also be targeted at both lower levels of government and the private sector. We did not undertake a detailed review of all federal and state technical assistance and public information programs that have some bearing on storm hazard mitigation. Most that are mentioned in Chapters 2 and 3 are directed at local governments and are ancillary to other policy instruments. Examples include technical assistance in developing local CRS programs under the NFIP, training workshops and the "deemed-to-comply" manual for local building inspectors that are sponsored by DCA to promote effective implementation of the Coastal Zone Protection Act, and preparation of the state Comprehensive Beach Management Plan by DBS which contains recommendations for contending with coastal erosion throughout the state. These efforts contribute to achieving the same policy objectives as the programs they support.

Godschalk, Brower, and Beatley (1989) emphasize a particular public information strategy which they characterize as "enlightening individual market decisions." The predominant policy instrument for accomplishing such enlightenment is the so-called hazard disclosure statement. The federal government, as part of the National Flood Insurance Program, requires financial institutions that are regulated by the federal government to notify occupants of land of potential flood hazards when a financial transaction over the land takes place. Presumably, this mechanism is intended to discourage private development or occupancy of hazardous sites, thereby contributing to the state policy objectives of minimizing the threats and costs of storm damage by influencing the development process.

State regulations governing the CCCL permit program provide a much less individualized form of hazard disclosure. Public hearings are required prior to establishing or revising a CCCL, and once the line is set, DEP is required to record the line in public records of each affected county and municipality and to provide a copy of the survey of the line to the clerk of the circuit court in each county.

CONSTRAINTS TO ACHIEVING STATE POLICY OBJECTIVES

Before proceeding to analyze the apparent gaps in the array of federal, state, and local policies that contribute to achieving Florida's coastal storm hazard mitigation objectives and the opportunities for improving those policies, it is important to understand the constraints with which any new policy initiatives must contend. This section describes several general limitations that will apply to most storm hazard mitigation policies as well as several constraints that are peculiar to individual categories of policy instruments.

GENERAL LIMITATIONS

There are three principal constraints to state storm hazard mitigation initiatives that must be

recognized. Two are specific to the problem of coastal storms and development: 1) the extent to which coastal lands have already been developed; and 2) the limited frequency and spatial distribution of storm damage of sufficient magnitude to present opportunities to alter land use activities within areas subject to coastal storm damage. The third is the substantial political opposition that exists to state intervention in land use decisions by local governments and private property owners.

Extent of Development

Many of Florida's storm hazard mitigation policies are designed to influence how undeveloped land is used. These include 1) direct regulation of site development, such as through the coastal construction control line (CCCL) permitting program; 2) regulation of the design and construction of habitable structures through the CCCL permit program and local building codes; 3) local regulation of land use types, densities, and intensities; 4) land acquisition programs such as CARL and the FCT grants program; and 5) the state's coastal infrastructure policy. The opportunities for using these policy instruments to achieve storm hazard mitigation goals and objectives will be constrained by the extent to which land is already developed. Policies which focus on the development process rather than site development will be further constrained by the extent to which undeveloped land has already been subdivided into smaller lots and the ownership patterns of those lots.

We have some partial data on the extent to which coastal property in the state has been developed, but no data are readily available on the extent of subdivision or the ownership patterns of small lots. The majority of the privately owned land along the state's open, sandy coasts is already developed. A rough analysis prepared by the DNR Division of State Lands (1989) determined that 538 miles (67%) of the state's 802 miles of sandy shoreline[1] were privately owned. Only 22% of that private land (15% of all sandy shoreline) was estimated as being undeveloped. It was also estimated that 12% of the private undeveloped land present in 1981 had been developed by 1989, while an additional 14% had been transferred to public ownership.

A more recent analysis prepared by the DNR Division of Beaches and Shores, the Florida Undeveloped Coastal Beach Resources Inventory of December 1990, affords a county-by-county assessment of the extent of shoreline development. This study identified all undeveloped parcels along the sandy shorelines of the Gulf and the Atlantic Ocean with 500 feet or more of undeveloped property (Florida Department of Natural Resources, Division of Beaches and Shores, 1990b). Table 6.3 presents the total linear feet of undeveloped property in each county as well as the total estimated shoreline and the% undeveloped. Total shoreline estimates were obtained from the 1971 shoreline study conducted by the U.S. Army Corps of Engineers. No data are included for Monroe County and the Big Bend counties because they are not classified as having sandy shorelines. Neither Dade nor Santa Rosa county had any undeveloped parcels of 500 feet or more in length.

The tabulation in Table 6.3 suggests that storm hazard mitigation policies targeted at land use development may have their greatest impacts in Charlotte, Collier, Flagler, Franklin, Gulf, Indian River, St. Lucie, and Walton counties where about 15% or more of the shoreline remains undeveloped. Moreover, the situation in Walton County has been altered substantially since 1990 through state acquisition of the Topsail Hill tract and several other parcels which total some 4.5 miles of shoreline or approximately 53% of the undeveloped open beach frontage inventoried in 1990. Policies focused on undeveloped private land will have a moderate impact in counties such as Bay, Brevard, Lee, Nassau, Okaloosa, and St. Johns where between 5 and 14% of the shoreline is not yet developed. Again, however, these estimates are limited by the lack of information on extent subdivision. In coastal areas that are almost fully developed or "built-out," such as Broward, Dade, Duval, Escambia, Palm Beach, Pinellas, and Sarasota counties, storm hazard mitigation policies designed to protect existing development and to modify structures and land uses in a post-storm environment will be more important. These policies, however, will be constrained by a second factor, the infrequency of recurrent local storm damage.

Table 6.3: Proportion of Undeveloped Open Coast Beach Frontage

County	Undeveloped (ft)[a]	Total (ft)[b]	% Undeveloped
Walton	45,200	133,056	33.97
Gulf	45,380	139,920	32.43
St. Lucie	27,489	116,160	23.66
Indian River	24,193	116,160	20.83
Charlotte	14,262	73,920	19.29
Franklin	46,985	288,288	16.30
Collier	40,877	264,000	15.49
Flagler	14,472	95,040	15.23
Nassau	7,570	70,224	10.78
Bay	19,182	235,488	8.14
Brevard	30,481	380,160	8.02
St. Johns	17,270	218,064	7.92
Lee	16,536	232,320	7.12
Okaloosa	7,454	129,360	5.76
Volusia	9,420	258,720	3.64
Manatee	1,820	73,920	2.46
Martin	2,145	110,880	1.93
Pinellas	3,125	186,912	1.67
Sarasota	3,020	184,800	1.63
Broward	1,710	126,720	1.35
Palm Beach	2,505	237,072	1.06
Escambia	1,520	215,424	0.70
Duval	525	84,480	0.62
Dade	0	183,744	0.00
Santa Rosa	0	16,368	0.00

Note: Data not included for the following counties which lack significant areas of sandy shoreline: Citrus, Dixie, Jefferson Hernando, Levy, Monroe, Pasco, Taylor, and Wakulla.

[a]Source: Florida Department of Natural Resources (1990b).

[b]Source: United States Army Corps of Engineers (1971).

Infrequency of Recurrent Local Storm Damage

The probability of a hurricane directly hitting any specific locality is very low (Jarrell, Hebert, and Mayfield, 1992), and the area directly affected is typically small - the radius of maximum winds around the hurricane center (R) averages about 15 miles, and the "direct hit" zone, defined as the area within 2 R to the right and one R to the left of the hurricane center, averages about 50 miles (Hebert, Jarrell, and Mayfield, 1993). As a result, estimating the probability of a hurricane strike for small geographic

areas is difficult because there are few available data (McDonald, 1993).

Simpson and Lawrence (1971) estimated hurricane probabilities (relative annual frequencies) for 50-mile segments of the coast based on hurricane records for the period 1886-1970. A summary of their estimates for the Florida coast are presented in Table 6.4. The National Hurricane Center has also tabulated hurricane frequencies by county for the period 1900-1990. A summary of these data for Florida coastal counties is presented in Table 6.5. Table 6.6 presents data from Hebert, Jarrell, and Mayfield (1993) which indicate the most recent occurrence of a direct or indirect hurricane hit for larger populated areas of the Florida coast.

These data demonstrate that post-storm opportunities to bring substandard habitable structures up to code in any particular local area will be infrequent. The area affected may also be substantially limited except in the event of a severe storm (Category 3 or higher). Thus storm hazard mitigation through post-storm redevelopment will be a long and intermittent process.

Political Opposition to State Intervention in Land Use Decisions

The imposition of planning and regulatory mandates on local governments, as well as direct state regulation of construction, site development, and land use, are constrained by the existence of significant political interests who oppose state intervention in both the home rule powers of local governments and the actions of private property owners. These political forces, and the conventional limits on state intervention which they have engendered, pose constraints to the array of feasible initiatives for closing the gaps in current state policies and programs that contribute to mitigating the risks and costs of coastal storm damage. Countermanding such opposition requires forceful arguments that such intervention is justified by the interests and obligations of the state. There are, therefore, very few instances of direct state regulation of land use and development and few state regulatory mandates to local government. In addition, the state's authority to review the content of local

Table 6.4: Probability For a Hurricane or Great Hurricane Occurrence in Any One Year for 50 mile Segments of the Florida Coastline

Sector	Reference City	Great Hurricanes[1]	All Hurricanes
14	Pensacola	-	13
15		-	14
16	Panama City	-	7
17	Apalachicola	-	6
18		-	7
19		-	6
20	Homosassa	-	8
21	Tampa	1	6
22	Sarasota	2	4
23	Fort Myers	1	5
24		2	9
25		4	13
26	Key West	2	13
27		5	12
28	Miami	7	16
29	West Palm Beach	7	15
30	Fort Pierce	5	8
31	Vero Beach	-	5
32	Daytona Beach	-	2
33	St. Augustine	-	1
34	Jacksonville	-	1

[1]Simpson & Lawrence define "great hurricanes" as having sustained winds of 125 mph or more. This roughly corresponds to Category 3 or higher on the Saffir/Simpson scale.

Source: Simpson and Lawrence (1971).

Table 6.5: Florida County Hurricane Strikes (1900-1990) by Saffir/Simpson Scale

County	Direct Strikes	Hurricanes > Category 3
Escambia	4	2
Santa Rosa	3	2
Okaloosa	6	3
Walton	5	3
Bay	8	1
Gulf	6	1
Franklin	6	1
Wakulla	2	0
Jefferson	1	0
Taylor	1	0
Dixie	1	0
Levy	2	1
Citrus	2	1
Hernando	3	1
Pasco	3	2
Pinellas	3	1
Hillsborough	3	1
Manatee	3	2
Sarasota	3	1
Charlotte	5	4
Lee	5	4
Collier	8	5
Monroe	17	8
Dade	11	4
Broward	7	3
Palm Beach	10	4
Hendry	NC[1]	NC
Glades	NC	NC
Okeechobee	NC	NC
Martin	9	3
St. Lucie	7	2
Indian River	4	0
Brevard	2	0
Volusia	3	0
Flagler	3	0
St. Johns	4	0
Duval	3	0
Nassau	1	0

[1]Non-coastal county.

Source: Jarrell, Hebert, and Mayfield (1992).

Table 6.6: Last Occurrence of a Direct or Indirect Hit by Any and/or a Major Hurricane at Populated Florida Coastal Communities (Category is in parentheses)

City	Direct Last Major	Direct Last Any	Indirect Last Any
Pensacola	1926(3)	1926(3)	1979(3)
Panama City	1975(3)	1985(2)	
Apalachicola	1985(3)	1985(2)	
Homosassa	1950(3)	1968(2)	
St. Petersburg	1921(3)	1946(1)	1968(2)
Tampa	1921(3)	1946(1)	1968(2)
Sarasota	1944(3)	1946(1)	1966(2)
Fort Myers	1960(3)	1960(3)	1966(2)
Naples	1960(4)	1964(2)	1992(3)
Key West	1948(3)	1987(1)	
Miami	1992(4)	1992(4)	
Ft. Lauderdale	1950(3)	1964(2)	1992(4)
West Palm Beach	1949(3)	1979(2)	
Stuart	1949(3)	1979(2)	
Fort Pierce	1933(3)	1979(2)	
Vero Beach	<1900	1979(2)	
Cocoa	<1900	1979(2)	
Daytona Beach	<1900	1960(2)	
St. Augustine	<1900	1964(2)	
Jacksonville	<1900	1964(2)	
Fernandina Beach	<1900	1928(2)	

Source: Hebert, Jarrell, and Mayfield (1993).

government comprehensive plans and land development regulations is very limited.

The state's comprehensive planning process is based on a hierarchical system that preserves the authority of local governments to develop specific planning strategies and implement them through land development regulations (LDRs). Chapter 163 FS and the 9J-5 FAC regulations detail what issues must be covered by local comprehensive plan goals and objectives, and implemented through local LDRs. However, the state does not compel local governments to adopt or enforce any particular LDRs, and once plans have been approved, the state has limited opportunities to review them further.

The state can impose comprehensive plan provisions and associated LDRs only where local governments fail to do so for areas that have been designated by the state as Areas of Critical State Concern. These are limited to areas with significant environmental or historical resources that would be endangered by uncontrolled or inadequate development.

State programs regulating coastal construction, dredge and fill activities, and onsite sewage disposal systems are grounded on the state's recognized responsibility to protect public health and safety and the environment. Thus the CCCL permitting program serves to preserve and protect the natural and recreational resources of the beach and dune system which are linked, in part, to the public trust resources of the wet sand beach, i.e. sovereign tidal lands. The dredge and fill regulations protect tidal lands and water quality, and the onsite sewage disposal regulations protect public health and water quality. Any additional state planning or regulatory mandates to local governments or direct regulatory initiatives must be tied to similar, accepted justifications for intervention.

Experience with the CCCL coastal construction permitting program suggests that in some circumstances localities may prefer a state regulatory presence where they concur with the need for intervention. Section 161.053(4) FS authorizes local governments to administer an approved permit program in lieu of the CCCL program, but none has taken the initiative to do so. DBS Director Kirby Green (1993) has indicated that localities generally prefer to have the state exercise this regulatory power, presumably to shield locals from the political fallout. Such instances, however, are relatively few.

SPECIFIC LIMITATIONS

Specific limitations exist within the context of the three general limitations and apply to the individual policy instruments. Our perceptions of these limitations are as follows.

Regulation of Coastal Construction and Site Development

Efforts to regulate coastal construction and site development must contend with both a changing physical environment and an uncertain legal environment. The dynamic nature of coastlines, especially those comprised of sand substrates, poses an unstable regulatory environment. In addition, the lack of concise judicial rules for evaluating whether a particular regulatory action results in a constitutional takings of private property further muddies the waters of potential regulatory policy initiatives.

Dynamic Nature of the Coastal Environment. The dynamic nature of sandy shorelines has the potential to undermine the long-term effectiveness of the CCCL and 50-foot setback permit programs and the 30-year erosion setback requirements. However, periodic resurveys of the CCCL in areas with significant rates of shoreline erosion or accretion will assure that the maximum protection afforded by these programs is maintained for new structures. Nonetheless, long-term erosion coupled with sea level rise will gradually move the MHWL closer to existing structures, including those built in compliance with a coastal construction permit and a 30-year erosion setback.

Takings Challenges to Land Use Regulation. Constitutional protections against the taking of private property for public use without just compensation constrain the ability of governments to restrict the uses of land, regardless of the recognized legitimacy of the regulatory activity. The U.S. Supreme Court's 1992 decision in Lucas v. South Carolina Coastal Council, 1992 WL 142517 (U.S.S.C.) has highlighted this issue and the continuing uncertainties over what levels of regulation require compensation.

DEP's legal staff (Wiehle, 1993) has reviewed the Part 161 regulatory program in the wake of the Lucas decision. The staff concluded that the case "appears to further limit the State's ability to prohibit the harmful use of private property through regulation without the need for compensation." The constraint arises where denial of a permit is deemed to deprive the property owner of all

"economically beneficial use" of his or her property.

Wiehle concludes that the state can only prevail in an inverse condemnation suit based on a regulatory takings claim where it can show "that the activity it seeks to prevent through the permit denial is one which either it or an adjacent property owner could prevent under principles existing at the time of purchase under the State's common law nuisance or property laws." Section 161.053(7) FS, which was enacted in 1971, states that "any coastal structure erected, or excavation created, in violation of the provisions of this section is hereby declared to be a public nuisance." However, in Wiehle's opinion, this statement of legislative intent does not meet the Supreme Court's determination that the permit denial must be based on "background principles of nuisance and property law that prohibit the uses [the plaintiff] ... intends in the circumstances in which the property is presently found."

Regulation of Land Use

The state has no authority to impose specific land development regulations (LDRs) except under very limited circumstances where local governments fail to adopt LDRs in conformance with guiding principles established for one of the four Areas of Critical State Concern that have been designated. Three of these are in coastal areas: 1) Big Cypress Swamp, 2) the Florida Keys, and 3) the Apalachicola Bay area.

While state law requires local governments to enact necessary LDRs to implement their approved comprehensive plans, DCA has no authority to conduct a systematic, substantive review of those LDRs or to compel local governments to adopt specific LDRs to accomplish storm hazard mitigation objectives or any other policy objectives. Any initiatives to alter this constraint must contend with the general constraint of strong political opposition to state intervention in the regulation of land use (see above).

Planning and Regulatory Mandates

Political opposition to state intervention in the regulation of land use and development is also the principal constraint to new planning and regulatory mandates. The existing statutory provisions governing state review of local comprehensive plans further limit the opportunities to address deficiencies in the coastal elements of current plans.

As currently structured, DCA's next opportunity to review local comprehensive plans will arise when local governments submit their first evaluation and appraisal reports (EARs) and related amendments pursuant to §163.3191 FS. Unless additional planning mandates are legislatively imposed and tied to the EARs process, DCA review will be limited to the amendments initiated by the individual local government. Thus the process offers no guaranteed means for correcting deficiencies, such as those discussed in Chapter 4, that have been identified in plans that were approved by DCA in the initial round of submissions and reviews.

Acquisition of Coastal Property

Acquisition of coastal property to achieve storm hazard mitigation policy objectives is constrained by several factors. First, the statutory and constitutional criteria governing the state's land acquisition programs appear to preclude purchase of land solely for storm hazard mitigation. Second, the property identification, evaluation, and purchase processes of existing programs are not well-suited to rapid implementation in post-storm circumstances. Post-storm acquisition is further constrained by the reluctance of owners of developed coastal property to relinquish it and the reluctance of public agencies to assume management responsibility for small, and sometimes isolated, parcels of land. Use of less-than-fee acquisition techniques faces additional constraints which are discussed below.

Constraints Posed by Existing State Land Acquisition Programs. one of the state's land acquisition programs, past or present, has specifically included storm hazard mitigation as a selection criterion,

until enactment of the 1993 ELMS legislation. The ELMS bill added such criteria to those to be used for CARL purchases with funds from the Preservation 2000 (P2000) bond issues. Apparently the ELMS III Committee intended that a similar addition would be made to the selection criteria for the Florida Communities Trust (FCT) land acquisition matching grants program for local governments. The bill did direct local governments to establish a method of identifying and ranking coastal parcels for acquisition with state funds which is to include consideration of storm hazard mitigation as a selection criterion. But the bill did not explicitly link this process to the FCT land acquisition grants program.

Conflicts between the conditions that would make a site desirable for acquisition to achieve storm hazard mitigation and those that are statutorily or constitutionally required for CARL and P2000 purchases may render the storm hazard criterion fairly impotent. In addition, there is a perception that most of the large tracts of coastal land that have attributes targeted by the CARL Program have already been considered. A separate funding initiative that would be unconstrained by the CARL and P2000 acquisition criteria would require development of sufficient public consensus in favor of acquisition principally for purposes of storm hazard mitigation. Whether such an effort could tap into the interest groups that have traditionally supported public land acquisition remains an open question.

The CARL and FCT acquisition criteria and processes also severely limit their potential application in post-storm circumstances where small parcels may need to be acquired fairly rapidly. Both decisionmaking processes are complex and lengthy and not suited to quick response to a post-storm opportunity. There are provisions in Chapter 253 FS for expedited acquisition under the CARL Program, but these have not, as yet, been used. Both programs also have tended to favor acquisition of large parcels.

Constraints to Federal Post-Storm Acquisition Programs. Experience with the Section 1362 acquisition program and the Upton-Jones relocation program under the National Flood Insurance Act (NFIA)

suggests that owners of storm-damaged, developed coastal property will almost always seek to rebuild rather than selling out or relocating a dwelling. Furthermore, most state and local government land management agencies tend to avoid assuming management responsibilities for numerous, small, and discontinuous property parcels.

The Section 1362 program is further limited in its impact because it only applies to properties insured under the National Flood Insurance Program. In Chapter 2 we estimated this to be only 26% of the households in flood hazard areas in the state. The Section 1362 program has also had very little money available for acquiring storm damaged property. While proposed amendments to the NFIA may make more money available for acquiring repeatedly damaged property, the federal money will require a 25% state or local match which may further dampen enthusiasm for promoting this policy instrument.

Constraints to Use of Less-Than-Fee Techniques. Use of less-than-fee acquisition techniques appears to have limited potential in coastal areas because the constraints necessary to achieve storm hazard mitigation objectives will generally preclude most economic uses of the property. The difference between fee-simple purchase and purchase of an effective easement or development restriction may be less than 20%. There may be occasions where a property owner is willing to convey an easement or development rights covenant in consideration for property tax relief provided for in state statutes. However, less-than-fee acquisition has been most successfully applied to agricultural or silvicultural lands where the current tax liability is already low. Thus tax relief is not likely to be a major consideration for the property owner.

Development of Capital Facilities and Infrastructure

The state's two principal policy instruments that influence development of capital facilities and infrastructure face vastly different constraints. We are not aware of any substantial legal constraints to the effective use of the state's authority to assist in the financing of beach erosion control

assistance programs. The principal impediment has been inadequate funding to develop restoration management plans for all of the state's critically eroding beaches. Detailed erosion studies remain to be done for more than 40% of the state's critically eroding shorelines (Florida Department of Environmental Protection, Division of Beaches and Shores, 1993).

The state's coastal infrastructure policy, on the other hand, is constrained by the 1985 policy decision, embodied in §380.27(2) FS, to link the infrastructure decisions of state agencies to the comprehensive plans of local governments. If this commitment to home rule remains unchanged, the state must contend with the constraints to new planning mandates if there is to be any substantive improvement in the consistency and effectiveness of state policy governing expenditures for infrastructure in coastal high hazard areas.

Economic Incentives

The general and specific constraints on increasing the use of regulatory instruments and mandates to local governments suggest that a complementary strategy of economic incentives may be more politically feasible. Indeed, this alternative is generally suggested as an alternative to "command-and-control" strategies. We have distinguished two types of incentives: 1) those that involve cost-sharing or other direct financial assistance from one level of government to a lower level; and 2) those that alter the economics of the land market to discourage undesirable actions or encourage desirable behavior by the private sector. There are, however, constraints to these incentives that must also be appreciated.

Incentives to Other Levels of Government. The use of economic incentives that involve direct expenditures by the state are likely to be problematic because of the multiple demands that already exist on the state's limited fiscal resources. The state economic incentive programs that currently help achieve storm hazard mitigation goals are funded through bonds (the P2000 bonds for the FCT

matching grants program) and through indirect taxing mechanisms (the property insurance policy surcharge that funds the Emergency Management, Preparedness, and Assistance Trust Fund and the premiums charged insurance carriers to finance the Hurricane Catastrophe Fund). New initiatives will presumably require new funding mechanisms.

Proposed amendments to the National Flood Insurance Act will reduce the federal subsidy of two storm hazard mitigation programs under the NFIA. Both the Section 1362 buyout program and the Upton-Jones Program, under which federal funds fully covered property acquisition and incentives for private property owners to relocate or demolish imminently endangered structures, would be repealed. The bill calls for a general purpose federal grants program that would cover similar initiatives, but state or local governments would have to cover 25% of the costs.

Private Sector Incentives. Private sector incentives that contribute to storm hazard mitigation include the Upton-Jones Program under the NFIA, Florida's tax concessions for conveyance of easements and development rights, and transfer of development rights (TDR) programs. Upton-Jones targets owners of habitable structures that are insured under the NFIP. Experience in other states indicates that the principal constraint, where the program is actively promoted, is the reluctance of beachfront property owners to relinquish their property or relocate their structure to another site unless they have no other option. It also appears that the program works best where a state agency assumes the role of certifying structures as subject to imminent collapse using the NFIP criteria rather than conventional condemnation standards. Experience in other states suggests that local code enforcement officers are reluctant to "condemn" a structure using the lower-threshold federal criteria.

The main constraints to the use of the state's property tax relief provisions governing conveyance of conservation easements and development rights have been discussed in the preceding section on constraints to use of less-than-fee acquisition techniques. They include the high %age of total property

value represented by the right to build on coastal property and the low tax obligations on lands most suited to such conveyances.

TDR programs involve some of the same constraints plus others. The best known successes have involved transfers of development rights from undeveloped agricultural land to areas proximate to existing growth centers (Pizor, 1986). In these cases, owners of land within the sending area (farmers) still had the potential to earn a substantial economic return from the property after conveyance of the development rights. In addition, the land in question consisted of significant areas in single ownership. Several analysts have concluded that TDR will only be effective where it is coupled with significant constraints on development within the sending area and where the demand for development density is at least as great in the receiving area as it is in the sending area (McGilvray, Anderson, and West, 1985; Pizor, 1986).

The situation in many coastal real estate markets appears inimical to a successful TDR effort. Where land is already subdivided and lots have been purchased by people who wish to develop a single-family residence, there will be little incentive to sell the development rights - no significant economically-beneficial use will remain. Where large areas of unplatted land exist, there must be sufficient constraints on development over a large enough area coupled with a sufficiently desirable receiving area to make TDR an attractive financial proposition. Higher development densities on parcels removed from the immediate coast will not be an attractive option unless similar restrictions apply to the majority of the regional coastal development market (McGilvray, Anderson, and West, 1985). The most promising strategy short of total fee-simple acquisition may be to acquire land and resell it with lower permitted development densities. We are not aware of any Florida state agency with the authority to carry out such a transaction.

Education and Information

Education and information, as policy instruments, depend on the connection between information and behavior and the assumption that adequate information to private parties or other government actors will structure their actions in desired ways. Hence, information on the risks of flood hazard areas may be given to property owners anticipating building in such areas, or technical assistance may be provided by the state to local governments in anticipation of local participation in program activities.

Experience suggests that public education and technical assistance to other government entities will be most effective when those actors have sufficient motivation to behave as desired and merely lack the knowledge of what to do or how to do it. Thus education and technical assistance programs that accompany economic incentives or regulatory programs may facilitate their implementation.

The evidence on the efficacy of hazard disclosure policies is less compelling, however. The one study we have encountered of the Alquist-Priolo Special Studies Zone Act in California suggests that the disclosure policy instrument was not properly designed, i.e. the timing of the hazard disclosure was too late in the real estate transaction (see Chapter 5). While a better designed policy has now been proposed in Massachusetts, we have found no evaluation data with which to judge its probable efficacy. However, studies of flood and earthquake insurance purchasing behavior (Kunreuther, 1976) suggest that even where people are well informed of natural hazards, they are unlikely to take action to reduce the risks of a hazard that is perceived to be of low probability unless they have had first-hand experience with the hazard, even though the magnitude of the possible injury is significant. Jarrell, Hebert, and Mitchell (1992) have estimated that as of 1990 (i.e. before Hurricane Andrew) between 94 and 95% of Florida's coastal population had not experienced a direct hit by a major hurricane (Category 3 or higher).

OPTIONS FOR ACHIEVING STATE POLICY OBJECTIVES

Our review of the policy instruments implemented within Florida by federal, state, and local government agencies, reveals instances in which instruments are inadequately conceived or applied and gaps where new policy initiatives could be taken. In the following sections we evaluate the extent to which each of the state's storm hazard mitigation policy objectives is being achieved and suggest policy options that could be considered to enhance those objectives.

PRESERVE NATURAL STORM PROTECTION FEATURES OF THE COASTAL ENVIRONMENT

The state's panoply of regulations governing construction and site development above and below the mean high water line are specifically targeted at preserving the natural storm protective features of beach, dune, and coastal wetland systems. These have been supplemented by acquisition of coastal shorelines and wetlands under the former Save Our Coasts Program, the CARL Program, and the Florida Communities Trust matching grants program with local governments, plus federal and state programs for covering up to 75% of the costs of restoring and renourishing beach and dune systems.

We have not identified formal evaluation data with which to judge the effectiveness of these programs. Staff within the DEP Division of State Lands indicated that they may be assembling a summary of the coastal lands that have been acquired through the SOC and CARL programs (Brock, 1993), and the Division of Water Management is reported to be developing a data base that may allow an assessment of the impacts of the state's dredge and fill regulations in preserving wetlands (Wonnacott, 1993). We have, however, identified several opportunities to improve the legal instruments and fiscal resources that can be used through these programs to more effectively achieve the objective of preserving the natural storm protection features of the state's coastal environments.

Options for Enhancing the State's Coastal Construction Regulations

The principal shortcomings of the regulatory system include 1) the lack of a dedicated funding source to purchase properties where strict enforcement of coastal construction permit regulations would result in a constitutional takings; 2) the absence of statutory mandates to prevent local governments from allowing subdivision of coastal land that creates parcels that cannot be developed in compliance with the state's coastal construction regulations; and 3) the state's limited authority to compel property owners to relocate structures before they are below the mean high water line (MHWL).

Option 1: Establish a dedicated source of state funds for purchasing properties that would be rendered unbuildable by strict enforcement of the state's coastal construction regulations.

The Department of Environmental Protection Division of Beaches and Shores formerly used the interest earned on funds deposited in the Beach Management Trust Fund to acquire parcels following a judicial takings judgment. The Division is also actively developing a procedure for negotiating purchase of parcels prior to actually denying a coastal construction permit, so as to avoid a takings lawsuit. Action by the State Legislature to return interest accrued in the Trust Fund to this purpose would facilitate such purchases. However, additional funds may be needed. If so, these could perhaps be taken from a more general storm hazard mitigation land acquisition fund (see Option 6).

Option 2: Mandate conformance of local subdivision regulations with the 30-year setback and other locational requirements under the 50-year setback and CCCL permitting programs.

There are no restrictions in current state law to creating lots within the CCCL area that are too shallow to permit development in compliance with state regulations. This sets up potential takings claims that

could be averted if the land subdivision process reflected those requirements at the outset. This could be accomplished through amendment of appropriate sections of Chapters 125, 166, and 177 FS.

Option 3: Impose relocation requirements comparable to those imposed under the grandfather provisions of the 30-year erosion setback rule, as permit conditions for all CCCL and 50-foot setback construction permits in areas with significant erosion rates.

The state currently has exercised only limited authority in requiring relocation of residential or commercial structures when they are at the water's edge. Single-family residences built under the grandfather provisions of the 30-year setback requirement have been required by DBS to be relocated when they are at the MHWL. However, this provision has not yet been tested in the courts, and has not been imposed as a condition for other CCCL or 50-foot setback permits. Residential and commercial structures built prior to enactment of the 30-year setback rule are not subject to any state relocation provisions until they are below the MHWL (§161.061 FS) unless the foundation is damaged. This is also the case for structures built between the CCCL and the 30-year setback, although these structures presumably will not face a relocation problem for many years.

The relocation requirements for structures built landward of the 30-year erosion projection line have evidently been imposed under DBS's existing authority under §161.053 FS. Imposition of similar requirements for other CCCL and 50-foot setback permits could presumably be similarly authorized.

Where a relocation requirement cannot be met on an existing parcel, the state may face a potential takings claim. However, the finding of a takings in the Lucas case hinged on the determination that denial of a permit to construct a single-family residential dwelling constituted denial of "all economically beneficial or productive use of the land." Successful takings claims have also been tied to justifiable

"development expectations." The state could conceivably argue that a landowner who had used the land for some period of time had achieved an economically beneficial use of the land within the limits of reasonable development expectations given the erosive nature of the site.

Option 4: Require relocation of habitable structures at sites with receding shorelines before they interfere with natural sand movement or intrude into the sovereign beach.

Requiring relocation once the MHWL reaches a structure (as in Option 3) may not provide optimal protection of the beach and dune system and may not prevent the structure from intruding onto the sovereign beach if the rate of erosion is rapid and compliance is delayed. An option that would be more protective than Option 3 would require relocation when the MHWL is within some minimum distance of the structure, such as some multiple of the annual average erosion rate. Such a policy would probably require amendments to §§161.052 and 161.053 FS.

No state that we surveyed had a comparable, enforceable requirement. However, Virginia requires property owners whose houses are separated from the MHWL a distance less than 10 times the average annual erosion rate to submit a relocation plan to the State Marine Resources Commission. The state cannot compel relocation until the structure is below the MHWL, but the plan requirement has been successful in initiating relocation action in several instances.

Imposing a relocation requirement based on a setback threshold would probably have to be based on state authority to protect the beach and dune sand sharing system or an argument that the structure should be moved when incursion on the sovereign beach is imminent. Employing the setback threshold strategy successfully might also require greater restrictions on permits for installation of rigid erosion control structures under §161.041 FS. Currently a major nonconforming habitable structure (one built

prior to the CCCL or 50-foot setback permitting requirements) can be protected with a seawall or other protective structure if it is vulnerable to erosion from a five-year storm. A higher threshold of storm damage vulnerability may be required to achieve relocation, although an applicant for an erosion control structure permit is required to demonstrate that relocation of the habitable structure to be protected is economically and physically unfeasible.

Options for Enhancing the State's Coastal Land Acquisition Programs

The major gaps in the state's current land acquisition programs that limit their effectiveness in preserving the natural storm protective features of the coastal environment include: 1) the lack of explicit authorization for the Florida Communities Trust matching grants program to finance acquisition of land for storm hazard mitigation; 2) the conflicts between acquisition criteria under the CARL and Preservation 2000 programs and those that should be applied to promote acquisition of land to achieve storm hazard mitigation; and 3) similar limits in the statutory language authorizing conveyance of conservation easements and development rights.

Option 5: Amend the authorizing legislation for the Florida Communities Trust so that storm hazard mitigation is explicitly listed as an objective to be attained through the Trust's matching grants program for local land acquisition.

While the 1993 ELMS bill creates a mechanism for local governments to identify and rank coastal properties for acquisition through state land acquisition programs, including lands that would contribute to storm hazard mitigation, the bill does not directly amend the legislation authorizing use of P2000 funds by the FCT program (§380.510(7) FS). Thus there is no formal legal linkage between the ranking lists to be developed by local governments and the criteria to be used in awarding FCT grants.

Option 6: Create a separate dedicated source of state funds for acquiring parcels of coastal property primarily with the objective of mitigating public losses from storms.

Constraints imposed by statutory acquisition criteria for P2000 bonds and for the CARL Program appear to limit effective use of these means to acquire significant land primarily to attain storm hazard mitigation policy objectives, despite revision of those criteria by the 1993 ELMS bill to include storm hazard mitigation. Property that may provide significant local storm hazard mitigation benefits by preserving a wetland or beach and dune system may not have sufficient statewide environmental resource or recreational benefits to be ranked high enough for acquisition under the CARL Program. The P2000 criteria may limit use of funds allocated to the FCT program, even if Option 5 is taken and the FCT acquisition criteria are amended to include storm hazard mitigation. In other cases, property which is subject to high rates of erosion may be viewed as a management liability in the context of other CARL acquisition goals, and yet be an important parcel to acquire to achieve storm hazard mitigation objectives.

Creation of a separate funding source for acquiring lands for coastal storm hazard mitigation would remove the required linkage to protection of environmentally or recreationally important uses that is central to P2000 and CARL. It would could also contribute to implementation of Option 1.

Financing a separate funding source may be constrained, however, by the language of §17 Article IX of the State Constitution, which has served as the authority for issuing all bonds used to acquire state lands for conservation and recreation purposes since 1963. If separate bonding authorization is required, a substantial public education effort may be needed to generate support both for incurring state indebtedness and for removing real estate from the local tax base for such a purpose.

Option 7: Develop a state inventory of coastal properties that would be ranked highly for acquisition to achieve storm hazard mitigation policy objectives.

Establishing a separate fund for acquiring land for storm hazard mitigation as envisioned in Option 5 will require an estimate of how much money is likely to be needed for such purposes. While the ELMS bill did direct DCA to assist local governments in preparing their own lists of priorities for acquiring coastal lands, there is no mechanism in place to prepare a central, statewide list of parcels that would be ranked highly for acquisition to achieve storm hazard mitigation objectives. Such an effort might build on the local government inventories, but there may be opportunities to build on other inventories as well, such as the one conducted by the State Division of Beaches and Shores in 1991 of undeveloped coastal properties.

Parcels identified in that study as having 500 feet or more of contiguous undeveloped shoreline could be analyzed to determine their vulnerability to storm damage (flooding, storm surge, and erosion), the potential impact acquisition might have on preserving natural storm protection features and on altering development patterns and reducing the amount of property and numbers of lives at risk. A project team with the Joint Center for Environmental and Urban Problems at Florida Atlantic University and Florida International University is developing an analogous process for assessing developed parcels that are damaged by coastal storms (see Metzger et al., 1993). The DBS inventory, however, is limited to properties within the jurisdiction of the CCCL permit program, i.e. located in counties with predominantly sandy shorelines fronting on the Atlantic Ocean, the Gulf, or the Straits of Florida.

Option 8: Amend the statutory authorization for the conveyance of development rights covenants and conservation easements to explicitly allow such transactions for the purpose of achieving storm hazard mitigation objectives.

Under current law, conveyance of easements or development rights appears to be authorized only where the easement or covenant would protect significant natural resource or recreational values. Thus amendment of the applicable statutes (§§704.06(1) and 193.501(6)(h) FS) may be necessary to apply these acquisition techniques where storm hazard mitigation would be the primary benefit.

The urgency of taken such action should be tempered, however, by the constraints to using such techniques in coastal settings. As noted in the discussion of constraints to use of less-than-fee acquisition, the difference in price between acquiring an easement or development right that will accomplish storm hazard mitigation objectives and acquiring full title to the property may be small. The types of land uses that have been found most amenable to sale of easements and development rights have been mainly agriculture and silviculture. There are likely to be few instances where property used for such purposes would be a high acquisition priority for coastal storm hazard mitigation.

Options for Enhancing Economic Incentives

Experience form other states suggests that the state can play a role in promoting greater use of the Upton-Jones Program under the National Flood Insurance Act which serves as an economic incentive for property owners to demolish or relocate structures that are on the verge of succumbing to the forces of beach erosion and wave damage.

Option 9: Obtain authorization from the Federal Emergency Management Agency (FEMA) to certify structures as subject to imminent collapse under Upton-Jones provisions of the National Flood Insurance Act (NFIA) and actively promote the program in cooperation with local governments. Apply FEMA imminent collapse criteria rather than local condemnation criteria, and link the program to the state's coastal construction permitting program.

It appears from the experience of Massachusetts, Michigan, and North Carolina that availability of federal flood insurance money to cover the cost of demolition or part of the costs of relocation will be most attractive to property owners where the program is linked to strict enforcement of the state's coastal construction regulations under Chapter 161 FS and where the state assumes the role of certifying structures as subject to imminent collapse rather than relying on local code enforcement officers who are reluctant to apply the lower-threshold Upton-Jones criteria. Florida has done neither to date. It should be noted, however, that proposed amendments to the NFIA would repeal the Upton-Jones Program and replace it with a general grants program to the states, based on 75% federal funding, under which buyouts would be permitted comparable to those under Upton-Jones.

ALTER COASTAL ENVIRONMENT TO REDUCE VULNERABILITY TO STORMS

State policies that have an impact on altering the coastal environment to reduce storm vulnerability include both the regulation of and financial support for beach erosion control initiatives. We have found no important gaps in the state's regulation of coastal armoring structures or in its policies governing state financial support for beach erosion control projects.

The different rules that apply to protecting conforming and nonconforming structures along open sandy coasts under §161.041 FS attempt to strike a compromise between those major structures (homes, commercial buildings, etc.) that have not benefitted from the setback and construction design standards imposed under the CCCL and 50-foot setback permits programs and those that have. The different restrictions imposed under the state's dredge and fill regulations along interior and vegetated shorelines (Part VII, Chapter 403 FS) seem to be based on a legitimate distinction of vulnerability to coastal erosion forces.

It has been argued that publicly-funded beach erosion control projects, including hard engineered structures such as seawalls and soft engineered projects such as beach restoration, give upland

property owners a false sense of security and therefore diminish the incentives to avoid occupying areas subject to damage form coastal storms. The majority of such projects in Florida, however, are associated with protecting areas that are already developed. While relocation is promoted in the State Land Development Plan as the preferred strategy, the approach proposed by the FAU/FIU Joint Center (Metzger et al., 1993), which presents relocation as the strategy of last resort when beach restoration is not economically justified, seems more consistent with the policy objectives stated in Chapter 161 FS. It implies, however, that a formal analysis of public and private costs and benefits be completed.

The principal constraint identified to implementing the state's program for addressing the state's beach erosion problems is a shortage of resources to complete analysis of the remaining 40% of the state's critically eroding shorelines.

Option 10: Increase state funding allocated to the Department of Environmental Protection, Division of Beaches and Shores, for completing analysis of the remaining 97 miles of critically eroding shorelines.

REDUCE VULNERABILITY OF THE BUILT ENVIRONMENT TO STORM DAMAGE

The principal policy instruments that serve to reduce the vulnerability of privately-owned structures to coastal storm damage are the construction standards imposed under the state's coastal construction permitting programs and local building codes. Achievement of this policy objective is incomplete in Florida for several reasons. Most importantly, regulations governing the design and construction of habitable structures in areas susceptible to storm damage are not uniform within areas of comparable risk across the state. Three other deficiencies limit effective achievement of this policy objective in post-storm circumstances: 1) the high substantial damage threshold which applies to the state's construction standards; 2) a shortage of qualified building inspectors who can enforce building codes during the recovery phase; and 3) inadequate insurance coverage of individual structures for the costs

of rebuilding to current code requirements.

Options for Enhancing Building Construction Standards

The state's regulations governing coastal construction do not provide equal levels of storm hazard mitigation to all coastal areas. The CCCL and 50-foot setback construction standards administered by DBS under Chapter 161 FS apply only to sandy shorelines along the open coasts of the Gulf, the Atlantic Ocean, and the Straits of Florida. There is no comparable state protection of buildings and facilities along inland shores and areas with vegetated shorelines, including all but about 18 miles of shoreline in the eight Big Bend counties and the Florida Keys. Based on estimates of total shoreline developed by the U.S. Army Corps of Engineers (1971), about 450 miles of the state's coastline (35%) are not covered by the DBS regulations.

The Coastal Zone Protection Act is designed to extend comparable storm damage protection to habitable structures in areas along vegetated coasts with FEMA-designated velocity zones (V-zones) through local building codes governing construction within the Coastal Building Zone. The Coastal Building Zone also extends further landward than the CCCL. Local governments have allegedly not been uniformly diligent in enforcing the foundation and wind load requirements. In addition, the wind load and flood elevation standards required under the Coastal Zone Protection Act are no longer equivalent to those imposed by DBS, nor are they consistent with the wind load recommendations of FEMA following hurricanes Andrew and Iniki. Two options are possible: 1) extending state regulatory jurisdiction to other areas subject to comparable risk; and 2) mandating the adoption of comparable standards as part of local building codes.

Option 11: Extend state regulation of habitable structure design standards to all tidal shorelines including vegetated shorelines and the shores of inland waters.

Current state regulations governing wind load and flood elevation construction standards for habitable structures are linked to the authority in Chapter 161 FS to protect the beach and dune systems along the state's sandy shorelines. While such areas are more vulnerable to erosion damage, they are not significantly more susceptible to flooding and structural damage from storm surge or winds than are areas of similar topography along vegetated and interior coastlines. Storm surge zones for Category 3 and higher storms extend much further landward than the CCCL in many areas of the state, and the majority of the state is subject to basic wind speeds of 90 to 100 miles per hour. Hurricane Andrew clearly demonstrated that wind damage can occur far landward of the CCCL.

The Coastal Zone Protection Act of 1985 no doubt is evidence of an earlier decision to forego extending state regulation to all areas of comparable risk. The administrative costs would be significant, and there would be substantial political opposition to further direct state regulation of construction practices. However, strengthening construction standards will not only enhance achieving the state policy goal of protecting life and property, it will also contribute to minimizing the state's costs of post-storm response and recovery.

Option 12: Revise the State Minimum Building Code and the Coastal Zone Protection Act so as to require application of wind load design standards and flood elevation standards comparable to those imposed in areas subject to state coastal construction permits.

If Option 11 is deemed infeasible, the alternative is to use existing mechanisms for mandating minimum local building code standards. The State Minimum Building Code (Chapter 553 FS) applies to all local governments who choose to regulate construction. Currently the statute directs local governments to adopt one of four models. However, these differ in the extent and specificity of their standards for wind load resistance. FEMA has recommended that the ASCE Standard 7 be adopted in all areas

subject to hurricane-force winds. This is the standard applied under the state's coastal construction permits. Herbert Saffir (1992) identifies the South Florida Building Code as the only one among the four models listed in Chapter 553 FS that applies this standard. He recommends use of the ASCE standard statewide.

The Coastal Zone Protection Act (Chapter 161, Part III, FS) applies to local building codes administered within the Coastal Building Zone which encompasses all areas containing V-zones designated by FEMA. The statute requires all local building codes to apply flood elevation requirements consistent with those required by FEMA for the V-zones. These standards are not as stringent as those imposed by the state within CCCL and 50-foot setback zones, however, because DBS uses a more conservative method for estimating 100-year storm flood elevations that are typically one to two feet higher than those developed by FEMA. Amending Part III of Chapter 161 to require use of the DBS method for calculating flood elevations would result in comparable protection for all areas subject to coastal flooding.

Options for Enhancing Post-Storm Protection of Vulnerable Structures

Pursuit of Options 11 or 12 will significantly advance the state policy objective of reducing the vulnerability of newly constructed buildings and facilities. However, application of the more protective standards to existing structures will occur only when major modification of the structure occurs. One of the primary circumstances in which major modifications are made is when a structure sustains significant damage from a coastal storm. As noted above, there are three gaps in the current system that limit the opportunity to apply more protective standards in post-storm circumstances: 1) the high substantial damage threshold which applies to the state's construction standards; 2) a shortage of qualified building inspectors who can enforce building codes during the recovery phase; and 3) inadequate insurance coverage of individual structures for the costs of rebuilding to current code requirements.

Option 13: Lower the "substantial modification" threshold for requiring repaired or rebuilt habitable structures to meet design and construction standards seaward of the Coastal Construction Control Line (CCCL) or the 50-foot setback.

The substantial modification threshold that must be exceeded before a structure is required to be rebuilt to code is higher for the state's construction standards under the CCCL and 50-foot setback permitting programs than it is for local building codes and comparable regulations in most of the other states we surveyed. Under the Coastal Zone Protection Act, whenever the costs of cumulative modifications over a 2-year period exceed 50% of the market value of a structure within the coastal building zone, the owner must bring the entire structure into conformance with current building standards. FEMA applies a similar standard to qualify for reinsuring a structure under the National Flood Insurance Program, except that the FEMA threshold is not based on cumulative damage or modifications.

The threshold under the state's coastal construction permitting program is considerably different. Existing major habitable structures can be remodeled or repaired after a storm without complying with the 50-foot setback requirement, the CCCL permit conditions, or the 30-year setback so long as the modified or repaired structure remains within the confines of the existing foundation and no modification of the foundation is involved. According to DBS staff, there have been no cases where a permit has been denied to rebuild on the existing foundation, even in several cases where the foundation was on the active beach as the result of a storm.

A lower damage threshold for requiring conformance with the DBS construction standards would increase the opportunities to reduce the number of habitable structures vulnerable to storm damage. The Office of Policy and Planning of the former Department of Natural Resources has recommended amending Chapter 161.053 FS so that DBS can require that private structures located within the 30-

year erosion projection area be rebuilt to the same standards that would apply to new structures if the structure were damaged more than 50% of its replacement value. This threshold could be lowered further by employing the damage basis applied under the Coastal Zone Protection Act. The impact could be further extended by applying the damage threshold to all habitable structures within the entire area seaward of the CCCL rather than limiting it to structures within the 30-year erosion projection area.

Option 14: Support and participate in the effort by the Building Officials Association of Florida to deploy retired certified building inspectors and provide for mutual aid among municipalities in the wake of major disasters.

The post-storm window of opportunity to bring substantially damaged structures up to code so as to reduce their vulnerability to future storms is highly dependent on having enough building code enforcement personnel in the field immediately following a storm. This problem has been highlighted by federal Interagency Hazard Mitigation Teams following both Hurricane Andrew and the March 1993 storm. Similar problems may also arise for DBS following a large-scale, severe hurricane that strikes coastal areas subject to the CCCL and 50-foot setback permitting programs.

The State Interagency Management Committee Winter Storm Task Force (1993) has recommended that DCA encourage local governments to participate in an emergency preparedness plan being developed by the Building Officials Association of Florida to deploy retired certified building inspectors and provide for mutual aid among municipalities. DBS may also benefit from participation in such a plan.

Option 15: Promote adoption of proposed amendments to the National Flood Insurance Act that would provide holders of federal flood insurance with coverage for

rebuilding in compliance with current National Flood Insurance Program (NFIP) construction and elevation requirements.

An additional impediment to using post-storm circumstances as an opportunity to bring nonconforming structures up to code is the lack of coverage in individual property and flood insurance policies for upgrading a structure. Under the NFIP, federal flood insurance covers only repair or replacement of the structure as insured. Many property insurance policies also do not include provisions for rebuilding to current code.

Federal legislation introduced in 1993, the National Flood Insurance Reform Act (S.1405), would provide holders of federal flood insurance with coverage for rebuilding in compliance with current NFIP construction and elevation requirements (Florida Interagency Management Committee Winter Storm Task Force, 1993).

Option 16: Explore the potential for the state to require that private insurance carriers operating in the state provide coverage for rebuilding in compliance with state and local building codes as modified under Options 11 or 12.

Option 15 would provide a partial resolution of the problem of inadequate insurance coverage for bringing storm-damaged structures up to code, but likely would not cover reconstruction in conformance with state or local wind load and flood elevation requirements as envisioned in Options 11 and 12. The Hurricane Catastrophe Fund created by legislation enacted during the 1993 special legislative session may offer a vehicle for requiring private insurance carriers to provide such coverage.

MANAGE DEVELOPMENT TO PROTECT LIFE AND PROPERTY AND MINIMIZE STATE COSTS

Table 6.1 indicates that two of the state's policy storm hazard mitigation policy objectives are

furthered by policy instruments that manage the development and redevelopment of coastal land: 1) minimizing threats to life and property; and 2) minimizing state costs of planning for, responding to, and mitigating coastal storms. The array of state policy instruments contributing to these objectives is the most extensive for any of the objectives listed in Table 6.1, but they include many that contribute to policy objectives already discussed. We present specific policy options here for each of the major policy instrument categories.

Options for Enhancing the State's Coastal Construction Regulations

Virtually all of the state regulatory programs governing construction and site development can help minimize the threats and costs of coastal storm damage as well as the goal of protecting coastal environmental resources and the objective of reducing vulnerability of buildings and facilities. Options 1 through 4 presented above will also apply to the objectives of managing coastal land development and redevelopment to minimize the threats and costs of storm damage. We have identified no others that are needed to enhance achievement of these objectives.

Options for Enhancing the State's Planning and Regulatory Mandates

Our review of the storm hazard mitigation elements of county and municipal comprehensive plans demonstrated that the system of translating state policy objectives for hazard mitigation to localities is not working well and that considerable leverage for the purpose of achieving state policy objectives has been lost. We found no community among 18 counties and municipalities analyzed that met all of the 9J-5 FAC requirements pertinent to coastal storm hazard mitigation, and in many instances the plans contained only broad and general statements referencing an intent to consider a policy at some future date. Implementation was sometimes linked to ordinances and regulations whose content was left unspecified. When queried, local planning officials frequently could not identify a specific LDR that is applied to achieve policies such as directing populations away from coastal high hazard areas or limiting development or public expenditures in such areas. In addition, several of the policy options

presented below require a means to review and approve amendments to local comprehensive plans and the LDRs for implementing them.

Option 17: Provide a means for correcting deficiencies in the coastal elements of local comprehensive plans and assuring their implementation through appropriate local land development regulations (LDRs).

As currently structured, the Evaluation and Appraisal Report (EAR) process for local comprehensive plans does not provide a reliable mechanism for correcting deficiencies or enhancing the utility of such plans for consistently achieving state storm hazard mitigation goals and objectives. DCA review is confined to the amendments that local governments choose to initiate. DCA is also explicitly constrained from reviewing local LDRs except under vary narrow circumstances where a substantially affected individual initiates review of a specific LDR that is alleged to be inconsistent with the provisions of a local comprehensive plan.

The political feasibility of providing a new opportunity for DCA review of local comprehensive plans other than through the EAR process may be low, while the potential for mandating specific LDRs may be even more remote. Yet the absence of such mechanisms greatly diminishes the potential to make any significant progress in achieving the state's objectives of minimize the threats and costs of coastal storm damage. It also will severely constrain implementation of the post-storm redevelopment strategies proposed by the FAU/FIU Joint Center (Metzger et al., 1993) for implementation by the Division of Beaches and Shores (see especially policies D.1 - D.8, p. 27).

Options for Enhancing the State's Land Acquisition Programs

Because land acquisition has the potential to influence the development process by removing land from the real estate market, Options 5 through 9, presented under the policy objective of preserving the

natural storm protective features of the coastal environment are also important to attaining the objectives of minimizing the threats and costs of storm damage. Two additional options are presented here as Options 17 and 18: one addresses post-storm acquisition opportunities and the other the use of purchase and resale as a means to reduce the density of development in areas subject to storm hazards.

Option 18: Provide statutory authority for expedited acquisition of coastal property under post-storm conditions.

The CARL processes for project identification, ranking, and implementation are not geared to rapid execution in a post-storm situation. If CARL is to be used for post-storm hazard mitigation acquisition, explicit provisions for expedited acquisition may be needed unless those in §253.025 FS are deemed to be adequate. If a new fund is to be established for storm hazard land acquisition as presented in Option 6, it will need provisions for such expedited initiatives.

Option 19: Give the Florida Communities Trust the authority and a mandate to acquire and replat land and resell it to achieve density reduction objectives.

The ELMS III Committee recommended that the State Legislature encourage state programs to utilize less-than-fee acquisition techniques for preservation purposes including the purchase and resale or leaseback of land with restrictions. This option represents a compromise between purchase of fee-simple property or development rights, both of which may be capital intensive, and severe regulatory restrictions on development, which may be held to be takings. Purchase, resubdividing, and resale is recommended in the FAU/FIU Joint Center study as a strategy to be employed by local governments. However, the limited leverage of the state on such practices by local governments (see preceding section on planning and regulatory mandates) suggests that use of this strategy by state agencies may

also be desirable. The California Coastal Conservancy (see Chapter 5) has been successful in purchasing coastal property and reselling it after resubdividing for lower density.

The Florida Communities Trust (FCT) is authorized to acquire land in fee-simple and hold it for up to five years, but it must eventually resell or otherwise convey it to a state or local agency or a qualified nonprofit organization. There is, therefore, no apparent authorization for the FCT to resell or lease land to the private sector after resubdividing it or imposing development restrictions, such as specific setbacks, density restrictions, etc. that might contribute to achieving state storm hazard mitigation objectives.

Options for Enhancing the State's Coastal Infrastructure Policies

As discussed in preceding sections, Florida's policies governing public expenditures for new and reconstructed infrastructure are now primarily linked to those contained in the coastal elements of local government comprehensive plans under §380.27(2) FS and §9J-5.012 FAC. Because of differences between these provisions and the state's former policies, contained in Governor Graham's 1981 executive order (E.O. 81-105) as amended in 1986, the substance of the state's policy has been changed. If objectives contained in the executive order are to be attained and the linkage to local comprehensive planning maintained, amendments are required to Chapter 380 FS and 9J-5. In the alternative, the state may consider returning to a centralized state policy that is uncoupled from the local planning process. Such a policy would permit the state to make its own judgments as to what circumstances warranted expenditure of state funds for infrastructure that will create potentially greater state liability for the costs of storm damage.

Additional problems exist with the current system because of uncertainty over how the transition should be made by state agencies in following the executive order as opposed to the dictates of Chapter 380 FS. The entire process is further limited by the absence of a formal process for

coordinating such reviews among state agencies.

Option 20: Amend Chapters 163 and 380 of the Florida Statutes, and Chapter 9J-5 of the Florida Administrative Code governing the coastal elements of local government comprehensive plans to achieve greater consistency with the storm hazard mitigation policy objectives articulated in E.O. 81-105 governing post-storm redevelopment and federally-designated Coastal Barrier Resources System units.

While Governor Graham's executive order, as amended by his letter of August 1986 to state agencies, explicitly includes post-storm redevelopment in its constraints on state agency expenditures for coastal infrastructure, §380.27(2) FS only governs "projects which increase the capacity of infrastructure." Thus as the provisions of E.O. 81-105 are phased out, state agencies will only be constrained from supporting post-storm replacement of infrastructure where the replaced facilities are intended to have increased capacity that might induce further growth that is consistent with that called for in a local government's comprehensive plan. Under §380.27(2) FS there is no formal requirement to attempt to relocate state-financed infrastructure that is vulnerable to coastal storm damage or to consider withholding state support where that vulnerability cannot be reduced.

Governor Graham's 1986 letter extended the reach of the 1981 executive order by explicitly stating that "[t]he state should not pay to expand infrastructure or economic development in any designated unit of the federal Coastal Barrier Resource System" (CBRS units). This policy is not preserved through the provisions of §380.27(2) FS since there are no requirements in Chapter 163 FS or 9J-5.012 FAC regarding CBRS units. This deficiency could be rectified by amending §380.27 FS to include a consistent state policy similar to that governing bridges to barrier islands that parallels the language of Graham's 1986 directive.

Option 21: Amend Chapters 163 and 380 of the Florida Statutes and Chapter 9J-5 of the Florida Administrative Code so as to mandate use of a single definition of the Coastal High Hazard Area by all local governments and state agencies that is consistent with risk levels that are explicit or implicit in other state policies governing natural hazards.

Chapter 380.27(2) FS altered the reach of the state's coastal infrastructure policy from barrier islands to areas designated as Coastal High Hazard Areas (CHHAs). However, neither Chapter 163 FS nor 9J-5 FAC establishes a uniform definition of the CHHA to be used by local governments. The result has been significant variation in the geographic reach of the state's coastal infrastructure policy. The 1993 ELMS bill language urging use of the Category 1 storm evacuation zone as the definition of the CHHA for planning purposes is ambiguous since it is not binding on the most important planning issues tied to the CHHA: mitigation, redevelopment, and coastal infrastructure. Our analysis also demonstrates that a CHHA linked to the Category 1 evacuation zone will be less protective in many parts of the state for areas along open sandy shores than one tied to the Coastal Construction Control Line (CCCL). A CHHA linked to the Category 3 evacuation zone combined with the CCCL would be more consistent with other state and federal policies concerned with coastal storm damage which target hazards with 100-year return frequencies.

Option 22: Initiate action through the Office of the Governor to clarify the conditions under which state agencies are to adhere solely to the provisions of §380.27(2) of the Florida Statutes as opposed to Executive Order 81-105.

Governor Graham's 1986 letter refers to the need for policies to guide agency actions during the "phase-in period of new growth management measures." However, the closing of the letter states that "[t]hese policies ... shall remain in effect until local governments implement plans, programs, and

regulations that conform with or exceed the measures outlined above." No mechanism is in place to certify whether local government comprehensive plans and regulations conform with the intent of the 1981 executive order. As noted in the preceding section of planning and regulatory mandates, the state currently has no authority to review the substance of local land development regulations. Guidance from the Governor's Office is needed on how to effect this transition.

Option 23: Establish a formal process for coordinating state agency review of coastal infrastructure decisions.

There is no mechanism in place for assuring consistent or coordinated review by state agencies under either E.O. 18-105 or §380.27(2) FS. The State Coastal Management Program within DCA prepares an annual report on the state's coastal infrastructure policy, but to our knowledge it has no means of formally monitoring, much less coordinating, such decisions. Massachusetts, which adopted a coastal infrastructure policy in 1980 that is similar to that contained in Florida's 1981 executive order, has been successful in implementing the policy through three gubernatorial administrations (see Chapter 5). The Massachusetts State Coastal Management Program coordinates the program through memoranda of agreement with applicable state agencies and formal guidelines on implementing the policy.

Option 24: Repeal §380.27(2) of the Florida Statutes, and return to a centralized state decisionmaking process that assesses the appropriateness of state expenditures for coastal infrastructure based on state policy objectives, including minimizing short-term and long-term public costs of coastal storm damage.

The problems inherent to achieving state policy objectives through local planning and land development regulations can be entirely avoided by returning to a capital investment decisionmaking process that

is keyed to state interests. Such a process would not prevent local governments from subsidizing provision of coastal infrastructure, but it could be structured so that all liability for long-term maintenance and repair, including post-storm reconstruction, would lie with the local government and/or private sector entities that choose to build the facilities initially. Such a policy would contribute to reducing both the risks and the costs of storm damage to the extent that it discourages development in areas prone to coastal storms. Where development proceeds despite withholding of state financial support, the state's objective of allocating costs to the private sector in proportion to risk is still achieved.

One element of the state's infrastructure policy remains unambiguous and independent of the provisions of local comprehensive plans. The barrier island bridge policy contained in §380.27(2) FS has reportedly operated successfully. However, its scope is very restricted and does not offer equal comparable constraints to development of interior islands which are subject to threats from coastal storms that are largely similar to those on barrier islands.

Option 25: Extend the state's barrier island bridge policy to all unbridged coastal islands.

Limitation of Florida's current policy (§380.27(1) FS) restricting state expenditures for bridges and causeways to unbridged islands that qualify as barrier islands does not provide equal protection to all hazardous coastal islands. In areas such as the southwest coast, for instance, the storm surge and wind damage vulnerability of many sheltered islands is not significantly different from that of barrier islands that front the Gulf. Thus the risks to public safety, private property, and public infrastructure are comparable as are the potential costs incurred by state and local governments in planning for, responding to, and mitigating the damage from coastal storms.

Options for Enhancing Education and Information

The principal education and information policy instrument that may contribute to minimizing the threats and costs of coastal storm damage, aside from technical assistance in concert with other state programs, is use of a hazard disclosure mechanism to alert the purchasers of coastal property to the hazards of such sites. The current notice requirements governing the state's CCCL permit program do not provide direct notice to individuals contemplating purchase of coastal property that is prone to coastal storm damage.

Option 26: Enact legislation modelled on the proposed Massachusetts bill that would require early and accurate notice to prospective buyers of property within some clearly defined coastal hazard area.

The Massachusetts Coastal Management Program has sponsored state legislation requiring notification of prospective purchasers of residential real estate of coastal flooding and erosion hazards by sellers and real estate agents. It is designed to avoid the shortcomings of similar notice requirements that have been tried in California for earthquake risk zones but have been ineffective, in part because of the late timing and form of the notice given (see Chapter 5). There is also a lender notice requirement under the National Flood Insurance Program, and in North Carolina and South Carolina. North Carolina's is linked to its coastal permitting program, while South Carolina requires notification during real estate transactions. Aside from an analysis of the California notice requirement, we have found little information on the effectiveness of such measures. North Carolina's appears to be motivated at least in part to limit the liability of the Coastal Resources Commission which administers the state permitting program.

REDUCE VULNERABILITY OF PUBLIC FACILITIES AND INFRASTRUCTURE TO STORM DAMAGE

Policy instruments that limit development in coastal areas subject to storm damage will also serve to

reduce the vulnerability of public facilities and infrastructure if the result is to limit the extent to which new facilities and infrastructure are built in hazardous areas. Thus policy options focused on coastal land acquisition, local government planning mandates, and the state's coastal infrastructure policies will also contribute to achieving this policy objective. Relevant policy options include Options 5 through 9, 17 through 19, 21, and 25. One additional option is presented here concerning the recently created Hurricane Catastrophe Fund.

Option 27: Require that the cost-effectiveness of relocation of infrastructure vulnerable to coastal storm damage be assessed as a condition to any grants made from the Hurricane Catastrophe Fund for protecting local infrastructure.

The Hurricane Catastrophe Fund will provide grant funds to local governments, state agencies, and nonprofit charitable organizations for projects to protect local infrastructure from hurricane damage. While such grants will contribute to this policy objective, they may better achieve this objective and others if applicants are required to evaluate the option of relocating the vulnerable infrastructure.

ALLOCATE PUBLIC COSTS TO PRIVATE SECTOR IN PROPORTION TO RISK

Few of the state's existing policies or programs offer the potential to more equitably allocate the public costs of storm hazard mitigation to those in the private sector who choose to occupy areas prone to coastal storm damage. Where local governments create special districts to pay the local share of beach erosion control projects that are partially supported by the state and federal governments, this objective is roughly attained. Where federal, state, and local funds are withheld for constructing and repairing infrastructure that supports development in areas subject to coastal storm damage, private property owners are forced to assume a higher proportion of the costs they otherwise impose on the public sector.

A strategy that could be employed to achieve this objective, and the broader goal of minimizing the public costs of storm damage, would be to assess property owners for all of the public costs of planning for, responding to, and mitigating coastal storm damage, in accordance with the risks posed by the uses people make of land that is susceptible to such storms. Two options are outlined here. One builds upon two recent legislative initiatives that created the Hurricane Catastrophe Fund and the Emergency Management, Preparedness, and Assistance Trust (EMPAT) Fund. The other involves creation of regional special purpose districts to provide storm hazard planning and management services based on fees tied to different risk zones.

Option 28: Impose a risk-based surcharge on all commercial and residential property insurance policies to cover the costs of planning for, responding to, and mitigating coastal storms.

Prior to creation of the EMPAT fund, virtually all state emergency management costs, other than those covered by federal assistance under the Disaster Relief (Stafford) Act, have been funded from the state general fund. Thus members of the public who live in less hazardous areas of the state have subsidized planning, recovery, response, and mitigation initiatives for those who live in areas more prone to disasters. The EMPAT Fund, created during the 1993 session of the State Legislature, imposes a flat, annual surcharge on property insurance policies sold in the state to raise additional funds for such purposes: $2 per residential policy and $4 per commercial policy. Proceeds are to be used to supplement existing general revenue funds for state relief assistance for non-federally declared disasters, administration of state and local emergency management programs, and grants for projects to enhance emergency preparedness, response, and recovery.

While the EMPAT Fund generates more revenue, it does nothing about the inequitable fashion by which state emergency management services are funded. An approach similar to the surcharge could be

employed, however, to cover all of the state (and perhaps local) costs of emergency preparedness, response, recover, and mitigation tied to coastal storms. To achieve the policy objective of allocating public costs in accordance with risks imposed by private sector actors, the surcharge would have to be based on some measure of risk. Such a measure might be derived from the formula being developed for assessing premiums against property insurance companies in the state for financing the Hurricane Catastrophe Fund, which was created during the 1993 special legislative session. That formula is to be developed on a zipcode basis through an analysis of simulated storm events to predict damage estimates based on wind speed, angle of approach, terrain, types of construction, and other factors.

Option 29: Establish regional hurricane mitigation districts as a means of coordinating and providing the emergency management services necessitated by hurricanes and other severe storms and for assessing the costs for those functions on the basis of relative risk.

One of the major shortcomings of Option 28 is that not all property is covered by property insurance. However, it has the benefit of using a taxing vehicle that has already been legitimized. An alternative model that would reach all property owners is one modeled in part on the regional water management districts which are financed by ad valorem taxes based on a uniform millage rate within each district. The water management districts have set a precedent, supported by state case law, that allows the legislature to allocate a state function to special districts. However, the millage rate within a district must be constant. Thus a risk-based system might be designed so that individual district boundaries are defined by broad categories of risk (perhaps some combination of SLOSH storm surge zones and hurricane wind frequency zones).

It is our understanding that such districts could contract with other state agencies to provide specific

services. Therefore, it is possible to create a system that maintains the central functions of the Division of Emergency Management (DEM) within the Department of Community Affairs, while assigning other functions to the regional hurricane mitigation districts that are more effectively accomplished at that scale. The ad valorem taxes raised by the districts could be used to finance all contracted DEM services and those of the districts that are connected with preparedness, response, recovery, and mitigation of coastal storms and hurricanes. These might include the state share of federal §404 hazard mitigation grants and §409 hazard mitigation plans as well as the funds for a dedicated storm mitigation land acquisition program such as that described in Option 6.

FORGING A FEASIBLE STRATEGY

We have presented a menu of options in the preceding section that spans a broad range from fine-tuning regulatory programs to a radical restructuring of how storm hazard management is administered and funded. As we note in the preface, most initiatives that would enhance attaining the goals of protecting coastal environmental resources and protecting life and property require additional intervention by the state, either through planning and regulatory mandates to local governments or through direct regulation or manipulation of the development of coastal lands prone to storm damage. If new regulatory and land acquisition initiatives are avoided entirely, the most the state can do is attempt to limit its costs by transferring them to those who choose to occupy lands that are at greatest risk of coastal storm damage. The resultant increases in the costs of living and working in hazardous coastal areas may deter development in, and promote retreat from, the most hazardous locations. If the cost increases are not sufficient to motivate changes in behavior, the state will, at the least, have reduced its costs and more equitably allocated the costs it must bear to those who incur them.

A feasible strategy for enhancing achievement of the state's storm hazard mitigation goals must take account of the constraints posed by the physical and social environment. As we have demonstrated

here, policy instruments that focus on development will be constrained by the extent to which coastal land has already been subdivided and built upon. Policies that target the post-storm window of opportunity are constrained by the infrequency of such opportunities, the small and sometimes discontinuous areas that are affected, the brief interval of the opportunity, and the great reluctance of people to abandon their financial and emotional investments in coastal property. New initiatives are also constrained by political forces that oppose state government intervention in land use decisionmaking by local governments and the private sector and, perhaps, by a limited political constituency that views storm hazard mitigation as a priority for investment of public resources.

In the final sections that follow, we characterize configurations of policy options that can contribute to advancement of the state's storm hazard mitigation goals as 1) fine-tuning, 2) incremental change, and 3) policy innovations. Fine-tuning of existing statutes, regulations, and programs will generally have modest impacts. Some of the incremental changes, however, may yield substantial enhancements over current policies and programs. The most significant improvements, however, will require innovations that necessitate substantial changes in the allocation of public resources or in the role of state government in influencing the behavior of its citizens.

PROTECTING COASTAL ENVIRONMENTAL RESOURCES

Our analysis suggests that greater protection of coastal resources can be partly accomplished through a combination of fine-tuning of existing statutes (Option 5) and incremental changes to current regulations (Options 1-3), land acquisition mechanisms (Options 7 and 8), economic incentives for relocating imminently endangered structures (Option 9), and state expenditures for analyzing critically eroding beaches (Option 10). Substantial gains in achieving this goal, however, will require two major policy innovations: 1) establishing a separate and dedicated source of funding for acquiring lands to achieve storm hazard mitigation objectives (Option 6); and 2) requiring the relocation of habitable structures at sites with receding shorelines before they interfere with natural beach processes and

intrude upon the sovereign beach (Option 4).

PROTECTING LIFE AND PROPERTY

Enhancing protection of life and property from the hazards of coastal storms will require policy initiatives focused primarily on two objectives: 1) reducing the vulnerability of private buildings and facilities; and 2) managing the development and redevelopment of land. Current policies that address the third objective under this goal, altering the coastal environment to protect life and property, appear adequate. Progress on the first objective may be more feasible because it involves incremental changes to existing state regulatory and funding programs. Significant advances on the second objective will require a substantial departure from recent views of the state's role in guiding and influencing land use planning and regulation.

Reducing the Vulnerability of Buildings and Facilities

Extension of the state's regulation of design and construction standards to all areas of the state's coasts (Option 11) coupled with revisions to the state's mandates governing local building codes (Option 12) can resolve the problem of inconsistent protection of habitable structures that face comparable risks from coastal storms. Effective application of these standards under post-storm conditions can be increased by incremental change to the substantial improvement/damage threshold under the state's coastal construction regulatory programs (Option 13), expanded capacity to enforce building codes in post-storm circumstances (Option 14), and initiatives to assure that property owners hold adequate insurance to cover bringing substantially damaged structures up to code (Options 15 and 16). Option 16, which suggests employing the leverage generated by creation of the Hurricane Catastrophe Fund, represents a more significant innovation that will require further study and, perhaps, substantial political leadership.

Managing Development and Redevelopment to Minimize Threats

Fine-tuning of the CARL land acquisition process may marginally enhance its applicability in post-storm circumstances (Option 18), but the more radical step of creating a separate, dedicated source of funds for storm hazard land acquisition (Option 6) appears essential if purchase of fee-simple property rights is to have any substantial impact on the development or redevelopment of coastal land.

Incremental changes to the state's barrier island bridge policy (Option 25) would provide more consistent state policy governing one form of growth-inducing infrastructure, but the current dichotomy between the state's earlier infrastructure policy, set forth in Governor Graham's 1981 executive order, and the policy established through 1985 amendments to Chapter 380 FS, necessitate more substantial changes if a consistent and effective state policy governing coastal infrastructure is to be achieved.

Absent any change to Chapter 380 FS, clarification is needed from the Governor's Office on the present status of the 1981 executive order (Option 22), and a formal process is needed to coordinate state agency decisions on coastal infrastructure (Option 23). If the state is to rely entirely on the mechanism defined in Chapter 380 FS, and there is a commitment to using that process to achieve state policy objectives, a combination of marginal and innovative policy changes will be required. Incremental changes are needed in the statutes and regulations governing the coastal elements of local comprehensive plans (Options 20 and 21) to achieve a consistent statewide policy that includes policy objectives defined in the earlier executive order. To be effective, however, these must be coupled with significant changes in the state's authority to mandate amendments to local comprehensive plans and adoption of local land development regulations that will achieve storm hazard mitigation goals (Option 17). A third option, which also represents a major shift in current policy, is to return to a centralized state policy that is uncoupled from the local planning process (Option 24). Such a policy would permit the state to make its own judgments as to what circumstances warranted expenditure of state funds for infrastructure that will create potentially greater state liability for the costs of storm damage.

Two other options which constitute entirely new initiatives may further contribute to the state's ability to influence the development of land so as to minimize the threats posed by coastal storms: 1) mandating provision of hazard disclosure information to prospective purchasers of property in hazardous coastal areas (Option 26); and 2) directing the Florida Communities Trust to actively buy and sell real property to reduce development densities in areas prone to coastal storm damage (Option 19).

MINIMIZING THE PUBLIC COSTS OF STORM DAMAGE

The options listed for achieving the objective of minimizing the threats of coastal storm damage through managing the development and redevelopment of coastal land (Options 17-26) will have similar impacts on reducing the public costs that result from such development and redevelopment. Most of these options will also reduce the vulnerability of public infrastructure by limiting the installation of infrastructure in areas most prone to coastal storm damage. Option 27, which fine-tunes provisions governing grants from the Hurricane Catastrophe Fund, would also contribute to this policy objective.

The greatest gap in the state's current array of policy instruments is the absence of effective means of allocating the public costs of coastal storms to those who incur them by occupying hazardous coastal lands. Options 28 and 29, both of which constitute major departures from current state policies, offer alternative means of addressing this gap. Option 28 is constrained by its linkage to property insurance policies which are not held by all owners of coastal property. Option 29 is more inclusive but will require significant further study and debate. Neither of these options need stand alone. They are complementary to all the other policy instruments and are best viewed as providing balance to a comprehensive set of policies that address all three of the state's storm hazard mitigation goals.

ENDNOTES TO CHAPTER 6

1. These data evidently are limited to areas under the jurisdiction of the state's CCCL permitting program. Thus, they exclude Monroe County, the Big Bend counties from Pasco north to Wakulla, and portions of some other counties (e.g., Collier) that do not have sandy shorelines.

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APPENDIX A

A COMPARISON OF THE RELATIVE POSITIONS OF THE COASTAL CONSTRUCTION CONTROL LINE, THE FEMA V-ZONE, AND SLOSH HURRICANE STORM SURGE ZONES

INTRODUCTION

In preparing the coastal element of their comprehensive plans, local governments are required to designate a coastal high hazard area (CHHA). State regulations allow local governments to base their CHHAs on a number of references including coastal velocity zones (V-zones) designated by the Federal Emergency Management Agency (FEMA) under the National Flood Insurance Program, the coastal construction control line (CCCL) delineated by the Florida Department of Environmental Protection, Division of Beaches and Shores under Chapter 161 of the Florida Statutes, and hurricane evacuation zones. Hurricane evacuation zones, which are defined by county emergency management officials, typically conform more or less with the storm surge zones delineated by SLOSH model analyses prepared for individual counties by regional planning councils or the Florida Department of Community Affairs.[1] The 1993 ELMS bill directs all local governments to use the Category 1 storm evacuation zone as a common basis for defining the CHHA for "planning purposes."

This appendix analyzes the spatial relationship between V-zones, CCCLs, and SLOSH storm surge zones for different hurricane categories. This analysis shows that in many places along the coast, the landward extent of the CCCL exceeds that of the Category 1 storm surge zone, and in some cases, the Category 3 zone. We also found that the correspondence between categorical storm evacuation zones and SLOSH storm surge zones varies substantially among the counties. Our results suggest that CHHAs based on a combination of the CCCL and the Category 3 storm surge zone (or corresponding evacuation zone) will provide a more uniform definition of the CHHA that is

more nearly consistent with levels of risk typically accounted for in other planning strategies that concern natural hazards (see discussion in Chapter 3).

METHODOLOGY

To assess the relationship between these three policy instruments; the FEMA V-zone, the SLOSH model storm surge/hurricane evacuation zones, and the coastal construction control line (CCCL), seven study areas were selected in the state. Counties were selected as study areas because maps for all three policy instruments are prepared on a county wide basis and emergency management functions are located at the county level. The selected counties are distributed throughout the state, and possess unique geographic features. The distribution of counties also takes into account the effects of hurricanes making landfall from a variety of directions at different locations in the state. The study area includes Duval, Brevard, Dade, Monroe, Collier, Sarasota, and Wakulla counties.

The three maps used in this comparison are prepared by different sources. The FEMA V-zone is recorded on flood insurance rate maps (FIRMs) prepared for the National Flood Insurance Program by FEMA. These maps are used to determine whether structures are eligible for U.S. government-backed flood insurance based on their geographic location and relative elevation. The CCCL maps are prepared by the Division of Beaches and Shores, of the Florida Department of Environmental Protection (DEP), formerly the Florida Department of Natural Resources (DNR). These maps indicate the location of the CCCL which is used to define that portion of the beach and dune system subject to the erosion effects of a 100-year storm surge. The maps consist of a series of aerial photographs. In areas of the state where there are no sandy beaches, such as Monroe and Wakulla County, no CCCL map is prepared. The SLOSH storm surge maps, also known as hurricane storm tide atlases, were prepared by the regional planning councils (RPCs) or the Florida Department of

Community Affairs. While most of the SLOSH maps are prepared for individual counties, some of the older maps were prepared for larger regions. Data for Duval and Dade County were taken from these older SLOSH model maps.

Forty-seven measurement points were selected throughout the study counties. Measurement points were selected using two criteria. First, measurement points were identified where the relative positions between policy lines changed from the previous measure. Changes are often caused by geographic features which in turn play a significant role in influencing the path of damage caused by a storm. The second criterion employed was that a measurement point be easily indexed on all three maps. As often as possible, measurements were made from the intersections of labeled streets. In the cases where this was impossible, measurements were taken relative to geographic landmarks easily identifiable on all three maps.

All measurements were made by hand using a drafting ruler with a 1/50 inch accuracy. Each map has a different scale. The SLOSH storm surge maps were least accurate. The scales of these maps ranged from 1 inch to 4,000 feet to 1 inch to 4,800 feet. Because of the scale and the thickness of the lines used to delineate the zones, measurements made from these maps have a margin of error of +/- 100 feet. The FIRMs indicating FEMA V-zones were considerably more accurate than the SLOSH model storm surge maps. The scale used on the FIRMs ranged from 1 inch to 500 feet to 1 inch to 1,000 feet. The measurements made from these maps have a margin of error of +/- 5 feet. The CCCL maps are the most accurate; all are prepared to a scale of 1 inch to 200 feet. The margin of error for measurements made from these maps is +/- 4 feet.

In addition to these measurements, the emergency management directors for each of the counties were contacted to determine the extent to which hurricane evacuation zones coincide with the boundaries of the SLOSH storm surge zones. As was made evident from these interviews, actual

evacuation policy often exceeds the boundaries established by the three policy lines. Factors such as evacuation routes, remoteness of barrier islands, and the quality of housing stock all influence the decisions made by the emergency management directors. It should be noted, however, that all of the interviewees expressed a general interest in seeing a uniform designation for the CHHA.

The analysis is organized by county, moving from the northeast section of the state, south around the Keys, and back north to the Big Bend. It should be noted that data for panhandle counties west of Wakulla were unavailable at the time this analysis was conducted. The data used in this analysis were collected between September 1 and December 1, 1993. The analysis of each county is divided into three sections. The first describes the geographic features and political subdivisions of the study area. The second summarizes the evacuation policy exercised by the county emergency management director. The third describes in detail each measurement location and summarizes the relationships between the policy lines from the three maps at each location. This third section includes a brief description of the measurement location, a table that tracks the distance of each policy line from the reference point, an index summarizing the location of each policy line relative to the coast, and a table that includes the widths of each line relative to the most seaward line. Two tables are included at the end of this appendix. Table A.1 records the relative positions of the various policy lines at all forty points throughout the state. Table A.2 presents a contact list for the seven emergency management directors or staff that were interviewed.

ANALYSIS

DUVAL COUNTY

Features of the Study Area

Duval County has a sandy coast comprised of three barrier islands bounded on the west by the Intracoastal Waterway and the east by the Atlantic Ocean. The CCCL map used in this study was

prepared on January 4, 1981. The storm surge atlas (also referred to as the SLOSH model map) was funded by FEMA and published in June of 1988. The SLOSH model map is for northeast Florida (Nassau, Duval, and St. Johns counties). Only the section of the map for Duval County was used in this analysis. The FIRMs used in this study are dated August 15, 1989 and April 15, 1992. Separate FIRMs were consulted for the incorporated cities within the county. The FIRMs for Atlantic Beach, Jacksonville Beach, and Neptune Beach were dated April 17, 1989.

The Atlantic coast of Duval County extends south from the county's northern border with the Nassau River. The first major barrier island is Little Talbot Island, bounded on the north by Nassau Sound. The island is labeled Little Talbot Island State Park on the CCCL map. Little Talbot Island is bounded on the south by Fort George Inlet. Fort George Island, which appears uninhabited on the CCCL map is bounded on the north by the Fort George Inlet and on the south by the mouth of the St. Johns River. Batton Island is a small island located south of Fort George Island in the mouth of the St. Johns River. The island is labeled as Huguenot Park on the storm surge map. The main barrier island forming the inhabited coastal area of the county extends southward from the mouth of the St. Johns River beyond the Duval/St. Johns County border. The towns of Seminole Beach, Manhattan Beach, Atlantic Beach, Neptune Beach and Jacksonville Beach are located on this island.

Emergency Management Contact Interview

Hastings Williams, Jr. is the Director of Civil Defence for Duval County. The contact person that provided information for this report was Mr. Andrew Sykes. The interview was conducted by telephone on November 18, 1993. Mr. Sykes indicated that hurricane evacuation zones are based in part on the storm surge maps, but not exclusively. In the event of a Category 1 or 2 storm a voluntary evacuation order is given. The reason why people are urged to evacuate even for Category 1 or 2 storms is that it is difficult to get assistance to some of the coastal areas even

under the best conditions due to limited access. Also, the possibility of the storm increasing helps shape this decision. With a Category 1 or 2 storm it is recommended that all mobile home dwellers in the county evacuate. With a Category 3 or greater storm, the entire barrier islands are evacuated. Mr. Sykes mentioned that there is no evacuation problem north of the St. Johns River because the area is generally uninhabited. Big Talbot Island, most of which is owned by the state, has approximately 12 dwelling units only.

Comparative Measurements

Measurement 1: The first measurement is taken in an area labeled Talbot Island State Park on the SLOSH model map. The measurement reference point is located next to the first parking lot complex north of Fort George Inlet, where Route A1A begins to turn southwestward. All measurements are taken relative to the southwest corner of the southern intersection of the road looping eastward to form the parking area north of Fort George Inlet and Route A1A.

V-zone	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
375'	960'	635'	(-) 210'	(-) 635'	(-) 42,980'	(-) 43,610'
Seaward	Seaward	Seaward	Landward	Landward	Landward	Landward

Going from land to the Atlantic the zones are:

LAND - Category 5 - Category 4 - Category 3 - Category 2 - V-zone - Category 1 - CCCL - ATLANTIC

The CCCL appears to be the most narrow.

The Category 1 zone is wider than the CCCL by 325'.

The V-zone is wider than the Category 1 zone by 260'.

The Category 2 zone is wider than the V-zone by 585'.

The Category 3 zone is wider than the Category 2 zone by 410'.

The Category 4 zone is wider than the Category 3 zone by 42,345'.

The Category 5 zone is wider than the Category 4 zone by 630'.

Measurement 2: This measurement is taken at Kathryn Abbey Hannah State Park in Manhattan Beach. The storm surge zones are interesting at this point because Pablo Creek lies approximately two miles landward from the coast. As a result, the area immediately landward of the reference point is within the Category 3 zone but it returns to Category 1 and 2 zones along the creek valley as one moves further landward. The effects of the St. Johns River valley are noticeable in the same fashion. This situation where lower category storm surge areas occur landward of higher category storm surge zones is also seen extensively in Wakulla County. All measurements are relative to the eastern side of Seminole Beach Road at the intersection with Wonderwood Drive.

V-zone (EL-17)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
400'	300'	315'	210'	(-) 25,345'	(-) 25,765'	(-) 26,085'
Seaward	Seaward	Seaward	Seaward	Landward	Landward	Landward

Going from land to the Atlantic the zones are:

LAND - Category 5 - Category 4 - Category 3 - Category 2 - CCCL - Category 1 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 1 zone is wider than the V-zone by 85'.

The CCCL is wider than the Category 1 zone by 15'.

The Category 2 zone is wider than the CCCL by 90'.

The Category 3 zone is wider than the Category 2 zone by 25,455'.

The Category 4 zone is wider than the Category 3 zone by 420'.

The Category 5 zone is wider than the Category 4 zone by 320'.

Measurement 3: The effects of the St. Johns River are also exhibited in this measurement area. The measurement is taken in the City of Atlantic Beach at the point where Second Street North intersects with Seminole Beach Road. At this point Seminole Beach Road begins to turn southwest. All measurements are relative to the eastern most side of Seminole Beach Road at the four way intersection formed by Seminole Beach Road, Second Street North and another unlabeled residential road heading south.

V-zone (EL-15)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
820'	795'	845'	740'	210'	(-) 20,064'	(-) 21,860'
Seaward	Seaward	Seaward	Seaward	Seaward	Landward	Landward

Going from land to the Atlantic the zones are:

LAND - Category 5 - Category 4 - Category 3 - Category 2 - CCCL - V-zone - Category 1 - ATLANTIC

The Category 1 zone appears to be the most narrow.

The V-zone is wider than the Category 1 zone by 25'.

The CCCL is wider than the V-zone by 25'.

The Category 2 zone is wider than the CCCL by 55'.

The Category 3 zone is wider than the Category 2 zone by 530'.

The Category 4 zone is wider than the Category 3 zone by 20,274'.

The Category 5 zone is wider than the Category 4 zone by 1,796'.

Measurement 4: The next measurement location seems to be characterized by a ridge line running just landward of the coast as the distance between each storm surge zone is very narrow at this point. It should be noted that, as with previous measurements, lower category storm surge zone fall landward of higher category zones in areas that include river valleys. The measure is taken in Neptune Beach. The Duval County Storm Tide Atlas indicates a "seawall, minimum elevation 11 feet" along the coast at this location. All measurements are relative to the east side of 3rd Street North, at the intersection of Florida Boulevard and 3rd Street North.

V-zone (EL-21)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
1,000'	975'	900'	790'	315'	(-) 17,530'	(-) 20,380'
Seaward	Seaward	Seaward	Seaward	Seaward	Landward	Landward

Going from land to the Atlantic the zones are:

LAND - Category 5 - Category 4 - Category 3 - Category 2 - Category 1 - CCCL - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The CCCL is wider than the V-zone by 25'.

The Category 1 zone is wider than the V-zone by 75'.

The Category 2 zone is wider than the Category 1 zone by 110'.

The Category 3 zone is wider than the Category 2 zone by 475'.

The Category 4 zone is wider than the Category 3 zone by 17,845'.

The Category 5 zone is wider than the Category 4 zone by 2,850'.

Measurement 5: This measure is taken in Jacksonville Beach. Geographically, it shares similar features to previous measures but it is within a different political subdivision. The Duval County Storm Tide Atlas indicates a "seawall, minimum elevation 12 feet" along the coast at this location.

All measurements are relative to the southeast corner of Beach Boulevard (Route 212) and 3rd Street North (A1A).

V-zone (EL-17)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
850'	865'	685'	580'	*	(-) 17,110'	(-) 18,160'
Seaward	Seaward	Seaward	Seaward	At Reference	Landward	Landward

Going from land to the Atlantic the zones are:

LAND - Category 5 - Category 4 - Category 3 - Category 2 - Category 1 - V-zone - CCCL - ATLANTIC

The CCCL appears to be the most narrow.

The V-zone is wider than the CCCL zone by 15'.

The Category 1 zone is wider than the V-zone by 180'.

The Category 2 zone is wider than the CCCL by 105'.

The Category 3 zone is wider than the Category 2 zone by 580'.

The Category 4 zone is wider than the Category 3 zone by 17,110'.

The Category 5 zone is wider than the Category 4 zone by 1,050'.

Measurement 6: The final measurement is also taken at Jacksonville beach at the Duval County/St. Johns County border. All measurements are relative to the east side of 3rd Street South (A1A) at the border. Storm surge Category 1 is adjacent to Category 3 along A1A, there is no Category 2 indicated at this point. Also, CCCL information is not available for this point because the line on the map is not drawn to the St. Johns County border.

V-zone (EL-20)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
350'	N/A	*	N/A	(-) 420'	(-) 16,790'	(-) 19,750'
Seaward		At Reference		Landward	Landward	Landward

Going from land to the Atlantic the zones are:

LAND - Category 5 - Category 4 - Category 3 - Category 1 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 1 zone is wider than the V-zone by 350'.

The Category 3 zone is wider than the Category 1 zone by 770'.

The Category 4 zone is wider than the Category 3 zone by 16,370'.

The Category 5 zone is wider than the Category 4 zone by 2,960'.

BREVARD COUNTY

Features of the Study Area

The date of the photography on the CCCL map used in this study area is October 25, 1985. This CCCL map has both an existing and a proposed CCCL drawn on it. In a conversation with Philip Flood, at DEP's Division of Beaches and Shores, it was made apparent that the proposed line is currently the legal CCCL and therefore it has been used as the reference for this study. The date on the entire map package is November 1986. The SLOSH model map, formally entitled the Hurricane Storm Tide Atlas for Brevard County/J.F.K. Space Center was prepared by Post, Buckley, Schuh and Jernigan, Inc. Category 1, 3 and 5 storm surge zones were indicated on this map. Only Category 1 and 3 storm surge/hurricane evacuation zones were used in this study. The date on this map is September 1990. The FIRMs used in this study are for Brevard County and the incorporated areas within the county. The FIRMs are dated April 3, 1989 and August 18, 1992.

The northernmost section of barrier island in Brevard County is the Canaveral National Seashore. This parcel is formed from two spits of land that extend northward from Merrit Island. Merrit Island, just northeast of Titusville, lies between Cape Canaveral and the mainland coastline. At the widest points, both Cape Canaveral and landward lying Merrit Island are U.S. government property. Merrit Island is the National Wildlife Refuge and Cape Canaveral is the J.F.K. Space Center and the Air Force Station.

The southern tip of Merrit Island lies within the county's jurisdiction, extending in a narrow "barrier-like" spit. This strip of land lies between the mainland and the Cape Canaveral barrier island. The county section of Cape Canaveral begins at the City of Cape Canaveral, just south of Port Canaveral. The county or incorporated cities govern the barrier island from this point to the southern border of the county, at Sebastian Inlet.

As the majority of land on Merrit Island is U.S. government owned, and all the land on the Cape north of Port Canaveral is also owned by the federal government, the CCCL and the FEMA V-zones do not apply to these areas. It should be noted that these lands, as well as the entire "inner coast," or mainland, are subject to Category 1 and 3 hurricanes to varying degrees even though not subject to CCCL designation.

Emergency Management Contact Interview

Tony Carper, the Director of the Brevard County Office of Emergency Management, was contacted on September 24, 1993, regarding the relationship between the storm surge zones on the SLOSH model map and county evacuation protocol. Mr. Carper indicated that there is some correspondence but not entirely. For all landfalling storms of Category 1, 2, or 3, everyone is evacuated from the barrier islands. With Categories 4 or 5, they evacuate everyone to the east side of US Route 1, between US Route 1 and the Indian River Lagoon. For all exiting storms (such as

Donna), an operational decision is made according to how bad the storm looks. If the exiting storm is of Category 3, 4, or 5, they would effect some evacuation to provide access and ensure the provision of emergency services. Mobile homes are automatically evacuated for all storms of hurricane intensity (all categories).

As much of the county's coast is federal land and developed as U.S government installations, these areas are not directly under the county's jurisdiction. County orders to evacuate are not binding on the federal installations but they share a close relationship. While the federal authorities are not required to follow the county's lead, they are committed to do so. All federal employees are evacuated according to county guidelines (primarily because almost all of these people live in Brevard County). Mr. Carper went on to say that he "welcomes some uniform policy recommendations," regarding hurricane evacuation and indicated that "the CCCL and the V-zones have no practical relationship to evacuation as it is done in Brevard County."

Comparative Measurements

Measurement 1: The first measurement is taken from the terminus, or seaward side of Jetty Road. All measurements are relative to the terminus of Jetty Road.

V-zone (EL-12)	CCCL	Category 1	Category 3
150'	(-) 60'	500'	(-) 3,650'
Seaward	Landward	Seaward[1]	Landward[2]

[1] On the flood insurance map this measure extends 120' seaward of the line drawn to represent the coast, on the CCCL map this measure is at the point where beach and ocean meet in the areal photo.

[2] This point is marked on the hurricane map with a 15 inside a triangle. The landward extension of the Category 3 zone at this "point 15" is referenced to a map legend. The legend indicates that at this point, a Category 1 storm is 1.9 and a Category 3 storm is 3.6 feet above N.G.V.D.

Going from Land to the Atlantic the zones are:

LAND - Category 3 - CCCL - V-zone - Category 1 - ATLANTIC

The Category 1 zone appears to be the most narrow.

The V-zone is wider than the Category 1 zone by 350'.

The CCCL is wider than the V-zone by 210'.

The Category 3 zone is wider than the CCCL by 3,590'.

Measurement 2: The second measurement was taken at Cocoa Beach. The measurements are relative to the seaward side of A1A (Atlantic Boulevard) at the Minuteman Causeway. The measurements were taken at the southeast corner of the intersection.

V-zone (EL-13)	CCCL	Category 1	Category 3
190'	50'	240'	160'
Seaward	Seaward	Seaward	Seaward

Going from land to the Atlantic the zones are:

LAND - CCCL - Category 3 - V-zone - Category 1 - ATLANTIC

The Category 1 zone appears to be the most narrow.

The V-zone is wider than the Category 1 zone by 50'.

The Category 3 zone is wider than the V-zone by 30'.

The CCCL is wider than the Category 3 zone by 108'.

Measurement 3: The third measurement was taken at an area labeled "Shorty's Pocket" on the Hurricane map, between "Snug Harbor" and "Edwards Bay" as indicated on the Flood Insurance Rate Maps. This measurement point was selected because it appears as if the Category 3 zone abuts the oceanfront with no Category 1 zone being present. The Category 1 zone narrowed away since Measurement 2. All measurements are relative to the seaward side of A1A at 13th Street, the southeast corner.

V-zone (EL-13)	CCCL	Category 1	Category 3
190'	20'	N/A	160'
Seaward	Seaward		Seaward

Going from land to the Atlantic the zones are:

LAND - CCCL - Category 3 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 3 zone is wider than the V-zone by 30'.

The CCCL is wider than the Category 3 zone by 140'.

Measurement 4: The fourth measurement attempts to categorize the relationships between the zones at a point on the coast where the Category 3 zone has narrowed away, leaving the Category 5 zone abutting the coast. This condition begins within Patrick Air Force Base and continues southward to Satellite Beach, approximately 3 3/4 miles. This measurement was taken 1 1/3 miles south of the northernmost indication of this strip, where federal ownership gives way to county/private land. All measurements are relative to the seaward side of A1A at the Pineda Expressway (4th Street). Both roads are 4 lanes and the measurements were taken from the southeast corner.

V-zone (EL-14)	CCCL	Category 1	Category 3
270'	(-) 95'	N/A	N/A
Seaward	Landward		

Going from land to the Atlantic the zones are:

LAND - CCCL - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The CCCL is wider than the V-zone by 365'.

Measurement 5: South of Satellite Beach, as we move from Plate 7 to Plate 8 on the Hurricane zone map, a Category 3 zone returns along the oceanfront, running approximately 3 1/3 miles to a point where the oceanfront is not subject to a hurricane categories (1, 3, or 5). The fifth measurement was taken near the midpoint of this strip, adjacent to Indian Harbour Beach Park. All measurements are relative to the southeast, seaward corner of A1A and Pinetree Drive.

V-zone (EL-13)	CCCL	Category 1	Category 3
220'	*	N/A	80'
Seaward	At Reference		Seaward

Going from land to the Atlantic the zones are:

LAND - CCCL - Category 3 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 3 zone is wider than the V-zone by 140'.

The CCCL is wider than the Category 3 zone by 80'.

Measurement 6: The conditions of the coast change at this reference point. The coastline is not affected by Category 1, 3, or 5 storms. This condition extends southward for 12 miles from the previous measurement. It is most likely the result of the presence of seawalls along the coast which are visible in the aerial photographs on the CCCL map. This measurement was taken within this zone, in the Town of Melbourne Beach. All measurements are relative to the southeast, seaward corner of A1A and Ocean Avenues (which appears to provide beach access).

V-zone (EL-13)	CCCL	Category 1	Category 3
120'	(-) 100'	N/A	N/A
Seaward	Landward		

Going from land to the Atlantic the zones are:

LAND - CCCL - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The CCCL is wider than the V-zone by 220'.

Measurement 7: Within the 12 mile stretch of land that appears to be protected by a seawall and is not subject to Category 1, 3, or 5 storms at the oceanfront, there is a small stretch of beach near Coconut Point that appears to be subject to Category 1 hurricanes. The seventh measurement is taken in this area. All measurements are relative to the southwest, landward corner of A1A and the no-name road just south of Coconut Point.

V-zone (EL-13)	CCCL	Category 1	Category 3
320'	*	120'	N/A[2]
Seaward	At Reference[1]	Seaward	

[1] The CCCL runs through the reference point.

[2] A Category 3 hurricane should cover the Category 1 zone.

Going from land to the Atlantic the zones are:

LAND - CCCL - Category 1 (and Category 3 ?) - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 1 zone is wider than the V-zone by 200'.

The CCCL is wider than the Category 1 zone by 120'.

Measurement 8: The next measurement was taken at Aquarina, where the coast is categorized by a narrow Category 1 zone followed immediately landward by a Category 5 zone, with the Category 3 zone being absent. It appears on the CCCL map as though there is a seawall present along the coast at this point. The section of island covered by this area extend southward from the area of Measurement 7, 6 1/2 miles to Sebastian Inlet. All measurements are relative to the southeast, seaward corner of A1A and Beverly Court.

V-zone (EL-13)	CCCL	Category 1	Category 3
210'	(-) 100'	80'	N/A[1]
Seaward	Landward	Seaward	

[1] A Category 3 hurricane should cover the Category 1 zone.

Going from land to the Atlantic the zones are:

LAND - CCCL - Category 1 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 1 zone is wider than the V-zone by 130'.

The CCCL is wider than the V-zone by 80'.

Measurement 9: The ninth and final measurement was taken near Sebastian Inlet. Because of the variations in the V-zone and the linear nature of the CCCL, a point approximately 1600' north of the northern bank of the inlet was used for measurement purposes. All measurements are relative to the southeast, seaward corner of A1A and the access road 1600' north of Sebastian Inlet.

V-zone (EL-13)	CCCL	Category 1	Category 3
410'	108'	80'	N/A[1]
Seaward	Seaward	Seaward	

[1] A Category 3 hurricane should cover the Category 1 zone.

Going from land to the Atlantic the zones are:

LAND -Category 1 - CCCL - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The CCCL is wider than the V-zone by 302'.

The Category 1 zone is wider than the CCCL by 28'.[2]

DADE COUNTY

Features of the Study Area

The date on the FIRMs used in this study is January 20, 1993. The date on the Storm Tide Atlas (SLOSH model map) is December 1989. The date on the CCCL map is August 30, 1992, (just six days after Hurricane Andrew). Dade County is marked by a series of coastal barrier islands, or keys, separated from the mainland coast by Biscayne Bay. The northernmost set of coastal barrier islands extends south from Broward County. This set of islands lies from the Broward County

border southward to Bakers Haulover Cut. Moving from north to south, the eastern shore of the island includes Golden Beach, Sunny Isles, and Haulover Beach. South of the cut, another long barrier island extends southward. This island includes the jurisdictions of Bal Harbour, Surfside, and Miami Beach. Shielded by this barrier island is a series of smaller islands contained within Biscayne Bay. These islands, from north to south, are Bay Harbor Islands, Normandy Isle, Treasure Island, portions of Miami Beach, Sunset Islands, and Lumus Island. Because these islands do not directly face the Atlantic Ocean, they do not appear on the CCCL map.

South of Miami Beach, separated by Government Cut, lies Fisher Island. South of Fisher Island, separated by Norris Cut, lies Virginia Key. South of Virginia Key is Key Biscayne. The southern tip of Key Biscayne is labeled Cape Florida on all three maps. The Cape forms the southernmost limit of the CCCL map and the storm surge map. This northern set of barrier islands shields approximately half of the county's coastline. South of Cape Florida there is an open area of coast, making up approximately 20% of the coastline, which is unprotected by barrier islands. This large gap is labeled Biscayne Channel. There is a tiny island, labeled Soldier Key, within the Biscayne Channel. South of Biscayne Channel is a set of barrier islands that shields the remaining 30% of the county's Atlantic frontage to its border with Monroe County. This barrier island set, from north to south, is comprised of a small group of keys labeled as Ragged Keys. South of these keys lies Sands Key, which is separated on the south by Sands Cut. Elliot Key lies south of Sands Cut and is a much larger barrier island, making up the majority of the land mass in this set of islands. South of Elliot Key lies an agglomeration of other smaller keys. The next key south of Elliot Key, facing the Atlantic, is Old Rhodes Key followed by Swan Key. These keys form the border with Monroe County. These barrier islands make up the City of Islandia. It should be noted that the City of Islandia is not included on the CCCL map or the storm surge maps so no comparative measurements were taken from that location.

Interview with Emergency Management Contact

Kathleen Hale is the Director of Emergency Management for Dade County. Sandra Jones was the staff person from the office that provided information for this study. The general policy for hurricane evacuation in Dade County errs on the side of being overly cautious. Miami Beach and Key Biscayne, the primary population centers along the coast are evacuated during all hurricanes (all categories). More generally, all population east of the Intracoastal Waterway is evacuated during all hurricanes. This would include people living in the City of Islandia. Also, all mobile homes in the entire county are evacuated during all hurricanes, from Category 1 through 5.

Comparative Measurements

Measurement 1: This measurement is taken just south of the Broward County border in Golden Beach. The Golden Beach section of the barrier island appears much more developed on the CCCL map than the southern half of the island that includes Haulover Beach. All measurements are relative to the western side of Avellino Drive at the intersection of Navona Avenue. As was the case with measurements taken in Duval County, lower category storm surge zones are present landward of higher category zones.

V-zone (EL-10)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
1,230'	1,000'	1,350'	1,300'	1,275'	1,250'	1,200'
Seaward	Seaward	Seaward	Seaward	Seaward	Seaward	Seaward

Going from land to the Atlantic the zones are:

LAND - CCCL - Category 5 - V-zone - Category 4 - Category 3 - Category 2 - Category 1 - ATLANTIC

The Category 1 zone appears to be the most narrow.

The Category 2 zone is wider than the Category 1 zone by 50'.

The Category 3 zone is wider than the Category 2 zone by 25'.

The Category 4 zone is wider than the Category 3 by 25'.

The V-zone is wider than the Category 4 zone by 20'.

The Category 5 zone is wider than the V-zone by 30'.

The CCCL is wider than the Category 5 zone by 200'.

Measurement 2: The second measurement is taken at Haulover Beach. Measurements are relative to the western side of the southern entrance to the large parking lot located south of the Haulover Beach Golf Course. From this reference point, the Category 5 storm surge limit extends landward to Collins Avenue. South of this reference point, all storm surge categories extend across the Intracoastal Waterway and have an effect on the mainland.

V-zone (EL-11)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
900'	500'	650'	625'	600'	575'	400'
Seaward	Seaward	Seaward	Seaward	Seaward	Seaward	Seaward

Going from land to the Atlantic the zones are:

LAND - Category 5 - CCCL - Category 4 - Category 3 - Category 2 - Category 1 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 1 zone is wider than the V-zone by 250'.

The Category 2 zone is wider than the Category 1 zone by 25'.

The Category 3 zone is wider than the Category 2 zone by 25'.

The Category 4 zone is wider than the Category 3 zone by 25'.

The CCCL is wider than the Category 4 zone by 75'.

The Category 5 zone is wider than the CCCL zone by 100'.

Measurement 3: The same geographic features present in the previous measurement are also present across Bakers Haulover Inlet, in the jurisdictions of Bal Harbour and Surfside. The features of the coast begin to change in the Atlantic Heights section of Miami Beach and southward, east of Normandy Isle. In this area, the storm surge zones are not marked along the coastline due to the presence of a seawall that is visible on the CCCL map. This area is where the third measurement reference point is located. The third measurement is taken at the southeast corner of the intersection of Collins Avenue and 65th Street.

V-zone (EL-10)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
550'	180'	275'	N/A	N/A	N/A	N/A
Seaward	Seaward	Seaward				

Going from land to the Atlantic the zones are:

LAND - CCCL - Category 1 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 1 zone is wider than the V-zone by 275'

The CCCL is wider than the Category 1 zone by 95'.

Measurement 4: This relationship caused by the seawall continues southward along Miami Beach to Government Cut. There are areas, especially along the coastline of the City of Miami Beach, where the sandy beach is very wide. The fourth measurement is taken at a point where the beach is quite wide. All measurements are relative to the southeast corner of Lincoln Road and Collins Avenue.

V-zone (EL-10)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
790'	350'	1,150'	N/A	N/A	N/A	N/A
Seaward	Seaward	Seaward				

Going from land to the Atlantic the zones are:

LAND - CCCL - V-zone - Category 1 - ATLANTIC

The Category 1 zone appears to be the most narrow.

The V-zone is wider than the Category 1 zone by 360'.

The CCCL is wider than the V-zone by 440'.

Measurement 5: The seawall that was present in the previous measurements does not show up along the coast of Fisher Island, which is bounded on the north by Government Cut and on the south by Norris Cut. The island is within the City of Miami Beach. While this measurement is made on Fisher Island, measurements were difficult to make due to a lack of labeled roads on the FIRMs. The measurement point selected is at the eastern end of the northernmost road on the island. The road ends very near the jetty forming the southern side of the Government Cut. Measurements are taken from the western side of this point. It should be noted that the Category 5 storm surge zone is located across the Intracoastal Waterway, on the mainland.

V-zone (EL-9)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
50'	400'	50'	250'	1,050'	1,150'	20,000'
Landward	Landward	Landward	Landward	Landward	Landward	Landward

Going from land to the Atlantic the zones are:

LAND - Category 5 - Category 4 - Category 3 - CCCL - Category 2 - V-zone/Category 1 - ATLANTIC

The V-zone and the Category 1 zone appear to be the most narrow.

The Category 2 zone is wider than the V-zone/Category 1 zone by 200'.

The CCCL is wider than the Category 2 zone by 150'.

The Category 3 zone is wider than the Category 2 zone by 560'.

The Category 4 zone is wider than the Category 3 by 100'.

The Category 5 zone is wider than the Category 4 zone by 18,850'.

Measurement 6: This measurement is taken at Virginia Key, which lies south of Fisher Island. The area along the key at Virginia Beach appears to be of a lower elevation as the entire southern section of the key is affected by a Category 2 storm surge. The measurements are taken at the east-west road leading into the Virginia Beach parking area. It should be noted that the effects of a Category 2 storm surge extend across Biscayne Bay to the mainland.

V-zone (EL-11)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
400'	700'	500'	23,550'	23,600'	23,650'	23,700'
Seaward	Seaward	Seaward	Landward	Landward	Landward	Landward

Going from land to the Atlantic the zones are:

LAND - Category 5 -Category 4 - Category 3 - Category 2 - V-zone - Category 1 - CCCL - ATLANTIC

The CCCL appears to be the most narrow.

The Category 1 zone is wider than the CCCL by 200'.

The V-zone is wider than the Category 1 zone by 100'.

The Category 2 zone is wider than the V-zone by 23,950'.

The Category 3 zone is wider than the Category 2 zone by 50'.

The Category 4 zone is wider than the Category 3 zone by 50'.

The Category 5 zone is wider than the Category 4 zone by 50'.

Measurement 7: This measurement is taken on Key Biscayne. The coastline is marked by a seawall that extends along the entire Atlantic coastline. All measurements are relative to the eastern most end of Ocean Lane Drive in the City of Key Biscayne.

V-zone (EL-11)	CCCL	Category 1	Category 2	Category 3	Category 4	Category 5
620'	360'	600'	N/A	N/A	N/A	N/A
Seaward	Seaward	Seaward				

Going from land to the Atlantic the zones are:

LAND - CCCL - Category 1 -V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 1 zone is wider than the V-zone by 20'.

The CCCL is wider than the Category 1 zone by 240'.

MONROE COUNTY

Features of the Study Area

The Hurricane Storm Tide Atlas used in this study is dated December 1989. The dates on the FIRMs used in this study are October 17, 1989 and November 4, 1992. The November 4, 1992, series is labeled "revised." Measurement source data for Monroe County are limited. Because there

are no sandy beaches along the Keys or the mainland (Everglades) portion of the county, no CCCL has been established. Additionally, as the mainland portion of the county as well as a significant portion of Florida Bay are within the Everglades National Park, no storm surge/hurricane evacuation data are available for these areas. Also, unlike other counties, the storm surge maps indicate the extent of Category 2, 3, and 5 hurricanes only.

The Florida Keys are the only section of Monroe County that can be included in this study. All measurements are taken relative to the Atlantic Ocean. The majority of the Keys fall within the Category 2 storm surge zone. There are some sections along U.S. Route 1 that are above this zone. Road sections approaching the bridges that connect the keys are usually within the Category 3 storm surge zone, while the bridge footings appear to be within the Category 5 storm surge zone. The actual bridges do not appear as being within any storm surge zone. Measurements are taken at those few places within the keys where there appears to be a significant enough elevation difference to cause a differentiation in the storm surge zones.

Interview with Emergency Management Contact

William Wagner is the Director of Emergency Management for Monroe County. The contact person that was interviewed for this study was Lisa Coats. The interview was conducted by telephone on November 11, 1993. Ms. Coats indicated that because Monroe County is comprised of a chain of islands, all of which are particularly vulnerable to hurricane damage, evacuation is a serious issue. Monroe County, because of its vulnerability, has no hurricane shelters. When evacuation orders are given, people must leave the Keys via U.S. Route 1.

In the event of Category 1 or 2 storm, all mobile home dwellers and tourists will be advised to leave the county. The Emergency Management staff will make a judgement call as to whether to evacuate all other permanent residents of the Keys depending on where the storm is likely to hit. In

the event of a Category 3 or stronger storm, all people will be evacuated from the Keys. These people are directed to go to Florida International University in Dade County, where temporary shelter will be provided.

Comparative Measurements

Measurement 1: This measurement is taken on Key West. All measurements are relative to the northeast corner of Whitehead Street and Truman Avenue.

V-zone (EL-10)	Category 2	Category 3	Category 5
1,600'	850'	450'	*
Seaward	Seaward	Seaward	At Reference

Going from land to the Atlantic the zones are:

LAND - Category 5 - Category 3 - Category 2 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 2 zone is wider than the V-zone by 750'.

The Category 3 zone is wider than the Category 2 zone by 400'.

The Category 5 zone is wider than the Category 3 zone by 450'.

Measurement 2: To demonstrate the elevation effect that the bridges connecting the various keys have on the storm surge zones, the next measurement is taken on Big Pine Key. The entire Key is within the Category 2 storm surge zone. All measurements are relative to the northeast corner of the intersection of Ships Way and the Overseas Highway (U.S. Route 1). The Category 2 storm surge zone transitions directly to a Category 5 zone along the south side of U.S. Route 1, i.e. Category 3 = Category 2.

V-zone (EL-11)	Category 2	Category 3	Category 5
5,100'	300'	300'	*
Seaward	Seaward	Seaward	At Reference

Going from land to the Atlantic the zones are:

LAND - Category 2 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 2/3 zone is wider than the V-zone by 4,800'.

The Category 5 zone is wider than the Category 2 zone by 300'.

Measurement 3: This measurement is taken at the same point as the previous measurement. The difference is that this measurement is taken due east along the tangent formed by U.S. Route 1, relative to the eastern shore of Big Pine Key.

V-zone (EL-11)	Category 2	Category 3	Category 5
9,675'	1,300'	800'	*
Seaward	Seaward	Seaward	At Reference

Going from land to the Atlantic the zones are:

LAND - Category 5 - Category 3 - Category 2 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 2 zone is wider than the V-zone by 8,375'.

The Category 3 zone is wider than the Category 2 zone by 500'.

The Category 5 zone is wider than the Category 3 zone by 800'.

Measurement 4: Upper Matecumbe Key and Plantation Key, especially along the central axis that U.S. Route 1 passes through, appear to have higher elevations and are marked by higher storm surge/hurricane evacuation zones. The next measurement is taken on Upper Matecumbe Key relative to the southern coast of the Key at the southwest corner of the intersection of Old Road (Old U.S. Route 1) and the first road cutting toward the southern shore (as indicated on FIRM # 12087C1118G).

V-zone (EL-11)	Category 2	Category 3	Category 5
450'	200'	600'	900'
Seaward	Landward	Landward	Landward

Going from land to the Atlantic the zones are:

LAND - Category 5 - Category 3 - Category 2 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 2 zone is wider than the V-zone by 650'.

The Category 3 zone is wider than the Category 2 zone by 400'.

The Category 5 zone is wider than the Category 3 zone by 300'.

Measurement 5: The features present in the previous measurement, where there appears to be higher elevations along the center of the Keys that U.S. Route 1 bisects, become most pronounced in Key Largo. Key Largo is the largest of all of the islands in Monroe County. The island's size appears to have little effect on the storm surge zones, with higher zones being confined to the U.S. Route 1 corridor. The rest of Key Largo falls within the Category 2 storm surge zone. The final measurement is taken in Key Largo relative to the northwest corner of the intersection of Kay Drive and the Overseas Highway (U.S. Route 1), just south of Tarpon Basin. The measurements are

taken along a north-south axis parallelling Kay Drive.

V-zone (EL-11)	Category 2	Category 3	Category 5
2,500'	1,700'	1,300'	300'
Seaward	Seaward	Seaward	Seaward

Going from land to the Atlantic the zones are:

LAND - Category 5 - Category 3 - Category 2 - V-zone - ATLANTIC

The V-zone appears to be the most narrow.

The Category 2 zone is wider than the V-zone by 800'.

The Category 3 zone is wider than the Category 2 zone by 400'.

The Category 5 zone is wider than the Category 3 zone by 1,000'.

COLLIER COUNTY

Features of the Study Area

The date on the CCCL map used in this study is April 7, 1979. The Hurricane Storm Tide Atlas for Collier County was prepared by the Southwest Florida Regional Planning Council and is dated June 1991. The Flood Insurance Rate Maps available for Collier County were dated June 3, 1986, and August 3, 1992. The northern portion of Collier County's coastline is characterized by a series of spits, forming barrier-like protection for the mainland. The two primary spits of land are separated by the Cocohatchee River. The northern-most stretch of land, extending to the Lee County border, is identified as the Barefoot Beach State Preserve. The southern stretch of land is identified as the Deenor Wiggins Pass State Recreational Area. The mouth of the Cocohatchee River is identified as Wiggins Pass. Along this northern third of Collier County's coastline, the relative extent of the Category 1, 2 and 3 storm surge zones remains rather constant and not extremely extensive. The

exception is at Wiggins Pass and northeast along the Cocohatchee floodplain. Within this region, the landward extent of all three storm surge zones is amplified.

The southern two thirds of Collier County are markedly different from the northern third. Just south of Barefoot Beach State Preserve lies Marco Island, a moderately developed barrier island. South of Marco Island, the coastline changes its north-south orientation, heading markedly southeast. This southeastern run of coastline is identified as Ten Thousand Islands. As the name implies, there are numerous islands separated from the mainland by a series of bays, the largest of which are, going from the northwest to the southeast, Gullivan Bay, Fakahatchee Bay and Chokoloskee Bay. All of the islands fall within the extent of the weakest storm surge category, Tropical Storm. The only exception is the developed island, Chokoloskee, which lies within the Category 1 storm surge zone. Therefore, all land masses seaward of the mainland are subject to Category 1 hurricanes.

Even though many of the islands appear uninhabited, FEMA V-zones have been drawn. The CCCL, however, does not extend south of Marco Island. The reasons for this are probably twofold. First, the majority of the land within this region falls within the Everglades National Park, and as federal land it would be exempt from the CCCL designation. Second, because the land is within the Everglades, the coastline is probably made up of mangrove swamps. Since the coastal islands would have non-sandy beaches, the CCCL would not apply to these areas. Within this region, only comparisons between the V-zone and the storm surge zones are possible.

Interview with Emergency Management Contact

Kenneth Pineau, the Emergency Preparedness Director for Collier County was interviewed on November 18, 1993. Mr. Pineau commented that as a rule they "don't want to evacuate more than they have to." With this being said, Mr. Pineau noted that in the event of a tropical storm (which

has 65-75 mph winds but is less intense than a Category 1 hurricane) storm shelters are opened for mobile home dwellers. In the event of a Category 1 storm, all of Marco Island is evacuated, as well as all islands and areas on the mainland west (seaward) of U.S. Route 41 southeast of Naples. This area generally corresponds to the Category 1 storm surge zone, although in some places it includes Category 2 areas. Northwest of the intersection of Route 41 and County Road 858, the zones indicated on the storm surge map correspond with the county's evacuation strategy.

Comparative Measurements

Measurement 1: The first landmark where the comparative measurements were taken is just south of the Lee County-Collier County line where Bonita Beach Road intersects with the road that runs along the county line. All measurements are relative to the southwest corner of Bonita Beach Road and the road running along the Collier-Lee border.

V-zone (EL-13)	CCCL	Category 1	Category 2	Category 3
(-) 630'	400'	(-) 5,300'	(-) 5,850'	(-) 7,700'
Landward	Seaward[1]	Landward	Landward	Landward[2]

[1] Due to the poor resolution of the aerial photograph on the CCCL map, the margin of error may be increased to +/- 50 feet.

[2] The category 3 storm surge zone extends beyond 7700'. Because Collier County is bordered by Lee County at this point, the extent of the Category 3 zone is not mapped into the neighboring county. This inland border with Lee County runs north-south for several thousand feet. It should be noted that 5000' due south along the same parallel as the border, the landward extent of the Category 3 zone is 36,700' (approximately 6 1/2 miles).

Going from Land to the Gulf the zones are:

LAND - Category 3 - Category 2 - Category 1 - V-zone - CCCL - GULF

The CCCL appears to be the most narrow.

The V-zone is wider than the CCCL by 1,030'.

The Category 1 zone is wider than the V-zone by 4,670'.

The Category 2 zone is wider than the Category 1 zone by 550'.

The Category 3 zone is wider than the Category 2 zone by 1,850'.

Measurement 2: The second measurement is taken in a residential subdivision identified as Maples Park. This point lies south of the area affected by the Cocohatchee River floodplain. All measurements are relative to the southernmost edge of the cul-du-sac of Egret Avenue.

V-zone (EL-14)	CCCL	Category 1	Category 2	Category 3
(-) 750'	(-) 475'	(-) 2,000'	(-) 2,400'	(-) 18,900'
Landward	Landward	Landward	Landward	Landward

Going from Land to the Gulf the zones are:

LAND - Category 3 - Category 2 - Category 1 - V-zone - CCCL - GULF

The CCCL appears to be the most narrow.

The V-zone is wider than the CCCL by 275'.

The Category 1 zone is wider than the V-zone by 1,250'.

The Category 2 zone is wider than the Category 1 zone by 4,000'.

The Category 3 zone is wider than the Category 2 zone by 16,500'.

Measurement 3: The third measurement is taken at a point approximately 11 1/2 miles south of Naples Park at a point where the Category 1, 2 and 3 zones begin to extend a much greater distance inland. This measurement is taken at Venetian Bay, which lies within the City of Naples. All measurements are relative to the southwest corner of Parkshore Drive and Gulf Shore Boulevard.

V-zone (EL-13)	CCCL	Category 1	Category 2	Category 3
1,010'	465'	(-) 2,450'	(-) 3,200'	(-) 41,200'
Seaward	Seaward	Landward	Landward	Landward

Going from Land to the Gulf the zones are:

LAND - Category 3 - Category 2 - Category 1 - CCCL - V-zone - GULF

The V-zone appears to be the most narrow.

The CCCL is wider than the V-zone by 545'.

The Category 1 zone is wider than the CCCL by 2,915'.

The Category 2 zone is wider than the Category 1 zone by 750'.

The Category 3 zone is wider than the Category 2 zone by 38,000'.

Measurement 4: Near the source of the Gordon River-Naples River Valley there is a region that appears to have a higher elevation seaward of the Gordon River. The fourth measurement is taken within this region of higher apparent elevation. All measurements are relative to the southwest corner of 1st Street North (Gulf Shore Boulevard) and 4th Avenue North.

V-zone (EL-13)	CCCL	Category 1	Category 2	Category 3
290'	115'	*	(-) 950'	(-) 5,200'
Seaward	Seaward	At Reference[1]	Landward	Landward

[1] The Category 1 runs through the reference point.

Going from Land to the Gulf the zones are:

LAND - Category 3 - Category 2 - Category 1 - CCCL - V-zone - GULF

The V-zone appears to be the most narrow.

The CCCL is wider than the V-zone by 175'.

The Category 1 zone is wider than the CCCL by 115'.

The Category 2 zone is wider than the Category 1 zone by 900'.

The Category 3 zone is wider than the Category 2 zone by 4,300'.

Measurement 5: Approximately six miles south from the previous measurement point, just north of Gordon Pass, the storm surge zones all widen in the extent of their landward incursion. Measurement five is taken in this region. All measurements are relative to the southwest corner of Gordon Drive and Bay Road.

V-zone (EL-13)	CCCL	Category 1	Category 2	Category 3
220'	80'	(-) 17,600'	(-) 37,350'	(-) 160,500'
Landward	Seaward	Landward[1]	Landward[1]	Landward[1]

[1] The extent of the storm surge zones, in miles, is as follows: Category 1 extends 3 and 1/3 miles, Category 2 extends 7 miles, and Category 3 extends 30 and 1/3 miles. The Category 3 zone ends within the Big Cypress National Preserve and National Wildlife Management Area.

Going from Land to the Gulf the zones are:

LAND - Category 3 - Category 2 - Category 1 - CCCL - V-zone - GULF

The V-zone appears to be the most narrow.

The CCCL is wider than the V-zone by 140'.

The Category 1 zone is wider than the CCCL by 17,680'.

The Category 2 zone is wider than the Category 1 zone by 19,750'.

The Category 3 zone is wider than the Category 2 zone by 140,750'.

Measurement 6: South of Gordon Pass, running for approximately 13 miles, lies Keewaydin Island. The landward extent of the three storm surge zones continues to increase throughout this region. Due south of Keewaydin Island lies the relatively developed Marco Island. The sixth measurement is taken on Marco Island. All measurements are relative to the southern terminus of Henderson Court (at the cul-du-sac) bounded on the southeast by the Spinaker Waterway. Because it was difficult to locate the reference point on the FIRM and the CCCL map, they were excluded from this measurement.

V-zone (EL-13)	CCCL	Category 1	Category 2	Category 3
N/A	N/A	(-) 122,500'	(-) 156,600'	(-) 161,000'
		Landward	Landward	Landward[1]

[1] The SLOSH model limit is at 161,000' (30.5 miles) at this point. The category 3 zone appears to extend beyond this limit.

Going from Land to the Gulf the zones are:

LAND - Category 3 - Category 2 - Category 1 - CCCL - V-zone - GULF

The Category 1 zone appears to be the most narrow.

The Category 2 zone is wider than the Category 1 zone by 34,100'.

The Category 3 zone is wider than the Category 2 zone by 4,400'.

Measurement 7: Marco Island is bordered on the south by Caxambras Pass. The coastline of the county extends southeast from Marco Island and is characterized by numerous sea islands forming, through their agglomeration, a barrier between the Gulf and the mainland. Because this area does not have sandy beaches, there is no CCCL designation. The seventh measurement is taken within this area, comparing the V-zone with the storm surge zones. This final measurement is taken at Everglades City, one of the only developed areas southeast of Marco Island. All measurements are

relative to the center of the traffic circle (round about) at the intersection of Broadway and Copeland Avenue.

V-zone (EL-12)	CCCL	Category 1	Category 2	Category 3
1,800'	N/A	(-) 32,300'	(-) 49,100'	(-) 54,700'
Seaward[1]		Landward	Landward	Landward[2]

[1] Unlike the previous FIRM maps, the map indicating the extent of the V-zone has a scale of 1 inch to 1000 feet. The margin of error for the V-zone in this case is + or - 10 feet.

[2] The SLOSH model limit is at 54,700' (10.4 miles) at this point. The Category 3 zone appears to extend beyond this limit to the northeast into the Big Cypress National Preserve.

Going from Land to the Gulf the zones are:

LAND - Category 3 - Category 2 - Category 1 - V-zone - GULF

The V-zone appears to be the most narrow.

The Category 1 zone is wider than the V-zone by 34,100'.

The Category 2 zone is wider than the Category 1 zone by 16,800'.

The Category 3 zone is wider than the Category 2 zone by 5,600'.

SARASOTA COUNTY

Features of Study Area

The Hurricane Storm Tide Atlas used in this study was prepared by the Southwest Florida Regional Planning Council and is dated December 1991. The Storm Tide Atlas aggregated information for storm surge Categories 4 and 5, labeling the extent of these storms as 4/5. This hybrid category is recorded in this study. The FIRMs used in this study are dated September 3, 1992. A separate FIRM, dated May 1, 1984, was used for V-zone information within the incorporated boundaries of the City of Venice. The CCCL map used in this study is dated January 1985.

The northern section of Sarasota County includes a series of barrier islands. From north to south, the islands are Longboat Key, Siesta Key, and Casey Key. Venice Inlet forms the southern boundary of this chain of keys. South of the City of Venice there is a section of coastline that is unprotected by barrier island. This strip of exposed coastline is approximately three and one half miles long. South of this exposed area, just north of the mouth of Alligator Creek, lies Manasota Key. Manasota Key extends south beyond the Sarasota County-Charlotte County border.

Interview with Emergency Management Contact

Greg D. Feagans is the Emergency Management Director for Sarasota County. Lori Park was the representative from this office who was interviewed for this study. The interview was conducted by telephone on November 18, 1993. Ms. Park indicated that the county uses the Hurricane Storm Tide Atlas as a guide for evacuation. It should be noted that all of the coastal barrier islands and exposed coastline fall within the tropical storm or Category 1 storm surge zones. In the event of a Category 1 storm, all coastal barrier islands are evacuated.

Comparative Measurements

Measurement 1: The first measurement is taken in Longboat Key. Heading south along Gulf of Mexico Drive from Manatee County, the measurement is relative to the northwest corner of the intersection of Longboat Key Drive and Gulf of Mexico Drive. It should be noted that Category 2 - 5 storms extend across Sarasota Bay and affect the mainland.

V-zone	CCCL	Category 1	Category 2	Category 3	Category 4/5
N/A	570'	300'	(-) 17,200'	(-) 17,500'	(-) 17,900'
	Seaward	Seaward	Landward	Landward	Landward

Going from land to the Gulf the zones are:

LAND - Category 4/5 - Category 3 - Category 2 - Category 1 - CCCL - GULF

The CCCL appears to be the most narrow.

The Category 1 zone is wider than the CCCL by 270'.

The Category 2 zone is wider than the Category 1 zone by 17,500'.

The Category 3 zone is wider than the Category 2 zone by 300'.

The Category 4/5 zone is wider than the Category 3 zone by 400'.

Measurement 2: The next measurement is taken on Siesta Key. Siesta Key is separated from the mainland by Little Sarasota Bay. Some parts of the Key, specifically the northern sections, are within the Category 2 storm surge zone but most of the Key is within the Category 1 storm surge zone. As with the previous measure, Categories 2-5 extend well on to the mainland, totally covering the barrier island. The Key widens in the northern section. This measurement is taken in that area, relative to the northeast corner of the intersection of Beach Road and Ocean Boulevard.

V-zone (EL-13)	CCCL	Category 1	Category 2	Category 3	Category 4/5
(-) 170'	(-) 110'	450'	(-) 12,300'	(-) 12,600'	(-) 13,900'
Landward	Landward	Seaward	Landward	Landward	Landward

Going from land to the Gulf the zones are:

LAND - Category 4/5 - Category 3 - Category 2 - V-zone - CCCL - Category 1 - GULF

The Category 1 zone appears to be the most narrow.

The CCCL is wider than the Category 1 zone by 660'.

The V-zone is wider than the CCCL by 60'.

The Category 2 zone is wider than the V-zone by 12,130'.

The Category 3 zone is wider than the Category 2 zone by 300'.

The Category 4/5 zone is wider than the Category 3 zone by 1,300'.

Measurement 3: Along the section of Siesta Key that contains Hero Lagoon, the entire barrier island is subject to the effects of tropical storms. The third measurement is taken in this area. It should be noted that Category 2-5 zones extend across Little Sarasota Bay to the mainland. The Category 1 storm surge zone is not visible at this reference point. The measurement is relative to the northernmost intersection of Sanderling Road and Midnight Pass Road, at the southeast corner. Sanderling Road is alternatively labeled Turnstone Road. Midnight Pass Road becomes Port Lane east of this reference point.

V-zone (EL-13)	CCCL	Category 1	Category 2	Category 3	Category 4/5
1,165'	900'	N/A	(-) 4,800'	(-) 5,100'	(-) 10,200'
Seaward	Seaward		Landward	Landward	Landward

Going from land to the Gulf the zones are:

LAND - Category 4/5 - Category 3 - Category 2 - CCCL - V-zone - GULF

The V-zone appears to be the most narrow.

The CCCL is wider than the V-zone by 265'.

The Category 2 zone is wider than the CCCL by 5,700'.

The Category 3 zone is wider than the Category 2 zone by 300'.

The Category 4/5 zone is wider than the Category 3 zone by 5,100'.

Measurement 4: The next barrier island south of Siesta Key is Casey Key. Separated from Siesta Key by Midnight Pass, the northernmost section of this Key is effected by tropical storms and

appears to have a low elevation, similar to Siesta Key. Casey Key narrows considerably with these features continuing approximately six miles south to a point where the key widens slightly just before Venice Inlet. The protected coastline west of Little Sarasota Bay and Blackburn Bay are affected by storms of varying intensities, from 1 through 5, depending on the precise location. The fourth measurement is taken relative to the northeast corner of Casey Key Road and Blackburn Point Road, just west of the Blackburn Point Bridge. Lower intensity storm surge zones occur landward of some higher intensity zones in this area due to the effects of Little Sarasota Bay and South Creek. It should be noted that the V-zone is labeled as a V16 zone at this point and the Category 1 zone is not indicated on the map. Also, it appears on the CCCL map as if the Category 2 storm surge zone runs along a wall of crushed rocks that may be a revetment.

V16 Zone (EL-17)	CCCL	Category 1	Category 2	Category 3	Category 4/5
300'	(-) 120'	N/A	250'	(-) 3,650'	(-) 5,950'
Seaward	Landward		Seaward	Landward	Landward

Going from land to the Gulf the zones are:

LAND - Category 4/5 - Category 3 - CCCL - Category 2 - V16 Zone - GULF

The V16 Zone appears to be the most narrow.

The Category 2 zone is wider than the V16 Zone by 50'.

The CCCL is wider than the Category 2 zone by 370'.

The Category 3 zone is wider than the CCCL by 3,530'.

The Category 4/5 zone is wider than the Category 3 zone by 2,300'.

Measurement 5: The next measurement is taken south of Venice Inlet within the City of Venice. The effects of Dona Bay and Roberts Bay can been seen in the landward extent of the storm surge

zones. Additionally, the Category 4/5 zone extends a considerable distance landward at this point. All measurements are relative to the northeast corner of the intersection of White Cap Circle (which is the third street south of the inlet on the east), and Tarpon Center Drive.

V-zone (EL-17)	CCCL	Category 1	Category 2	Category 3	Category 4/5
600'	150'	550'	(-) 7,200'	(-) 9,400'	(-) 57,600'
Seaward	Seaward	Seaward	Landward	Landward	Landward

Going from land to the Gulf the zones are:

LAND - Category 4/5 - Category 3 - Category 2 - CCCL - Category 1 - V-zone - GULF

The V-zone appears to be the most narrow.

The Category 1 zone is wider than the V-zone by 50'.

The CCCL is wider than the Category 1 zone by 400'.

The Category 2 zone is wider than the CCCL by 7,350'.

The Category 3 zone is wider than the Category 2 zone by 2,200'.

The Category 4/5 zone is wider than the Category 3 zone by 48,200'.

Measurement 6: South of Roberts Bay and north of Alligator Creek is a considerable section of coastline, approximately 3 1/2 miles long, unprotected by barrier islands. The landward extent of the lower level storms is quite limited here, with the Category 3 storm surge zone running along the coast at this measurement point. The fifth measurement is taken relative to southeast (inside) corner of Alhambra Road and Castle Street.

V-zone	CCCL	Category 1	Category 2	Category 3	Category 4/5
N/A	(-) 250'	N/A	N/A	50'	(-) 61,400'
	Landward			Seaward	Landward

Going from land to the Gulf the zones are:

LAND - Category 4/5 - CCCL - Category 3 - GULF

The Category 3 zone appears to be the most narrow.

The CCCL is wider than the Category 3 zone by 300'.

The Category 4/5 zone is wider than the Category 3 zone by 61,150'.

Measurement 7: Manasota Key forms a barrier island that extends from just north of Alligator Creek, south beyond the border with Charlotte County. Moving from north to south, the protected bay, Lemon Bay, widens. As the bay widens, the Key becomes increasingly vulnerable to hurricanes, perhaps from decreased elevation. The seventh measurement is taken along Manasota Key at Manasota Beach, where Lemon Bay is quite narrow. This point lies directly across from the City of Manasota. Measurements are relative to the northeast corner of Manasota Road and the landing road of Manasota Bridge.

V-zone (EL-17)	CCCL	Category 1	Category 2	Category 3	Category 4/5
330'	(-) 50'	300'	200'	(-) 590'	(-) 53,000'[1]
Seaward	Landward	Seaward	Seaward	Landward	Landward

[1] The category 4/5 storm surge zone actually extends beyond this point. The distance given is the Sarasota County/Charlotte County border.

Going from land to the Gulf the zones are:

LAND - Category 4/5 - Category 3 - CCCL - Category 2 - Category 1 - V-zone - GULF

The V-zone appears to be the most narrow.

The Category 1 zone is wider than the V-zone by 30'.

The Category 2 zone is wider than the Category 1 zone by 100'.

The CCCL is wider than the Category 2 zone by 250'.

The Category 3 zone is wider than the CCCL zone by 540'.

The Category 4/5 zone is wider than the Category 3 zone by 52,410'.

Measurement 8: The final measurement is taken on Manasota Key at the Charlotte County/Sarasota County border. Lemon Bay has widened considerably at this point. The entire coastal barrier island is affected by a Category 1 storm. The Category 1 storm surge zone also extends to the mainland. Measurements are relative to the west side of Manasota Road at the border.

V-zone (EL-17)	CCCL	Category 1	Category 2	Category 3	Category 4/5
610'	140'	(-) 5,900'	(-) 18,700'	(-) 40,000'[1]	N/A
Seaward	Seaward	Landward	Landward	Landward	

[1] The Category 3 storm surge zone actually extends beyond this point. The distance given is the Sarasota County/Charlotte County border.

Going from land to the Gulf the zones are:

LAND - Category 3 - Category 2 - Category 1 - CCCL - V-zone - GULF

The V-zone appears to be the most narrow.

The CCCL is wider than the V-zone by 450'.

The Category 1 zone is wider than the CCCL by 6,040'.

The Category 2 zone is wider than the Category 1 zone by 12,800'.

The Category 3 zone is wider than the Category 2 zone by 21,300'.

WAKULLA COUNTY

Features of the Study Area

Because there are no high energy sandy beaches along the Gulf coast of Wakulla County, no CCCL map has been prepared. The Storm Tide Atlas used in this study was still in the final stages of preparation and therefore no reference date is available. The map was provided by Mike McDonald of the Florida Department of Community Affairs. The FIRM maps used in this study label the V-zone as the V20 zone. The zone is referred to as V20 in this section of the study.

The Wakulla County coast is marked by low lying wetlands. The prevalence of ridges within this area means that lower category storm surge areas may lie landward of higher category areas. Most roads are not labeled on the FIRM, making comparisons between the maps difficult.

Interview with Emergency Management Contact

The Director of Civil Defence for Wakulla County is Mr. Murray, who was interviewed by telephone on December 1, 1993. Mr. Murray indicated that Wakulla County is extremely vulnerable to coastal flooding and storm surge. He mentioned that the low elevation of much of the county and the very high tides experienced there can contribute to massive flooding. Depending on the severity of storm, 80% of the county could be under water. A Category 1 storm has the potential to breach State Road 98 in several places.

The major population areas of the county are located on the water, and half of the county's population resides in mobile homes. When the Civil Defence office gives an evacuation order, they

do not differentiate between mobile homes and permanent structures. A problem that Mr. Murray expressed regarding the mobile homes dwellers is that "they take perverse pride in riding out a storm and bragging about it afterwards." Part of the reason why it may be difficult to convince residents to evacuate is because the county suffered from extensive looting in the aftermath of Hurricane Kate.

Mr. Murray indicated that he would make a judgment call regarding evacuation. Evacuation might be ordered in the event of a severe tropical storm or a Category 1 hurricane. Local shelters are not opened if the storm is going to be beyond the Category 2 level. In this case everyone must evacuate to Leon County or into Georgia.

Comparative Measurements

Measurement 1: The first measurement is taken on the northern shore of Ochlocknee Bay, 8,750' (1.66 miles) west from the intersection with State Road 98 along County Road 372 (labeled as Surf Road on the SLOSH model map), to the eastern bank of the inlet that bisects this road.

V20 Zone (EL-16)	Category 1	Category 2	Category 3	Category 4	Category 5
*	(-) 1,800'	(-) 19,400'	(-) 22,700'	(-) 35,000'	(-) 36,700
At Reference	Landward	Landward	Landward	Landward	Landward

Going from land to the Gulf the zones are:

LAND - Category 5 - Category 4 - Category 3 - Category 2 - Category 1 - V20 Zone - GULF

The V20 Zone appears to be the most narrow.

The Category 1 zone is wider than the V20 Zone by 1,800'

The Category 2 zone is wider than the Category 1 zone by 17,600'.

The Category 3 zone is wider than the Category 2 zone by 3,300'.

The Category 4 zone is wider than the Category 3 zone by 12,300'.

The Category 5 zone is wider than the Category 4 zone by 1,700'.

Measurement 2: The next measurement is taken from the terminus of County Road 60 at a point labeled "Skipper" on the FIRM. Measurements are taken due west from this location (West of Oyster Bay).

V20 Zone (EL-17)	Category 1	Category 2	Category 3	Category 4	Category 5
(-) 3,200	(-) 13,200'	(-) 14,600'	(-) 15,000'	(-) 52,600'	(-) 53,900
Landward	Landward	Landward	Landward	Landward	Landward

Going from land to the Gulf the zones are:

LAND - Category 5 - Category 4 - Category 3 - Category 2 - Category 1 - V20 Zone - GULF

The V20 Zone appears to be the most narrow.

The Category 1 zone is wider than the V20 Zone by 10,000'.

The Category 2 zone is wider than the Category 1 zone by 1,400'.

The Category 3 zone is wider than the Category 2 zone by 400'.

The Category 4 zone is wider than the Category 3 zone by 37,600'.

The Category 5 zone is wider than the Category 4 zone by 1,300'.

Measurement 3: This measurement is taken in the Oyster Bay/Shell Point area at the intersection of Kernegay Way and Shell Point Road.

V20 Zone (EL-17)	Category 1	Category 2	Category 3	Category 4	Category 5
(-) 9,600	(-) 8,800'	(-) 9,900'	(-) 27,450'	(-) 29,800'	(-) 63,200
Landward	Landward	Landward	Landward	Landward	Landward

Going from land to the Gulf the zones are:

LAND - Category 5 - Category 4 - Category 3 - Category 2 - V20 Zone - Category 1 - GULF

The Category 1 zone appears to be the most narrow.

The V20 Zone is wider than the Category 1 zone by 800'.

The Category 2 zone is wider than the V20 Zone by 300'.

The Category 3 zone is wider than the Category 2 zone by 17,550'.

The Category 4 zone is wider than the Category 3 zone by 2,350'.

The Category 5 zone is wider than the Category 4 zone by 33,400'.

Measurement 4: Moving east from Shell Point and Goose Creek Bay, the relationship between the storm surge categories normalizes, with no lower level categories being indicated landward of higher categories. The lands north of Apalachee Bay appear to be low lying as the lower category storms reach considerably far inland. The Wakulla/St. Marks River valley contributes to this effect. As there is not much development along the coast at this point, the next measure is taken relative to the northernmost tip of Sprague Island, which lies in the western portion of the mouth of the St. Marks River. The Category 3 storm surge limit extends 300' north of the Wakulla County border into Leon County.

V20 Zone (EL-17)	Category 1	Category 2	Category 3	Category 4	Category 5
(-) 8,050	(-) 22,300'	(-) 27,500'	(-) 41,600'	N/A	N/A

Landward	Landward	Landward	Landward		

Going from land to the Gulf the zones are:

LAND - Category 5 - Category 4 - Category 3 - Category 2 - Category 1 - V20 Zone - GULF

The V20 Zone appears to be the most narrow.

The Category 1 zone is wider than the V20 Zone by 14,250'.

The Category 2 zone is wider than the Category 1 zone by 5,200'.

The Category 3 zone is wider than the Category 2 zone by 14,100'.

Measurement 5: The final measurement is taken at the Wakulla County/Jefferson County border. The relationships between the storm surge lines are normalized, with no lower category storm surge areas being located landward of higher category areas. Also, the effects of the Wakulla and the St. Marks rivers are not exhibited in this region. It should be noted that the Category 5 storm surge extends beyond the limits of the model, 1,300' past the Wakulla County border into Leon County.

V20 Zone (EL-17)	Category 1	Category 2	Category 3	Category 4	Category 5
(-) 9,500	(-) 27,500'	(-) 42,700'	(-) 50,400'	(-) 61,700'	(-) 65,700
Landward	Landward	Landward	Landward	Landward	Landward

Going from land to the Gulf the zones are:

LAND - Category 5 - Category 4 - Category 3 - Category 2 - Category 1 - V20 Zone - GULF

The V20 Zone appears to be the most narrow.

The Category 1 zone is wider than the V20 Zone by 18,000'.

The Category 2 zone is wider than the Category 1 zone by 15,200'.

The Category 3 zone is wider than the Category 2 zone by 7,700'.

The Category 4 zone is wider than the Category 3 zone by 11,300'.

The Category 5 zone is wider than the Category 4 zone by 4,000'.

ENDNOTES TO APPENDIX

1. SLOSH refers to the Sea, Lake, and Overland Surge from Hurricanes model developed by the National Oceanic and Atmospheric Association for estimating the landward extent of storm surges generated by tropical depressions and hurricanes.

2. The accuracy of measurements taken from the SLOSH model map is +/- 100'. This brings into question the relationship between the CCCL and the Category 1 zone in this example.

Table A.1: Summary Table of the Relative Positions of the Policy Lines

REGION	COUNTY	MEASUREMENT NUMBER	POLICY LINES (FROM LAND TO SEA)						
Atlantic	Duval	1	Category 5	Category 4	Category 3	Category 2	VE Zone	Category 1	CCCL
		2	Category 5	Category 4	Category 3	Category 2	CCCL	Category 1	VE Zone
		3	Category 5	Category 4	Category 3	Category 2	CCCL	VE Zone	Category 1
		4	Category 5	Category 4	Category 3	Category 2	Category 1	CCCL	VE Zone
		5	Category 5	Category 4	Category 3	Category 2	Category 1	VE Zone	CCCL
		6	Category 5	Category 4	Category 3	Category 1	VE Zone		
	Brevard	1	Category 3	CCCL	VE Zone	Category 1			
		2	CCCL	Category 3	VE Zone	Category 1			
		3	CCCL	Category 3	VE Zone				
		4	CCCL	VE Zone					
		5	CCCL	Category 3	VE Zone				
		6	CCCL	VE Zone					
		7	CCCL	Category 1	VE Zone				
		8	CCCL	Category 1	VE Zone				
		9	Category 1	CCCL	VE Zone				
	Dade	1	CCCL	Category 5	VE Zone	Category 4	Category 3	Category 2	Category 1
		2	Category 5	CCCL	Category 4	Category 3	Category 2	Category 1	VE Zone
		3	CCCL	Category 1	VE Zone				
		4	CCCL	VE Zone	Category 1				
		5	Category 5	Category 4	Category 3	CCCL	Category 2	VE Zone/Ca	
		6	Category 5	Category 4	Category 3	Category 2	VE Zone	Category 1	CCCL
		7	CCCL	Category 1	VE Zone				
Keys	Monroe	1	Category 3	Category 2	VE Zone				
		2	Category 2	VE Zone					
		3	Category 3	Category 2	VE Zone				
		4	Category 5	Category 3	Category 2	VE Zone			
		5	Category 5	Category 3	Category 2	VE Zone			
Gulf	Collier	1	Category 3	Category 2	Category 1	VE Zone	CCCL		
		2	Category 3	Category 2	Category 1	VE Zone	CCCL		
		3	Category 3	Category 2	Category 1	CCCL	VE Zone		
		4	Category 3	Category 2	Category 1	CCCL	VE Zone		
		5	Category 3	Category 2	Category 1	CCCL	VE Zone		
		6	Category 3	Category 2	Category 1	CCCL	VE Zone		
		7	Category 3	Category 2	Category 1	CCCL	VE Zone		
	Sarasota	1	Category 4/5	Category 3	Category 2	Category 1	CCCL		
		2	Category 4/5	Category 3	Category 2	VE Zone	CCCL	Category 1	
		3	Category 4/5	Category 3	Category 2	CCCL	VE Zone		
		4	Category 4/5	Category 3	CCCL	Category 2	V16 Zone		
		5	Category 4/5	Category 3	Category 2	CCCL	Category 1	VE Zone	
		6	Category 4/5	CCCL	Category 3				
		7	Category 4/5	Category 3	CCCL	Category 2	Category 1	VE Zone	
		8	Category 3	Category 2	Category 1	CCCL	VE Zone		
Big Bend	Wakulla	1	Category 5	Category 4	Category 3	Category 2	Category 1	V20 Zone	
		2	Category 5	Category 4	Category 3	Category 2	Category 1	V20 Zone	
		3	Category 5	Category 4	Category 3	Category 2	V20 Zone	Category 1	
		4	Category 3	Category 2	Category 1	V20 Zone			
		5	Category 5	Category 4	Category 3	Category 2	Category 1	V20 Zone	

Table A.2: Contact List For Emergency Management Coordinators

BREVARD COUNTY Tony Carper Director, Office of Emergency Management 1746 Cedar Street, Rockledge, 32955 (407) 633-1770	**COLLIER COUNTY** Kenneth Pineau Emergency Management Director 3301 E. Tamiami Trail Naples, 33962 (813) 774-8444
DADE COUNTY Kathleen Hale Director, Emergency Management 5600 S.W. 87th Ave., Miami, 33173 (305) 596-8700 or (305) 273-6700 Contact: Sandra Jones	**DUVAL COUNTY** Hastings Williams, Jr. Director, Civil Defence 107 N. Market St., Jacksonville, 32202 (904) 630-2472 Contact: Andy Sykes
MONROE COUNTY William Wagner Emergency Management 5192 Overseas Highway, Chaplin Building Marathon, 33050 (305) 289-6018 Contact: Lisa Coats	**SARASOTA COUNTY** Gregg D. Feagans Director, Emergency Management P.O. Box 8, Sarasota, 34230 (813) 951-5283 Contact: Lori Park
WAKULLA COUNTY Mr. Murray Civil Defence P.O. Box 1263, Crawfordville, 32327	

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