Integrating Coastal Zone Management and Hazard Mitigation: Assessing the Potential Compatibilities of the Coastal Management Program and State of Texas Mitigation Plan.

Carla Prater and Tommy Kennedy

A Report Prepared for the
Texas General Land Office
and
The National Oceanic and Atmospheric Administration
Under GLO Contract No. 07-005-21

This investigation was funded by a grant from the National Oceanic and Atmospheric Administration administered by the Texas General Land Office. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its sub-agencies.

Hazard Reduction and Recovery Center
College of Architecture
Texas A&M University
TAMU 3731
College Station, Texas 77843

January 11, 2009

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I. Introduction

The *Status and Trends of Coastal Vulnerability to Natural Hazards Project* is a multiyear effort by the Hazard Reduction & Recovery Center at Texas A&M University designed to review the vulnerability of the Texas Gulf Coast to natural hazards and the effectiveness of the states' coastal management and hazard mitigation efforts. This part of the project is a documentary analysis of the State of Texas Mitigation Plan and its compatibility with the Texas Coastal Management Plan, and the capacity of both to promote coastal hazard mitigation. It will be supplemented by other elements, including interviews of key actors in coastal zone management, hazard management, and emergency management.

Increased vulnerability to natural and technological hazards on the coast is driven by changing land use patterns (i.e., increasingly dense human occupation of the coastal zone), population growth, rising sea levels, and the historically limited regulation of construction practices, among other factors. These problems threaten the diversity, quality, and functioning of Texas' Coastal Natural Resource Areas (CNRAs).

Among the ten legislative goals of the Texas Coastal Management Program (TCMP) are the protection of CNRA function and the minimization of loss of life and property due to impairment of the CNRAs (TCMP Rules, 1996). For example, one of the CNRA functions is to act as a cushion in hurricanes, absorbing wind and water before it reaches developed areas. Another important function is to absorb excess water during flood periods.

Local governments have most of the responsibility for controlling land use and building construction practices which can protect the functions of CNRAs, but they face numerous political and economic obstacles. By ensuring that the State of Texas Mitigation Plan (STMP), developed by the Governor's Division of Emergency Management, and the TCMP work together, the ability of the General Land Office to meet these and other legislative goals of the TCMP will be enhanced.

This report is a documentary analysis, focused on the STMP and the documents describing the much broader TCMP, especially documents available on the TCMP website (http://www.glo.state.tx.us/coastal). Although the documents fulfill the requirements of different legislation and are administered by different agencies, they do overlap to some degree. The purpose of this report is to explain the areas in which the two documents complement one another, and to point out potential areas of coordination in their respective implementation processes. The documentary analysis will be supplemented by a series of semi-structured interviews with officials of the public and private sectors in several jurisdictions along the Texas Gulf Coast. The purpose of the interviews, still in process, is to discover how the two documents are understood and used by the affected jurisdictions, and what can be done to increase the capacity for effective coastal zone management and coastal hazard mitigation. The results of the interviews will be included in a separate report.

The next section of this report begins with a brief description of the TCMP as outlined in the 1996 FEIS and the 2006 Annual Report. The programs goals and policies will be described, and some of the projects funded under the Program will be discussed in terms of their capacity to mitigate coastal hazards. Then the STMP will be described and discussed in terms of its capacity to mitigate coastal hazards. The relationships between the two is presented in a table showing the links between the goals of the TCMP and elements of the STMP. Finally, opportunities for further integration of coastal zone management and hazard mitigation will be discussed by showing specific TCMP goals that are not currently being addressed by the STMP.

II. Description of Texas Coastal Management Program

The TCMP is described as a networked program, administered by the GLO and governed by the Coastal Coordination Council (Council) comprising the heads of Texas' resource agencies including the General Land Office, Parks and Wildlife Commission, Texas Council on Environmental Quality (formerly the Texas Natural Resource Conservation Commission), Railroad Commission, the Texas Water Development Board, the Texas Transportation Commission, the State Soil and Water Conservation Board, and four gubernatorial appointees representing coastal stakeholder groups. The networked agencies include eighteen local governments, agencies represented on the Council, the Texas Historical Commission, and the Public Utility Commission.

Coastal zone management involves a number of issues. The TCMP (FEIS Overview pp. 4-5) organizes them into six major divisions: 1) Protection of Critical Areas; 2) Barrier Islands: Shoreline Access, Dune Protection, and Hazard Mitigation; 3) Protection of Estuaries and Coastal Water Quality; 4) Coastal Erosion; 5) Historic/Cultural Resources; and 6) Major Development. Although mitigation is only mentioned explicitly in one of these headings, mitigation measures fit conceptually in several of them, providing opportunities for increasing the consistency of the STMP and the TCMP and their usefulness for guiding hazard mitigation

The TCMP was developed in compliance with the federal Coastal Zone Management Program under the leadership of the Texas General Land Office, beginning in 1989. The Coastal Coordination Act of 1991 (33 TEX. NAT. RES. CODE ANN. § 201 et. seq, amended by HB 32226 in 1995) provided for the creation of the Coastal Coordination Council, to be chaired by the GLO. The Act required the development of goals and policies for managing coastal lands, the creation of a network of state agencies and local governments to implement the management strategies as well as the legal and regulatory frameworks and procedures necessary to ensure that policies will be implemented and enforced. The TCMP received its final approval from NOAA in 1997.

The major document outlining the program goals and objectives is the Final Environmental Impact Statement of August 1996, which includes the Coastal Council Rules in the Texas Administrative Code Title 31 (GLO Coastal Coordination Council, http://www.glo.state.tx.us/coastal/cmpdoc/chap4.html). The FEIS is supplemented by Annual Reports published by the CCC outlining the activities and projects funded under the TCMP grant process. Table 1 shows the TCMP goals, as outlined in the Texas Administrative Code Title 31, Part 16, Chapter 501, Subchapter B, Rule § 501.12.

Italicized goals are those with particular relevance to issues of emergency management, which of course includes hazard mitigation.

Table 1: Goals of the TCMP

1.	*To protect, preserve restore, and enhance the diversity, quality, quantity, functions, and values of coastal natural resource areas (CNRAs).*
2.	*To ensure sound management of all coastal resources by allowing for compatible economic development and multiple human uses of the coastal zone.*
3.	*To minimize loss of human life and property due to the impairment and loss of protective features of CNRAs.*
4.	To ensure and enhance planned public access to and enjoyment of the coastal zone in a manner that is compatible with private property rights and other uses of the coastal zone.
5.	*To balance the benefits from economic development and multiple human uses of the coastal zone, the benefits from protecting, preserving, restoring and enhancing CNRAs, the benefits from minimizing loss of human life and property, and the benefits from public access to and enjoyment of the coastal zone.*
6.	To coordinate agency and subdivision decision-making affecting CNRAs by establishing clear, objective policies for the management of CNRAs.
7.	To make agency and subdivision decision-making affecting CNRAs efficient by identifying and addressing duplication and conflicts among local, state, and federal regulatory and other programs for the management of CNRAs
8.	To make agency and subdivision decision-making affecting CNRAs more effective by employing the most comprehensive, accurate, and reliable information and scientific data available and by developing, distributing for public comment, and maintaining a coordinated, publicly accessible geographic information system of maps of the coastal zone and CNRAs at the earliest possible date.
9.	To make coastal management processes visible, coherent, accessible, and accountable to the people of Texas by providing for public participation in the ongoing development and implementation of the TCMP.
10.	*To educate the public about the principal coastal problems of state concern and technology available for the protection and improved management of CNRAs.*

Five out of the ten TCMP goals have direct relationships to mitigating coastal hazards. Goal 1 addresses the protection of CNRA functions, one of which is to serve as buffers to hurricane force winds and wave energy. Goal 2 refers to "compatible economic

development and multiple human uses," which is relevant to the economic impacts of storm and flooding hazards, while Goal 3 specifically addresses the potential for loss of life and property due to coastal hazards. Goal 5 also refers to balancing economic benefits of developing the coastal zone and protecting the CNRAs. Goal 10 addresses public education about the "principal coastal problems of state concern," one of which is certainly tropical storms and hurricanes. Finally, Goals 6, 7 and 8 are principally concerned with administrative procedures, while Goals 4 and 9 address public access to the coast and to coastal policy development.

Policies for the TCMP are divided into 21 categories in the FEIS (GLO 1996), shown in Table 2. Most of the categories are highly relevant to the mitigation of social and economic impacts of coastal zone hazards. For example, Category 1 (Construction of electric generating and transmission facilities) is highly relevant to mitigation due to the vulnerability of electric generating and transmission facilities to damage from high winds and water intrusion and the key socioeconomic role of electrical power. Category 2 covers oil and gas exploration and production facilities. The construction and operation of these facilities inevitably generates some level of stress on sensitive Texas coastal ecosystems that need to be protected because they buffer the coast against hurricane force winds, waves, and storm surge. Discharges from such facilities, whether accidental or not, are covered under Category 3. Category 4 covers solid waste treatment facilities, which are another potential source of environmental pollution that could adversely affect CNRAs. The potential for damages from oil and gas exploration is so important that it merits its own Category, number 5. Wastewater pollution can have serious adverse impacts on marshlands that buffer the coastal zone, and are covered in Category 6. The nonpoint source pollution covered in Category 7 has long been recognized as one of the most difficult challenges to water quality because it is more difficult to control many small pollution sources than one large one, but the cumulative impact of the small sources on the health of coastal ecosystems can be even larger than the impact of large sources such as oil and gas production facilities.

Category 8 addresses development in critical areas, which is possible the greatest threat of all to the CNRAs and their resistance to hurricanes and floods. Such development may involve the construction of waterfront facilities on submerged lands, which merits its own Category of policies, number 9. Category 10 covers dredging and the disposal of dredged material. Dredging channels must be done carefully in order to avoid unnecessary widening of channels that can increase the path for storm surges to reach the coast, and disposal of dredged material may be used to improve beaches and marshlands.

Category 11, addressing construction in the beach and dune system, has obvious links to the protection of these vital natural protections against hurricanes. In the same manner, Category 12 (Development in coastal hazard areas) regulates the expansion of human activities in the CNRAs that can increase exposure to loss of life and property in disasters. Categories 13 and 14 address development in coastal barrier protected areas and state parks and wildlife management areas. Development in these areas also has the potential to have adverse impacts on the health of natural hurricane barriers. The alteration of coastal historic areas (Category 15) is important not only on the grounds of

protecting Texas' cultural heritage, but on the same grounds as protecting the areas covered under the previous categories.

Category 16 addresses transportation. Well-designed transportation systems are critical to the success of hurricane evacuations. Air pollutants, in Category 17, are more likely to affect the health of the occupants in the coastal zone than the ecosystem, but high concentrations of sulfur dioxide are detrimental to the health of plant life, including that in coastal marshes. Policies in Category 18 on the appropriation of water can have effects on drainage systems. Category 19 addresses levee and flood control projects, which have direct effects on the impacts of coastal hazards.

The final two policy categories (20 and 21) are of more general administrative importance, because they address "major actions" which may or may not affect hazard mitigation, and administrative policies, which could have tangential effects on hazard mitigation through the mechanism of promoting or hindering effective administration of the TCMP and its associated projects.

In order to provide some quantitative evidence of the importance of various themes to the framers of the TCMP, a count was made of the number of times selected keywords appear in the Policies section of the FEIS. The third column of Table 2 shows the results of a keyword search using "hazard," "flood," "storm," "hurricane," and "disaster" as keywords. In addition, the Advisory Policies were coded in the same manner, and results are shown in Table 3.

Table 2: TCMP Policy Categories

Number	Category Name	Keywords
1	Construction of electric generating and transmission facilities	
2	Construction, operation, and maintenance of oil and gas exploration and production facilities	
3	Discharges of wastewater and disposal of waste from oil and gas exploration and production activities	
4	Construction and operation of solid waste treatment, storage and disposal facilities	7
5	Prevention, response, and remediation of oil spills	
6	Discharge of municipal and industrial wastewater to coastal waters	
7	Nonpoint source (NPS) water pollution	1
8	Development in critical areas	
9	Construction of waterfront facilities and other structures on submerged lands	2
10	Dredging and dredged material disposal and placement	1
11	Construction in the beach/dune system	
12	Development in coastal hazard areas	2
13	Development within coastal barrier resource system units and otherwise protected areas on coastal barriers	1
14	Development in state parks, wildlife management	

	areas, or preserves	
15	Alteration of coastal historic areas	
16	Transportation	3
17	Emission of air pollutants	
18	Appropriation of water	1
19	Levee and flood control projects	1
20	Policy for major actions	
21	Administrative policies	

Data in these tables show that some opportunities to emphasize and integrate hazard mitigation in the TCMP may have been missed. For example, Policy Categories 3, 5 and 6 address various manners in which coastal waters may be polluted. Such pollution can have serious negative effects on the health of wetlands and coastal marshes, which are in their turn effective barriers against hurricane storm surges. Another example is Category 14, which addresses development in state parks, wildlife management areas and preserves. Any such areas on the coast should be protected, improved and expanded because of their potential to mitigate the effects of coastal storms through reducing the amount of human occupation and the intensity of land use along the coast.

Table 3: Advisory Policies

Number	Category	Keywords
1	Planning	1
2	Acquisition	
3	Conservation/Preservation	
4	Restoration	2
5	Pollution prevention/Recycling	
6	Coastal hazard areas	15
7	Coastal barriers	3
8	Coastal shore areas	6
9	Water quality	
10	Public access/Recreation	
11	Visual/Scenic access	
12	Fisheries management	
13	Construction/Development	9
14	Silviculture/Agriculture	

In the fourteen Advisory Policy categories, Category 2 is an example of a policy that could be used to promote hazard mitigation, through the acquisition of marshlands to prevent its use as building sites. A holistic approach to planning and development should be encouraged, in order to promote recognition among CCC member agencies of the linkages between policy areas and their relationships to coastal hazard mitigation. In

future revisions of the TCMP, attention should be paid to making these linkages implicit in the language of policies, thus enhancing their potential to promote hazard mitigation projects.

Clear management authority and administrative responsibilities are spelled out for each Policy Category. Many of the Policy Categories include language on exemptions, variances, monitoring and enforcement, or detailed explanations of terms, enabling legislation, and historical context. This level of detail is very useful for the agencies and local governments attempting to implement the policies.

The TCMP has funded a wide variety of data gathering and analysis, habitat restoration, infrastructure renovation, infrastructure development and installation, training, education, and monitoring projects that are referenced in the *TCMP 2006 Annual Report*. These projects have been implemented by local governments, NGOs, state agencies and educational institutions. This is a very broad range of projects and actors, and shows how far-reaching coastal management is for the state.

An example of the type of project with direct utility for hazard mitigation is the Goose Island Marsh Restoration in Aransas Bay (TCMP 2006 page 20). Such projects can help build up the natural coastal hurricane defenses. There are a number of information-oriented projects that can increase our understanding of the intricate coastal ecology, such as the Coastal Erosion Data Network and Oyster Reef Resource Network (TCMP 2006 page 24), the Marsh Accretion Rates at Restored and Natural Sites in Galveston Bay (TCMP 2006 page 28), and the Sand Source Investigation Database (TCMP 2006 page 25). These scientific projects provide important data on complex and little understood processes affecting the coast. They are supplemented by public information projects such as the Expansion of Earth Day-Bay Day (TCMP 2006 page 25) and the Captain Crab Clean Beach Media and Education Campaign (TCMP 2006 page 27) that provide opportunities to educate the public about the importance of protecting the coastal buffer zone and may increase public support for protective measures.

III. Description of the State of Texas Mitigation Plan

Mitigation Defined

Without a clear, agreed understanding of what mitigation is, the CCC will be unable to evaluate the contributions of the state and local mitigation plans, or to decide what mitigation projects should have priority when it comes to allocating funds. Therefore, the first issue is to establish some sense of the meaning of mitigation.

FEMA's (1999, p. 1-1) Hazard Mitigation Grant Program Desk Reference defines mitigation as "any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects". One limitation of this definition is its inclusion of a diverse set of activities that have only an indirect relationship to the reduction of disaster impacts. For example, FEMA's independent study course on hazard mitigation (Federal Emergency Management Agency, 1998a) lists emergency services and public information as mitigation measures along with more logical candidates such as flood control works, land use planning, and building codes. To overcome this limitation, Lindell and Perry (2000) defined hazard mitigation as preimpact actions that provide

passive protection at the time of disaster impact. This definition clearly distinguishes hazard mitigation from emergency preparedness, which consists of preimpact actions that provide the resources (personnel, plans, facilities, equipment, materials) needed to support an active response at the time of disaster impact. It also distinguishes hazard mitigation from recovery preparedness, which consists of preimpact actions or policies that provide the resources needed to return the community to its normal patterns of social functioning after disaster impact occurs. The STMP, developed to comply with the Disaster Mitigation Act of 2000 in order to fulfill eligibility for various federal programs, closely follows the FEMA definition of mitigation and adds that mitigation "consists of a variety of both pre-incident and post-incident actions" (STMP p. 3-1). The TCMP may or may not wish to limit its funding to projects directly related to mitigation actions that provide passive population protection at the time of impact, and leave emergency preparedness projects that support emergency response under the auspices of the Governor's Division of Emergency Management (GDEM).

Mitigation Funding Sources

Much of the funding for hazard mitigation has in fact been provided in the aftermath of disasters, under the federally funded Hazard Mitigation Grant Program (Section 404 of the Stafford Act) that "provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration" (FEMA 2006). Although intended to promote hazard mitigation, the timing of HMGP awards (after a major disaster) decreased their usefulness in reducing hazard vulnerability (Godschalk et al.1999).

The competitively awarded Pre-Disaster Mitigation (Part 203 of the Stafford Act, 42 USC 5133) grants do not suffer from this limitation, and are available to states with a FEMA approved hazard mitigation plan. Projects under this program receive generous federal funding, but are partially funded under cost-sharing arrangements with the applicants (state emergency management agencies) and subapplicants (other state agencies, local and tribal governments, state and tribal colleges).

Other programs providing mitigation funding to states and local governments include the Flood Mitigation Assistance Program, the Repetitive Flood Claims Program, and the Severe Repetitive Loss Pilot Program. These programs were all authorized by 2004 amendments of the National Flood Insurance Act, and their regulations may be found in the Code of Federal Regulations 44 parts 78 and 79. There is some overlap in these programs; basically they are all intended to reduce or eliminate flood risks to buildings (including manufactured homes) covered by the NFIP. The FMA and SRL programs offer up to 75% federal funding, and the RFC provides up to 100% federal funding.

Description of the STMP

The STMP consists of six sections that cover the plan preparation process, risk assessment process, mitigation strategies, funding and technical assistance, state level commitment to mitigation, and plan maintenance. In addition there are annexes detailing the state's Hazard Mitigation Grant Program and Pre-Disaster Mitigation Administrative Plan, and several attachments with more detailed information on hazard analysis and other specifics.

The mitigation planning process was coordinated by GDEM, and included a wide variety of state agencies, local governments, and regional agencies. A State Hazard Mitigation Team was created that includes many of the same agencies as the CCC, including the Parks and Wildlife Department, GLO, TCEQ, TWDB, TXDOT, and the Railroad Commission. The process was also coordinated with FEMA to ensure compliance with federal requirements.

The 2004 STMP concentrates on the most prevalent hazards in the state: floods, hurricanes, tornadoes, drought, and wildfires. All of these hazards are present in the coastal zone, and hurricanes affect the coastal zone more than any other region of the state. The 2007 Plan expands the list of hazards to include Coastal Erosion, Coastal Retreat and Coastal Subsidence; Dam and Levee Failure; Earthquakes; Expansive Soils; Extreme Heat; Hailstorm; Land Subsidence; Sever Winter Storms; and Windstorms. It also provides more detailed data on the statewide occurrence of these hazards (GDEM 2007 pp 19-99).

Section 3, "Mitigation Strategy" details strategies aimed at Flood Mitigation, Tornadoes, Hurricane/Tropical Storms, Wildfire Mitigation, and Drought. This section references the GLO and TCMP in two places. First, on page 3-5, the STMP states that GLO and SHMT coordinated to compile a list of coastal priorities for hazard mitigation. However, this list does not appear in the plan. [1]

Second, on pages 3-16 and 3-17, under Hurricane/Tropical Storms there is a reference to GLO mitigation strategies, including funding for the relocation of houses seaward of vegetation line, installation of geotextile tube on beaches, and natural dune restoration, and the Hurricane Local Grant Program which is focused on public awareness and education.

Under General Mitigation Actions (pages 3-19 to 3-21) a number of specific actions are mentioned, however 14of the 36 total are actually preparedness, recovery planning, or response actions, rather than mitigation actions that provide possible protection to the population during an event.

Section 4, "Local Mitigation Planning Coordination" states that the highest priority for HMGP is removing structures from floodplains (p 4-3) in order to reduce the population's vulnerability to floods. These removals are to be voluntary, through acquisition of properties in the floodplains. However, the references to GLO and the TCMP (page 4-6) do not address this priority. Funding criteria for the GLO listed here apparently focus on dune restoration and geotextile tube projects. TCMP funding categories listed in this section and established by the Council include Coastal Natural Hazards Response, Critical Areas Enhancement, Shoreline Access, Waterfront Revitalization and Ecotourism Development, Permit Streamlining/Assistance and Governmental Coordination, Information and Data Availability, Public Education and Outreach, and Water Quality Improvement.

[1] I still could not find it in the 2007 version. It is supposed to be in "Section 3.D.2" (cited on page 140), but the plan jumps from Section 3.C (State Capability Assessments) to Section 3.E (Local Capability Assessments).

Some projects may increase development within the coastal surge zone rather than reduce it, for example, waterfront revitalization and ecotourism development can actually increase human occupation of the coastal zone. Streamlining the permitting process can actually make it easier to develop in sensitive areas, and increases in numbers of permits granted have been linked to increases in flood events and flood damages (Brody, Highfield, Ryu and Weber 2007, Brody, Zahran, Maghelal, Grover and Highfield 2007). Any increase in coastal populations increases the exposure of people and property to damage from hurricanes and floods, and encouragement and facilitation of such increases will work against the stated goals of the TCMP.

Some of the annexes have little to do with coastal zone management, such as the Drought Preparedness Plan and the Firefighting Annex. Annexes A (HMGP Administrative Plan) and B (PDM Administrative Plan) are posted on DEM's website. Attachment 1 is apparently still under revision and not readily available. Attachment 5 is a list of Disaster Mitigation Act 2000 Implementation Milestones passed by the state.

The hazard analysis maps are finished and included in the STMP as Attachment 6. (These maps are substantially upgraded and expanded in the 2007 version of the STMP.) The State Hazards Analysis Attachment 7 is a "Guide to Funding and Technical Assistance Programs" detailing the funding source, types of assistance and eligible projects, conditions, hazards covered, matching requirements and application deadlines. The information is presented in table format and will be useful to local governments that are looking for funding for hazard mitigation programs, including those that can have a positive impact on coastal zone management, such as the various US Army Corps of Engineers funding programs. Both the earlier and the more recent STMPs have sections on "Mitigation Success Stories," several of which are located in coastal counties and involve mitigation of the effects of coastal storms

Because this report is an attempt to explain the linkages of mitigation policy to Coastal Zone Management, and due to the importance of hazard mitigation in the coastal zone, a more thorough examination of the State of Texas Emergency Management Plan's Mitigation Annex (Annex P of the STMP) follows.

The Mitigation Annex

Attachment 3, the Mitigation Annex of the State of Texas Emergency Management Plan (STEMP), available at ftp://ftp.txdps.state.tx.us/dem/plan_state/state_annex_p.pdf gives information on the Emergency Support Functions of all State Hazard Mitigation Team members, including the GLO. Activities described in the Annex include development and maintenance of the State Mitigation plan and provision of technical assistance and guidance to local governments. Most hazard mitigation in the State of Texas is the responsibility of city governments because the state and county levels of government have little or no control over land uses and building standards. However, counties do participate in some flood mitigation activities and are members of various Councils of Governments that have produced mitigation plans.

Therefore it is important that the state take real steps to assist all local governments in development and implementation of their mitigation plans. The Hazard Mitigation Annex gives GDEM responsibility for providing "guidance and assistance to local governments for development and implementation of local mitigation action plans," assisting local

governments to analyze hazards, conducting hazard mitigation workshops, and publicizing available assistance, in addition to basic planning, information gathering and reporting functions. The State Hazard Mitigation Officer, under GDEM, is the leader of the State Hazard Mitigation Team (SHMT).

The GLO's role as a member of SHMT is to coordinate "coastal mitigation issues such as prevention of beach erosion and improvement of the quality of beaches" (Annex P, P-7). No detail is given as to what such coordination might mean in terms of real mitigation actions (i.e., removal of buildings from the seaward side of the vegetation line).

Explanations of other SHMT member agencies' responsibilities are also vague and perfunctory, with the exception of the Texas Department of Insurance, which

(1) Educates insurance policyholders on methods and types of products that can reduce losses, reduce claims, and eventually lower insurance premiums and increase the availability of insurance.

(2) Works with the manufacturing industry to develop and promote better construction products (e.g., roofing materials, window protection, storm clips, and other safety products).

(3) Works with local governments to develop a windstorm-resistant building code, and then assists those entities in inspecting structures for compliance.

(4) Develops and distributes to Texans, warning and mitigation brochures that provide key information in responding to threats and protection against damage from hurricanes, floods, tornadoes, frozen pipes, thunderstorms, lighting, hail, and wildfires. (Annex P, P-8)

The Texas Water Development Board also receives more detailed coverage, it

> (1) Provides matching grants for feasibility level flood protection planning studies.
>
> (2) Provides funding for flood control planning projects.
>
> (3) Administers the Flood Mitigation Assistance Program. (Annex P, P-9)

In general, the STMP adheres to planning conventions that are not very relevant or adaptable to the coastal zone management and coastal hazard mitigation. GDEM has historically been more concerned with and involved in disaster response and emergency preparedness than mitigation. This bias is exemplified by the organizational plan of the Mitigation Annex, which has to fit mitigation, a set of activities typically undertaken by planning and development agencies, into an outline more suited to military and quasi-military planning, such as that done by law enforcement and fire departments. Some sections are thus much briefer than others, for example, "Direction and Control" and "Continuity of Government" receive very little attention if compared to the more lengthy "Concept of Operations" and "Organization and Assignment of Operations" that address the definition of mitigation and outline mitigation programs and the roles of various state agencies in hazard mitigation.

IV. Goal Matrix

One of the purposes of this document, as outlined on pages one and two of the contract between GLO and the HRRC, is to evaluate the compatibility and consistency of the STMP and the TCMP, and address their capacity to "promote concerted actions that work toward coastal hazard mitigation." In order to examine more closely the relationship between these very different entities, a matrix of goals in the TCMP was developed. Goals are broad statements of intent that serve to guide agencies as they allocate resources to specific activities. As such, they are worthy of attention. Activities that are not consistent with goals are indicators of disregard for plans, the insertion of political considerations into technical activities, or other problems in the policy implementation process that should be addressed.

The TCMP Goal Matrix (Table 4) depicts the existing relationship between the Texas Coastal Management Program goals and the STMP's six sections. It is readily apparent that the Mitigation Strategy and the Local Mitigation Planning Coordination sections of the STMP relate to many of the TCMP goals, while the others sections do not fit as closely as they could with the TCMP. This section of the report will describe the relationships shown in this table as well as discuss specific steps that should be taken to increase the compatibility and consistency of these two state efforts. Inconsistencies among state plans and programs should be avoided, because the more compatible and consistent they are the more likely they are to promote concerted coastal zone mitigation actions.

The TCMP Goal Matrix consists of the ten TCMP Goals in the left hand column of the matrix, labeled A through J, with the six sections of the STMP along the top row of the matrix, labeled 1 through 6. An "X" was placed in the box that is addressed by both the TCMP goal and the STMP section. The table is structured this way so as to depict which goals of the TCMP are addressed by the STMP and in which section they are addressed.

For example, the STMP discusses the TCMP in one short paragraph in section 4 (Local Mitigation Planning Coordination). This brief treatment does not make it sufficiently clear to the reader that local governments may be required to comply with the TCMP's goals and policies, for example when allowing construction near the beach or permitting subdivisions (Texas Administrative Code Title 31, Part 16, Chapter 505, Subchapter E, Rules 505.60-505.74). As shown in Table 4, the sections of the STMP associated with CNRAs are consistent with the goals of the TCMP. Even though this is the case, there are areas throughout the STMP that could further discuss the TCMP and integrate these two state documents in a fashion that promotes hazard mitigation, which would in turn bring about better preservation and restoration of CNRAs.

All ten TCMP goals, A – J, are addressed in sections Three (Mitigation Strategy) and Four (Local Mitigation Planning Coordination) of the TMP, and Section Five (Comprehensive State Mitigation Program) addresses goals A – D of the TCMP. Although this does not mean the STMP promotes the same goals as the TCMP, it is evidence that the GDEM is at least aware of the issues involved in coastal zone management. For example, the issue of providing public access while protecting private property rights (TCMP Goal A) is not the main focus of any part of the STMP. The

number of miles open to public use (293) is included in the Geophysical Description of Texas, but public access receives little attention elsewhere in the STMP. However, protection of private property rights is evident in Strategy #1 of the Mitigation Strategies (p. 3-13), which describes efforts to buy repetitive loss properties, many of which are located in coastal counties. Section Four states that the "primary focus" of Hazard Mitigation Grant Program funds will be the acquisition of such properties (p. 4-4), and four of seven Pre-Disaster Mitigation projects in Fiscal Year 2003 were acquisition projects (p. 5-2). Buyouts allow the owners of repetitively damaged properties to receive fair compensation for their properties and move to safer areas.

Public education about coastal problems is an important element of the TCMP. Language on public education is included in Sections Three and Four of the STMP. Hurricane/Tropical Storm Mitigation Strategy #2, the Hurricane Local Grant Program is specifically designed to fund local projects that enhance hurricane-related public awareness and education (p.3-17). Section Four describes the GDEM Mitigation Section products such as *DEM-21 Mitigation Handbook*. These products are designed for local governments but available online to all citizens. Funding is available for public education and outreach programs from the TCMP (p. 4-6).

Overall, it is encouraging to see the degree of overlap between the concerns of GLO as expressed in the TCMP and GDEM as stated in the STMP. While the STMP covers the whole state and thus many hazards that are not present on the coast or strongly related to the TCMP, such overlaps will make it easier to "promote concerted actions" for coastal zone management in the state.

Table 4: TCMP Goal Matrix

STMP Sections TCMP Goals	Planning Process (1)	Risk Assessment (2)	Mitigation Strategy (3)	Local Mitigation Planning Coordination (4)	Comprehensive State Mitigation Program (5)	Plan Maintenance Process (6)
A) To ensure and enhance planned public access to and employment of the coastal zone in a manner that is compatible with private property rights and other uses of the coastal zones			X	X	X	
B) To balance the benefits from economic development and multiple human uses of the coastal zone, the benefits from protecting, preserving, restoring, and enhancing CNRAs, the benefits from minimizing loss to human life and property, and the benefits frompublic access to and enjoyment of the coastal zone.			X	X	X	
C) To coordinate agency and subdivision decision-making affecting CNRAs by establishing clear, objective policies for management of CNRAs.			X	X	X	
D) To educate the public about the principal coatsal problems of state concern and technology available for the protection and improved management of CNRAs.			X	X		
E) To protect, preserve, restore, and enhance the diversity, quality, quantity, functions, and values of Coastal Natural Resource Areas (CNRAs)	X		X	X		

F) To ensure sound management of all coastal resources by allowing for compatible economic development and multiple human uses of the coastal zone			X	X		
G) To minimize loss of human life and property due to the impairment and loss of protective features of CNRAs			X	X		
H) To make agency and subdivision decision-making affecting CNRAs efficient by identifying and addressing duplication and conflicts among local, state and federal regulatory and other programs fro the management of CNRAs			X	X		
I) To make agency and subdivision decision-making affecting CNRAs more effective by employing the most comprehensive, accurate, and reliable information and scientific data available and by developing, distribution for public comment, and maintaining a coordinated, publicly accessible geographic information system of maps of the coastal zone and CNRAs at the earliest possible date.			X	X		
J) To make coastal management processes visible, coherent, accessible, and accountable to the people of Texas by providing for public participation in the ongoing development and implementation of the Texas CMP.			X	X		

V. Integration of hazard mitigation in coastal management

There are a variety of ways in which the GLO can better integrate hazard mitigation into the TCMP that will be addressed in this section. All of these methods involve the development of closer ties with local governments and relevant state agencies. The importance of networking and building relationships cannot be overemphasized. Frequent meetings can help dissimilar groups come to a shared definition of problems and develop plans and projects that can work together to address these problems. To this end, the GLO should continue and accelerate its current efforts to create working relationships with local governments. Two specific groups should be targeted: land use planning/development professionals in the cities, and emergency management professionals at the city and county level. These groups have not historically had close relationships, understood each other, or worked very closely together. In this new century, it is time to move beyond stove piped public agencies and learn to collaborate. Hazard mitigation is a clear case of the need for collaboration across disciplinary and agency boundaries.

The GLO is familiar with thinking in long-range terms rather than considering only short-term political or economic benefits, and this orientation is a valuable one that can serve as the basis for long-range thinking about the best way to use and protect the state's natural and economic resources. The GLO also has a unique set of partner agencies in the CCC, and can build on these relationships as well as extend working relationships to other state agencies. By aligning their goals, these various agencies can increase their effectiveness. Now we will address the three areas in which the GLO can act.

1. *Promote a clearer understanding of and a stronger commitment to hazard mitigation at the local level.* The STMP is built on a model that is not well adapted to reducing natural hazard exposures. It focuses on meeting FEMA requirements in the "crosswalk" process (for an explanation of this process see the manual available at http://www.fema.gov/plan/mitplanning/guidance.shtm and see discussions in the mitigation plan evaluation report prepared by the HRRC staff as part of it activities for the GLO), which ensures that mitigation plans meet minimum standards and includes the elements required for receiving federal funds. This approach does not result in a readable, user-friendly plan. It reads more like a laundry list of state agencies and their varied programs and projects. The plan's definition of mitigation as "any action taken to eliminate or reduce the long-term risk to life and property from natural and human-caused hazards" (STMP p. 3-1) can certainly encompass the most useful tools for mitigating coastal hazards, but these tools are not the focus of the plan as it stands.

The plan does recognize that Texas state law places the burden of actual mitigation actions on local governments, usually meaning cities (STMP p. 3-2). Counties in Texas, unlike in many other states, have no planning or land use control authority. This places the burden of legislation, implementation, and monitoring on the governments least likely to have the resources to undertake hazard analyses, the political will to pass the needed legislation, or the capacity to implement policy and monitor compliance.

There are many reasons local governments do not, cannot, or will not undertake adequate mitigation activities. Chief among these is lack of political will, or commitment

(Godschalk et al. 1999). In most coastal cities, economic development defined as growth remains an important goal. The imposition of limits to such growth resulting from land use planning, hazard zoning, or adopting and enforcing building codes places local governments at odds with important local political forces. In such cases, it can be useful to educate elected and appointed officials as well as the public about the real present costs of disasters, methods of preventing them or minimizing the effects of hazard events, and the benefits that can flow to cities that undertake to reduce their hazard exposure. The GLO can undertake such a process of education through contacts it has already made at the local level, deepening these relationships and reaching out to small communities in particular. In addition, the GLO can work with emergency management professionals in groups such as the Texas Coastal Advisory Team to help educate local decision makers.

Another reason for the lack of serious mitigation action is a lack of local capacity. The GLO can address this issue through offering technical assistance to local governments that want to do more, for example through offering assistance in hazard analysis. The website project currently in development can be shaped to meet local government needs for information and information analysis, and training sessions for using the website should be developed while it is in progress. In addition, the funding of projects design to create tool, data, and models that will facilitate making sound development and mitigation decisions. Examples might include modeling projects on local sea-level rise, wind fields, the geo-hazards mapping project undertaken with Dr. Gibeaut for Galveston Island and incorporation of the results of these projects in to web-based decision support tools – like the coastal planning atlas – that can be employed at the local level to guide development and mitigation decisions.

2. *Promote the use of land use planning, zoning and building codes to reduce disaster exposure in the coastal zone*. In order to withstand legal challenges zoning ordinances must be tied to legally adopted, comprehensive land use plans that address the community's goals for the future through measurable objectives and policies that will help the jurisdiction meet stated goals. An open and collaborative planning process is helpful in gaining public acceptance for zoning ordinances and land use plans, but many smaller jurisdictions need assistance with the planning process at one point or another. Technical assistance in city comprehensive planning and zoning ordinance development is available at many universities around the state, and the GLO can assist interested local governments by helping them find a program that will work with them to develop or update their plans and ordinances, including hazard mitigation elements. A simple table of funding opportunities, with information on amounts available, criteria for evaluation, and requirements for funding, similar to that available as Attachment 7 to the 2007 STMP prepared by H_2O partners, can be very useful. GLO could prepare a list like this of funding assistance available to local planning and development agencies.

In addition, the GLO could prepare a model county planning enabling act, based on models used in other states (Institute for Business & Home Safety 2006), to put forward at the next State Legislative session. Mandating that counties undertake such planning would reduce the hazard to settlements located in unincorporated areas. Such a legislative change should be accompanied by a change to the city planning enabling act that makes land use planning mandatory rather than elective as it currently is in Texas (Texas State Local Government Code Chapter 219). By preparing a model county

planning act and recommending it to the Texas Legislature, and working to promote mandatory comprehensive city planning that includes hazard mitigation as one of its goals, GLO could advance awareness of the need for more attention to hazards mitigation at the local level, and influence the legislative outcome in a positive way. Research has shown that state planning mandates do matter, and that states with mandated local planning have more appropriate local land use practices than states that do not (May and Deyle1998).

Undertaking these types of activities might be greatly enhanced by partnering and working with the Texas Chapter of the American Planning Association (www.txplanning.org). The Texas APA offers not only a yearly workshop with training sessions, but a variety of local workshop on issues related to planning in Texas such as developing a comprehensive plan, creating ordinances that work, and tools to implement planning. Exploring the holding joint workshops on mitigation, environmental and coastal planning issues, model mitigation ordinances, and integrating mitigation planning into comprehensive plans might be vehicles to promote long term mitigation efforts by communities in the coastal management zone.

3. *Partner with the TWIA and TDI's efforts to promote better building practices through building codes, inspections, and enforcement*. The Texas Department of Insurance educates consumers about wind hazards through its website at www.tdi.state.tx.us. This educational effort should be extended to promoting the adoption of adequate building codes in all coastal communities. The adoption of building codes at the municipal and county levels should be mandatory, and legislative changes to this effect should be developed for adoption by the Texas legislature. GLO may be able to assist TDI in the attempt to formulate and pass such legislation.

In addition, TDI is responsible for approving insurance rates in the state and for inspecting buildings for compliance with building codes. TDI can continue its educational efforts by closely linking rates to wind exposure, and can be invited to participate in the CCC's various public education and outreach projects. Consumers need to be educated about the connections between the quality of homes built in their areas and the potential for damages in the case of hurricanes.

The TWIA is increasingly serving as the insurer of choice or indeed the only insurer of coastal properties. TWIA has a broad base of funding, but it may still be unable to meet the needs of a large event or a series of smaller ones occurring in rapid succession. If demand for its services could be reduced through reducing the amount of new building on the coast and making such building as does occur compliant with strong wind codes, the Association would have a better chance of surviving to offer its services to future generations of Texans.

One important area of potential collaboration is the need for stricter and more widespread building codes. Such codes could help reduce damages from hurricane force winds and the state's financial exposure to risk. By creating working partnerships and networks with local governments through the TCMP, along with the TDI and TWIA, GLO can help local governments and businesses better understand the true nature of coastal hazards and the risks they pose. Making local politicians and business leaders more aware of the hazards is one important step. Another one is providing examples of

how increased control of development can improve the fiscal health of state and local governments, by reducing subsidies for risky development.

Yet another area might be explored between the GLO and TDI might be in jointly funding of wind field modeling and assessment tools that will yield risks and vulnerability assessments at refined geographical scales to facilitate community based mitigation planning, high wind ordinances, and risk appropriate and relevant building codes. One of the difficulties local communities, stakeholders and individual citizens have when trying to undertake mitigation planning is the "fact basis" components of a plan which require not only identifying the hazards that threaten an area, but also detailed assessments of specific vulnerabilities and risks. Using broad based ASCE wind field maps, if they are available, provide only limited understanding of the wind risks at the local level where refined locational data on risk (i.e., Probabilities of sustained and gusting wind of various speeds) is needed for mitigation planning. Perhaps working with the TDI can make the funding of these types of projects more likely and can better ensure that the needs for local community's can be met. In addition, the results of these projects should be made available free to local communities and stakeholders in a format that is useful and readily accessible.

4. Partner with the Governor's Division of Emergency Management to promote mitigation and seek out opportunities to coordinate efforts. As noted above, it is important that closer working relationships between the GLO and other relevant state and local governments be developed to insure coordinated and concerted action related to mitigation efforts. One critical step might be having representation of the Governor's Division of Emergency Management on the Coastal Coordinating Council. The specific goals of including a member of DEM on the CCC would be to help shape funding policy to ensure that issues of relevance for broad issues of hazard mitigation become an ongoing agenda item and to better ensure coordination between DEM and the TCMP.

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