Status and Trends of Coastal Vulnerability to Natural Hazards Project Annual Report for Phase 1

by

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The Texas Coastal Zone, as defined by the Texas Coastal Management Program (CMP), is home to six of the top twenty most populated counties in the state, including Harris, Cameron, Nueces, Jefferson, Galveston, and Brazoria counties. Together the 18 coastal counties of Texas [Orange, Jefferson, Calhoun, Harris, Galveston, Brazoria, Matagorda, Aransas, Nueces, Calhoun, Kenedy, San Patricio, Victoria, Kleberg, Willacy, Cameron, Jackson, Victoria] contain just over 5.2 million people, representing approximately 25% of Texas' population and that population is projected to grow to 8.6 million by 2040. Harris County, which includes the greater Houston area, is the most populous county in Texas. For perspective at a national scale, the greater Houston area is one of the top ten largest metropolitan areas in the country and one of only two located in a coastal zone. Hurricane Ike, the fourth most costly hurricane in United States history (Berg, 2009) clearly demonstrated that this population is highly vulnerable to the surge and wind hazards that are associated with hurricanes.

To address the increasing vulnerability of our nation, the 2000 reauthorization of the Stafford Act called for an increased emphasis on natural hazard mitigation. In response, the State of Texas, through the Governor's Division of Emergency Management (GDEM), prepares a State of Texas Mitigation Plan (STMP) every three years that for approval by the Federal Emergency Management Agency (FEMA). During the planning and early initiation of this project, the 2004 STMP was in effect. That plan identified five natural hazards, including floods, tornadoes, tropical storms and hurricanes, droughts and wildfires as being of particular concern to Texas. Since the inception of this project, the 2007 STMP has been developed and has extended the number of natural hazards of concern to include, among others, coastal erosion and subsidence. The 2004 STMP suggests that losses due to a major hurricane could reach 20 billion and the 2007 plan increases this only slightly to 21 billion. In light of the 84 deaths directly or indirectly attributed to Ike, the over 30 individuals still missing, and current estimated losses of 19.3 billion (Berg, 2009), the STMP's estimates appear low. Considering that Ike was a Category 2 storm, these deaths and losses drive home the importance of addressing the increasing vulnerability of our coastal population. Indeed, one of the primary goals of the STMP is to stimulate and enhance the development of local mitigation action plans seeking to reduce the vulnerability of Texas coastal areas to hurricane and tropical storm impacts.

The CMP may be another important mechanism for addressing coastal vulnerabilities. The CMP seeks to be the "state's answer" to calls for a more "comprehensive approach for the management of coastal natural resources" through "effective and efficient" decision making (CMP Guide, page 2). The CMP's goals of protecting, restoring, and enhancing the diversity, quality, quantity, function and values of coastal natural resource areas (CRNAs) while at the same time seeking to minimize loss of human life, property

and the benefits of CNRAs argues for effective mitigation to ensure these goals are better achieved. There are undoubtedly many activities that the CMP could undertake to enhance the mitigation decisions and activities by coastal communities that will enhance coastal resources while minimizing vulnerabilities and risks. Unfortunately hazard mitigation issues have not received a level of attention within the CMP that is perhaps commensurate to the growing coastal vulnerability to coastal hazards and potential property losses they represent. There are undoubtedly many reasons for this, such as the lack of representation of the Governor's Division of Emergency Management (GDEM) on the Coastal Coordination Council and directives to focus more on erosion avoidance and remediation than on long-term mitigation issues.

The Status and Trends of Coastal Vulnerability to Natural Hazards project is a multi-phase project designed to undertake a status and trends study of coastal vulnerability to natural hazards of counties located in the CMP boundary. The target areas for this study will be Harris, Galveston, and Brazoria counties. However, much of the overall analysis will include counties along the entire Texas Coast.[1] The project includes the following tasks:

1. Evaluate content and implementation of the STMP (2004) for applicability to the CMP.
2. Assess the regulatory regime and effectiveness of construction codes and land use planning policies to mitigate potential impacts of coastal natural hazards.[2]
3. Identify best practices and emerging technologies related to building code and land use planning that could further mitigate potential impacts of coastal natural hazards.
4. Assess the local, state and federal resources available for mitigation, preparedness, response and recovery to coastal natural hazards and evaluate their application to the CMP.
5. Evaluate the geographic relationship between current coastal management program boundaries and projected impacts from various categories of hurricanes based on the latest coastal study area maps.
6. Assess the physical and social vulnerabilities of coastal populations to facilitate planning and policy development related to hazard mitigation and response.
7. Assess the adoption of hazard mitigation technologies (e.g., hurricane shutters), issues related to the adoption of these technologies, and disaster planning by households and municipalities so that effective and targeted outreach and education activities can be developed.

[1] The original proposal targeted counties in and around the Lake Sabine area, which included Chambers, Hardin, Jasper, Jefferson, Liberty, Newton, and Orange counties. However, after consulting with GLO staff, it was mutually agreed that the target areas would be Harris, Galveston and Brazoria counties, with an emphasis on those areas and communities within the CMP boundary. Throughout the first phase of this project, other changes were made to the original proposal, always based on consultation and agreement with the GLO staff. This document reflects these changes.

[2] By mutual agreement, the emphasis of this task shifted from construction codes and land-use planning policies, to a focus and assessment of mitigation actions plans and mitigation actions for areas within the CMZ.

It is hoped that the research outlined above will generate policy and programmatic recommendations related to coastal programs, management, and regulations. This research will also develop tools for enhancing public involvement in mitigation decision making and planning, as well as for assessing programmatic and policy weaknesses and hazard vulnerabilities along the Texas coast. Finally, it is hoped that this research will generate recommendations to better insure compatibility between and concerted action based on the STMP and the CMP, strengthening mitigation activities throughout the CMP boundary.

Phase 1 focused on Tasks 1, 2, 5, 6, and the formation of a status and trends project advisory committee. The following report provides a brief overview of the accomplishments for the first phase of this project for each task and associated subtask. Some sections include a discussion of the activities to be undertaken during Phase 2 of the project. More detailed information associated with each task are provided in appendixes found at the end of this report. The project effectively ran from January 2007 through the end of June 2008.

Task 1: Evaluate content and implementation of the State of Texas Mitigation Plan (October 2004) for applicability to the CMP.

This task included 3 subtasks:

1) Conduct a detailed documentary analysis of both the STMP and the CMP, focusing on issues of compatibility, consistency, and the capacity of these plans to promote concerted actions that work toward coastal hazard mitigation.
2) Interview public officials at the state, county and municipal level regarding their perceptions of the content and implementation of both the STMP and CMP. Much of the interviewing is part of Task 2; however, interviewees will be asked questions related to the STMP and the CMP, and more generally, the activities of the GLO with respect to the CMP to ascertain their knowledge of these plans. The target areas for local officials will be Harris, Brazoria, and Galveston counties, with emphasis on those locales in the CMP boundary.
3) Analysis of interview data and preparation of a report based upon interview results and documentary analysis assessing of the applicability of the STMP, both in terms of its substantive content and implementation, to the CMP.

The deliverables for this task were:

1. Preliminary report on the documentary analysis of the STMP and the CMP.
2. Preliminary report on the perceptions of local official and community leaders regarding the STMP design and implementation and its compatibility with the CMP.
3. List of advisory committee members.
4. Final report combining these findings.

The preliminary report containing the documentary analysis of the STMP and the CMP was undertaken by project staff and presented to the GLO in December of 2007. The preliminary report is attached as Appendix 1.

The report found a relatively high degree of compatibility and consistency between the STMP and the CMP. While the STMP of 2004 primarily addresses 5 hazards (flooding, tropical storms and hurricane, tornados, drought, and wildfires), tropical storms and hurricanes are recognized as highly probable hazards for the state of Texas and considerable space is devoted to these hazards. Not surprisingly, if one focuses on those components of the STMP, the compatibility is particularly evident.

Examples of compatibility and consistency include:

- Both plans share mutually consistent goals of reducing loss of life and property damage.
- The CMP makes clear references to coastal hazards throughout its discussions related to policy areas and advisory policies.
- A major potential requirement for insuring compatibility between the CMP and the STMP is the consistency review process. Whether addressing local, state, or federal consistency, the CMP is concerned about activities that have potential impacts on CNRAs. Since many of the mitigation actions proposed in local Mitigation Action Plans (MAPs) promoted by the STMP and sanctioned by the state and FEMA will be undertake in the CMP boundary, complementarily and consistency between the CMP and STMP will be critical. In other words, mitigation actions proposed by MAPs should be consistent with the CMP.
- The report identified consistency between all 10 of the CMP goals and elements of the STMP. The consistencies were most evident in the STMP's discussions and guidance related to its mitigation strategies, local mitigation planning coordination, and the states comprehensive mitigation program.
- The GLO's funding of research related to erosion, subsidence, and other coastal hazards is also critical for elements within the STMP's risk assessment activities and hence is another area of potential compatibility.

Examples of recommendations made by the preliminary report are:

1. *Promote a clearer understanding of and a stronger commitment to hazard mitigation at the local level.* The STMP recognizes that Texas state law places the burden of actual mitigation actions on local governments, meaning cities and municipalities. The GLO, through the CMP, seeks to enhance local decision-making processes through education programs, development of information and technical assistance, and promoting capacity development to local constituencies and stakeholders. Continuing and enhancing these activities, targeting mitigation related actions and coordinating with the GDEM through its mitigation planning activities, offers an area of fruitful integration that is mutually compatible with STMP and CMP goals.

2. *Promote the use of land use planning, zoning and building codes to reduce disaster exposure in the coastal zone*. By promoting technical assistance that enhances land-use

and comprehensive planning the GLO can assist local governments, subdivision developments, etc. to incorporate hazard mitigation elements into these activities. The inclusion of mitigation issues within consistency determinations and assessments may well promote the diffusion of these policies. The GLO could prepare a model planning enabling act or subdivision policies that could promote mitigation planning.

3. *Partner with agencies such as the GDEM, TWIA and TDI to promote better land use planning, building practices, inspections, and enforcement*. The Texas Department of Insurance (TDI) and the GDEM seek to educate consumers and the public about flooding, wind and surge hazards. Joint efforts between these agencies and GLO, through CMP funding, would enhance coastal mitigation activities in ways mutually consistent with the respective agency goals and the CMP. Indeed, the inclusion of representatives from the GDEM in particular and perhaps even the TDI or Texas Windstorm Insurance Association (TWIA), may well enhance further the cooperation and partnering among these agencies.

In response to the draft report, the GLO staff offered a number of thoughtful criticisms. Some of these comments suggested that the report focused narrowly on the documentary analysis of the Texas CMP Federal Environmental Impact Statement (FEIS) and not an assessment of the CMP in its entirety. The Texas CMP FEIS can be vague, while its various programs, such as the grants program, are quite comprehensive. GLO staff also noted that the STMP itself was updated in the late fall of 2007 and that the GLO is more integrated into the 2007 plan, playing a more important role related to mitigation planning.

As part of the second subtask, elite interviews were conducted during the spring and summer of 2007. These interviews required the development of an interview protocol and sanctioning of that protocol through Texas A&M University's Institution Review Board (IRB). A copy of the interview schedule can be found in Appendix 2. Some of the questions were targeted to gain insights into the relationship between the CMP and STMP.

NOTE: In response to a request from GLO staff, the project team shifted subtask 2 activities away from elite interviewing activities to focus on developing a local hazard mitigation plan assessment protocol and applying that protocol. As a consequence, the project team temporarily suspended its elite interviewing. Nevertheless, interviews were completed with staff from the GLO, TDI, TWIA, local planning agencies in Galveston and Houston, a local building department, and a local Emergency Management department. The interviews continue and will be completed during Phase 2. A preliminary report based on these interviews was prepared and is included in Appendix 3.

Examples of general findings include:

- The inclusion of a representative from the Governor's Division of Emergency Management on the Coastal Coordinating Council may well insure greater coordination and concerted action between the STMP and the CMP.
- The relationship between the GLO and GDEM (due to changes in the 2007 STMP) should be enhanced and should ensure greater consistency between the STMP and CMP in terms of their implementation. This also means that some discussion of the 2007 STMP in the final report will be important.
- There is a good deal of commonality in goals between the TDI and CMP. Both are concerned with reducing losses related to coastal hazards, although the former is much more concerned with wind hazard, as flood hazards are covered by the National Flood Insurance Program. This commonality in mission could have implications for joint efforts to better model and assess coastal wind hazards along the Texas Coast.
- TWIA exposure to property losses is rising exponentially along the Texas Coast as insurers refuse to underwrite wind hazards.
- The TDI is seeking to improve coastal building codes by updating these codes as new versions of the International Residential and Building Codes (IRC/IBC) building codes are issued with additional Texas amendments intended to make them even stronger. For example, the new IRC/IBC 2006 was recently adopted. However, there is little knowledge with respect to the adoption of these codes by local municipalities.
- Local municipalities often do not inspect residential or other built structures for wind related hazards. Any inspection related to wind (e.g. roof inspections) are undertaken by the TDI, if at all.
- The planning community has good general knowledge of the GLO and works quite closely with the agency through a variety of funding programs and permitted activities. Knowledge of the CMP and the GLO is, for the most, part confined to funding programs related to beach re-nourishment activities, public access support, signage, and public education materials.
- There seems to be a rather clear difference between planning and emergency management personnel activities at the local levels. In general, emergency management personnel appear to be less familiar with the CMP or the GLO, particularly as it relates to hazard mitigation.
- Hazard mitigation is not completely understood, nor is the relationship between normal development or planning activities and hazard mitigation. As a consequence, planning agencies are often undertaking policy changes (e.g., changes to land use policies or to building code regulation) and undertaking planning actions that are consistent with hazard mitigation; they are simply not viewed as "mitigation" actions.
- Emergency management is much more focused on emergency and response activities, such as evacuation planning, with little time, energy or commitment for mitigation and recovery planning.
- Building officials appear to understand the importance of including mitigation in building code regulations by insuring that building codes fit local hazard exposure and risk as well as the importance of coastal setbacks for mitigation purposes. They also appear to be knowledgeable of the CMP and GLO.

The above observations, it must be stressed, are very tentative given that interviews are ongoing. Furthermore, these observations are not based on a random sampling technique, which would assure the representativeness of the findings. Rather, they are based on a purposive non-random sample. This technique provides excellent insights into the perceptions of those interviewed, which in turn provides better insight into many problems and issues. However, they are not readily generalizable to the population of all state officials, coastal managers or planners, nor building code officials concerned with coastal issues.

Task 2. Assess the regulatory regime and effectiveness of construction codes and land use planning policies to mitigate potential impacts of coastal natural hazards.

The state of Texas regulatory regime is probably best described as a mosaic of regimes that is difficult to characterize given the lack of systematic information regarding the number of unique policies promulgated by various state, county and municipal entities; the spatial coverage of these policies; and the potential overlaps in these coverages. Indeed, the consistency of regimes, even within a given county, can be difficult to characterize depending upon whether one is focusing on a flood hazard or windstorm building code requirements. One difficulty in addressing these regimes is the legal environment of Texas, for it ultimately requires local municipalities to address land use policy and regulation. At the county level, this is simply not possible. A critical element in ascertaining this mosaic will be gathering information from multiple sources and, in some cases, developing methodologies for evaluating quality, implementation, and enforcement.

This task initially included 5 subtasks:

1) Initiate environmental scan of target area counties, preliminary assessment of the number and spatial boundaries of regulatory regimes related to building codes and land use planning policies, and secondary data gathering (e.g., collecting building codes, various land use policies, etc.).
2) Development of a purposive elite sampling frame and interview schedules. The elite sample will consist of state and local officials, building officials, builders and developers, construction firms, environmental groups, etc. These interviews will be critical to determine implementation issues and regime inconsistencies.
3) Initiate the in depth interviews with members of the elite sample.
4) Initiate the development of land use planning and building code assessment protocols related to quality, implementation, and enforcement.
5) Begin initial stages of systematic data collection and processing of building codes and land use planning policies.

The deliverables for this task were:

1. A preliminary report on land use planning and building code assessment protocols.

During the early part of the project year, as noted above, interviewing protocols were developed and routed through the necessary IRB process at Texas A&M University. Interviewing began and land use planning and building code assessments were started. However, during the late spring and early summer of 2007, the Project Team and GLO staff began to shift the focus from land use planning and building code issues to hazard mitigation planning. The GLO had taken a more active role in local mitigation action plans (MAPs). The Project Team and GLO staff mutually agreed to shift the focus of this task to the development of MAP assessment protocols and the use of these protocols to evaluate MAPs. The revised subtasks undertaken by the Project Team within Task 2 were as follows:

1. Environmental Scan: An environmental scan of target area counties and all coastal counties was initiated. The focus of this scan has been to undertake a preliminary assessment of the number and spatial boundaries of the different regulatory regimes related to the coastal management zone, building codes, hazard mitigation plans (regional, county, and city) and land use planning policies. Secondary data was collected in many cases and much of that data has been incorporated into the Texas Coastal Atlas, which will be discussed in subsequent tasks.

2. Development of Elite Interview Schedule and Initiation of Interviewing: An interview schedule for the elite surveys was developed and an initial sample frame based on the original target area (the Sabine Lake area) was developed. Also, as noted above, the local target area was shifted to Harris, Brazoria, and Galveston counties and some interviews were completed with staff from the GLO, TDI, TWIA, local planning agencies in Galveston and Houston, a local building department, and a local emergency management department. Toward the end of Phase 1 and as part of Phase 2, a new elite survey plan was developed and initiated. This plan can be found in Appendix 4 and it will be completed in Phase 2.

3. Development of the MAP Assessment Protocol: Efforts were focused on the development of a methodologically sound and rigorous assessment protocol. The final assessment protocol consists of seven components or plan dimensions. These include: 1) vision statement, 2) planning process, 3) fact basis, 4) goals, and objectives, 5) inter-organizational coordination & capabilities, 6) policies, tools, and strategies, and 7) implementation. Within each of these areas there were multiple indicators assessed and there were assessments for multiple hazards. The basic coding scheme was: 0 if not mentioned; 1 if mentioned, but without detail coverage; and 2 if mentioned and there was detailed coverage in the plan. The full protocol can be found in Appendix 5.

4. Application of the MAP Assessment Protocol: Initially, the protocols were applied to three regional MAPs: Houston-Galveston Area Council (H-GAC) Regional Hazard Mitigation Plan (HGAC-Plan); Guadalupe-Blanco River Authority Hazard Mitigation Plan (GBRA-Plan); and Texas Colorado River Floodplain Coalition Hazard Mitigation Action Plan for the Lower Colorado River Basin (TCRFC-Plan). The utilization of the protocol required that 3 project staff members independently assess each plan. These assessments were then compared and any discrepancies in coding were addressed. It

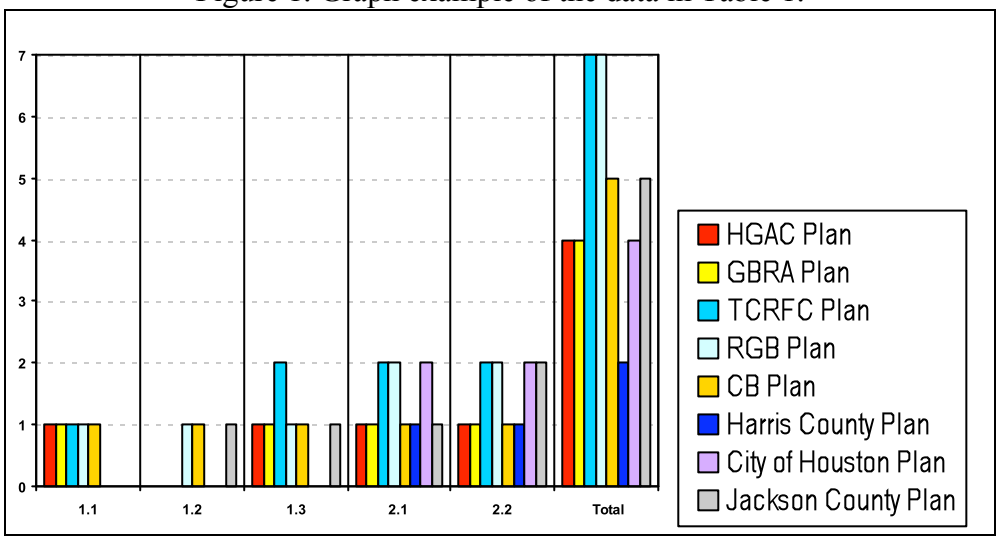
should be noted that problematic coding issues became an opportunity to refine the protocol and fully develop the coding methodology. The refined protocol was then reapplied to the above 3 plans and 5 additional plans, including the Rio Grande Border Hazard Mitigation Action Plan, Coastal Bend Mitigation Action Plan, Harris County Mitigation Plan, City of Houston Mitigation Action Plan, and Jackson County Mitigation Plan.

A report on the analysis of these plans is currently being developed for presentation to the GLO staff toward the end of July or early August, as part of Phase 2. Table 1 presents an example of the application of the protocol related to the vision statement for the plans that have been coded. For example, with respect to first category (problem description) there are three dimensions assessed: 1.1) a description of the community and historical hazard threats; 1.2) a description of the local hazards impact on the entire state, and 1.3) current or potential hazard issues. Each regional plan scored a 1 on dimension 1.1, while the county and city plans failed to include this dimension in their plans. A visual representation for the "vision statement" assessments is presented in Figure 1.

Table 1. Example assessment for plan vision statement.

Category	Items	HGAC	GBRA	TCRFC	RGB	CB	Harris county	City of Houston	Jackson county
1. Problem description	1.1 Description of community and historical hazard threats	1	1	1	1	1	0	0	0
	1.2 Description of the local hazards impact on the entire state	0	0	0	1	1	0	0	1
	1.3 Currently or potential hazards issues	1	1	2	1	1	0	0	1
2. Vision	2.1 A statement identifying overall image of sustainable and hazard resilient community or state	1	1	2	2	1	1	2	1
	2.2 General goals and objectives	1	1	2	2	1	1	2	2
Total		4	4	7	7	5	2	4	5

Figure 1. Graph example of the data in Table 1.



A more complete discussion of coding issues and final assessments will be provided in the final report to be submitted in Phase 2. Based on the eight plans evaluated, the mean score for total plan quality is 30.03 on a scale of 0-70. This means that there is considerable room for improvement of local hazard mitigation action plans. Of the various dimensions examined, "fact basis" and "policies" are the lowest scoring plan components. Overall, the Rio Grande Border MAP stands out as the highest quality plan scoring highly on the vision statement, goals and objectives and the policies, tools and strategies components. Of course, these are preliminary findings. A more complete and detailed analyses will be presented in the final report.

As part of the final report on the MAP assessment due in Phase 2, the Project Team hopes to apply the protocol to 5 additional MAPs. These additional plans are: South East Texas Regional Planning Commission Regional Hazard Mitigation Action Plan; Orange County Mitigation Action Plan; Jefferson County Mitigation Action Plan; Pearland Mitigation Action Plan; League City Mitigation Action Plan, and possibly the Friendswood City Mitigation Action Plan. This would complete all FEMA approved MAPs for areas in the CMP boundary. This will allow the Project Team to compare assessments of 14 individual MAPs, which include 6 regional, 4 county, and 4 city or municipality MAPs.

Tasks 5 and 6:

Both Tasks 5 and 6 deal with assembling various forms of data, such as mapping or spatial data. Examples include transportation routes or building codes. The other similarity is both tasks require the development of a website to display data and tools that will enable the public to gain access to these data in a user friendly website environment. The website developed for this purpose is called the Coastal Communities Planning Atlas (coastalatlas.tamu.edu). Given the similarities between these two tasks, the accomplishments for each will be discussed together. The following will briefly outline

the tasks and subtasks associated with each. This will be followed by a discussion of the accomplishments for both tasks and their subtasks.

Task 5: Evaluate the geographic relationship between the current CMP boundary and projected impacts from various categories of hurricanes based on the latest coastal study area maps.

Task 5 is designed to develop procedures for spatially displaying and analyzing these policy regimes in conjunction with the CMP boundary and potential impacts from hurricanes. The goal will be to provide insights with respect to the spatial distribution of quality management policies and the degree to which management policies are consistent and compatible with hazard risk within the CMP boundary in order to identify spatial weaknesses in broader coastal management issues. In a very real sense, the focus of this task will be a spatial analysis of coastal management vulnerability – an analysis of vulnerabilities emerging due to management deficiencies, gaps, or inconsistencies.

While there are 6 subtasks within Task 5 in the full project, only three of these were to be initiated during Phase 1. These subtasks were as follows:

1. Assembling physical hazard analyses related to coastal natural hazards (surge maps, inland flooding maps, flood plain maps, wind field maps, etc.) will begin.
2. The assemblage and integration of coastal management and policy boundary files will also begin.
3. And finally, the development of methodologies for displaying building code and land use planning policy assessments based on quality, implementation, and enforcement will also begin. This task must be undertaken in concert with the development of measurement protocols and data collection methodologies to insure implementation and development for this task.

The deliverables for year during Phase 1 included:

1. Initial web-site launch.
2. Initiation of periodic updates of the website.

Originally this task was only supposed to address our focus study area of Harris, Brazoria, and Galveston counties. However, due to a synergy of activities between this and other projects that the HRRC is involved in, many of the subtasks activities were extended to include the entire Texas coast. In addition, we were able to acquire software (Geo-Cortex) that greatly enhanced our ability to incorporate useful tools to facilitate the ability of planning departments, emergency management agencies, and the broader public to access these data and utilize them in planning and mitigation activities.

Task 6: Assess the physical and social vulnerabilities of coastal populations to facilitate planning and policy development related to hazard mitigation and response.

A critical element in determining “management vulnerabilities” and assessing the policy mosaics along the coast related to mitigation, land use planning, and building code

quality is an assessment of the physical and social vulnerabilities of coastal areas. Hazard vulnerability is generally characterized as being a function of hazard exposure and physical characteristics. The former is generally defined in terms of the likelihood that events of different magnitude and scope will impact a particular area while the latter is generally defined in terms of the damage to the built environment that will be sustained from each of the hazard events (NRC 2006). In recent years there has been an emerging recognition that a comprehensive understanding of vulnerability requires the addition of another critical dimension, social vulnerability. This is generally understood as the capacity of individuals or social systems of various scale to anticipate, cope, resist and recover from the impacts of a of hazard agent (Blakie et al. 1994; Cutter 1996; Peacock, Morrow, and Gladwin 1997; Morrow 1999). Social vulnerability is shaped by: the social structures and processes that determine access to scarce resources such as income, wealth, social capital, power and housing; cultural factors that shape belief and customs; and driving forces, such as urbanization and demographic change.

The following subtasks were initiated during Phase 1:

1. Initiate the assemblage and integration of physical hazard maps and analyses related to coastal natural hazards beyond hurricanes and tropical storms.
2. Initiate the assemblage and integration of relevant coastal hazard physical vulnerability assessments from various potential partnering agencies.
3. Initiate the assemblage and integration of data from the census and other governmental sources critical for assessing social vulnerabilities (i.e., transportation dependence, income, household structure, critical facilities, etc.).

Deliverables for these subtasks:

1. Elements of this task will appear on the project website during Phase 1.

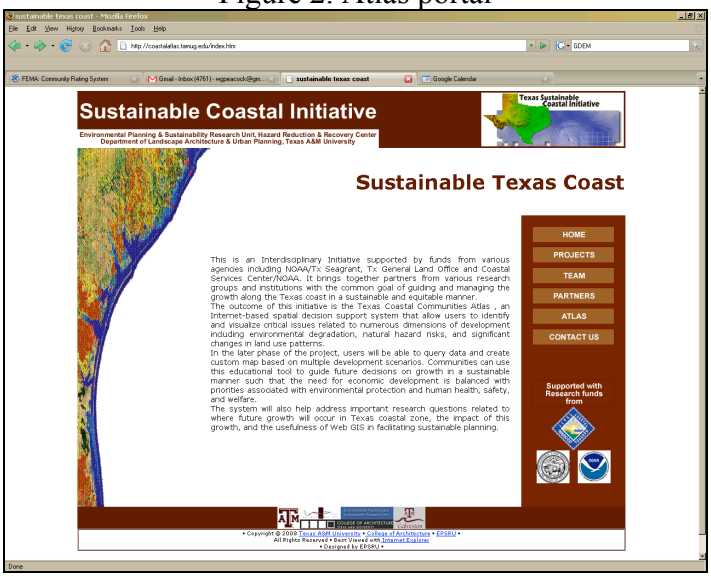
The activities associated with this task were to be focused on the target areas of Harris, Brazoria and Galveston counties. However, as with many of these data gathering and mapping activities, they were extended to the entire Texas coast. The exception to this was the social vulnerability analysis, which includes only the targeted counties and the coastal counties northeast of the targeted area to the Louisiana border.

Examples from Website Development related to Tasks 5 and 6:

In sum, both Tasks 5 and 6 include collecting data, creating a website that will allow for the mapping of these data and the development of tools to utilize these data. While Task 5 focuses on hazard data and policy data in the context of the CMP boundary, task 6 includes additional hazard data, data on physical infrastructure and vulnerability, and data for establishing social vulnerabilities.

The principle access point for the website is through http://coastalatlas.tamu.edu (entry portal is presented in Figure 2).

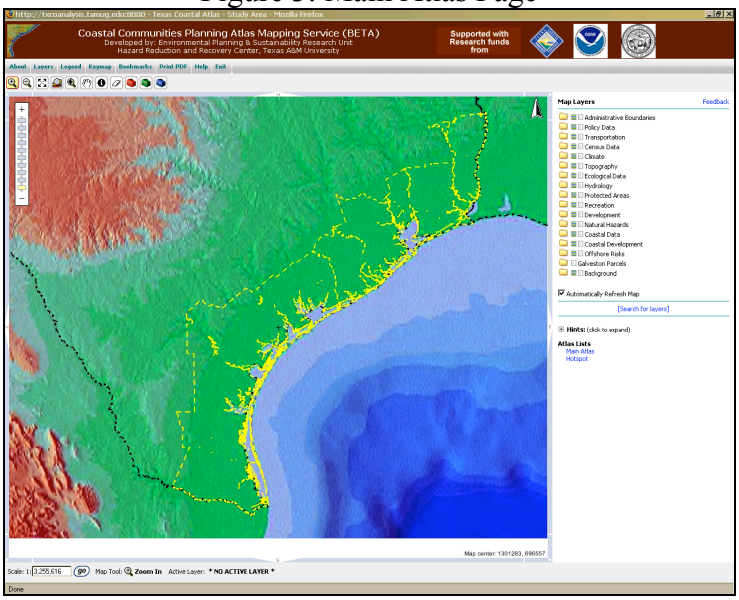
Figure 2. Atlas portal



Access to the atlas websites can be gained by clicking on the "ATLAS" button. The following screen will provide two links. To gain access to the Main Atlas, simply click on "Main Atlas" link.

Figure 3 presents the Main Atlas page:

Figure 3: Main Atlas Page



This Main Atlas website provides 81 data layers associated with subtask 5 and 6. Table 2 lists the layers included with the Main atlas page.

Table 2: Data Layers available on the Main Atlas Website.

Administrative Boundaries
1. State Boundary
2. Texas Counties
3. Study Area
4. City Limits
5. Three Nautical line
6. Three Marine league

Policy Data
7. Coastal Management Zones
8. Building Code

Transportation
9. Interstate Highway
10. Major Highway
11. Roads
12. Hurricane Evacuation Route
13. Railroad
14. Heliports
15. Airports

Census Data (2000)
16. County Population (2000)
17. Census Tract Population (2000)
18. Block Group Population (2000)
19. Block Population (2000)

Census 1980-1990
20. County Population Growth Rate
21. Census Tract Population Growth Rate
22. Block Group Growth Rate

Climate
23. Rainfall

Topography
24. Elevation

Ecological Data
25. Eco-regions
26. Vegetation
27. Seagrass
28. Wash over Areas

Hydrology
29. Hydrological Units
30. Rivers and Streams
31. Lakes and Reservoirs

Protected Areas
32. Federal Lands
33. National Parks
34. State Parks
35. Wildlife Refuge
36. Marine Sanctuaries
37. Audubon Sanctuaries
38. Coastal Preserves
39. Burn Exclusion Zones
40. Habitat Priority Areas
41. Wetlands Inventory Data
42. Historic Places (National Register)
43. Species
44. Rookery
45. Hard Reefs
46. Open gulf

Recreation
47. County and City Parks
48. Beach Access
49. Marinas
50. Boat Ramps

Development
51. Property Values (2000)
52. Census Counties
53. Census Tracts
54. Census Block Groups
55. Populated Places
56. Dams
57. Wetland Permits

Natural Hazards
58. Hurricane Surge Zones
59. Hurricane Risk Zones
60. Hurricane Tracks
61. Hazard Events (1960-2005)
62. FEMA Flood Zones
63. Fire Risk Zones
64. Earthquake Risk Zones

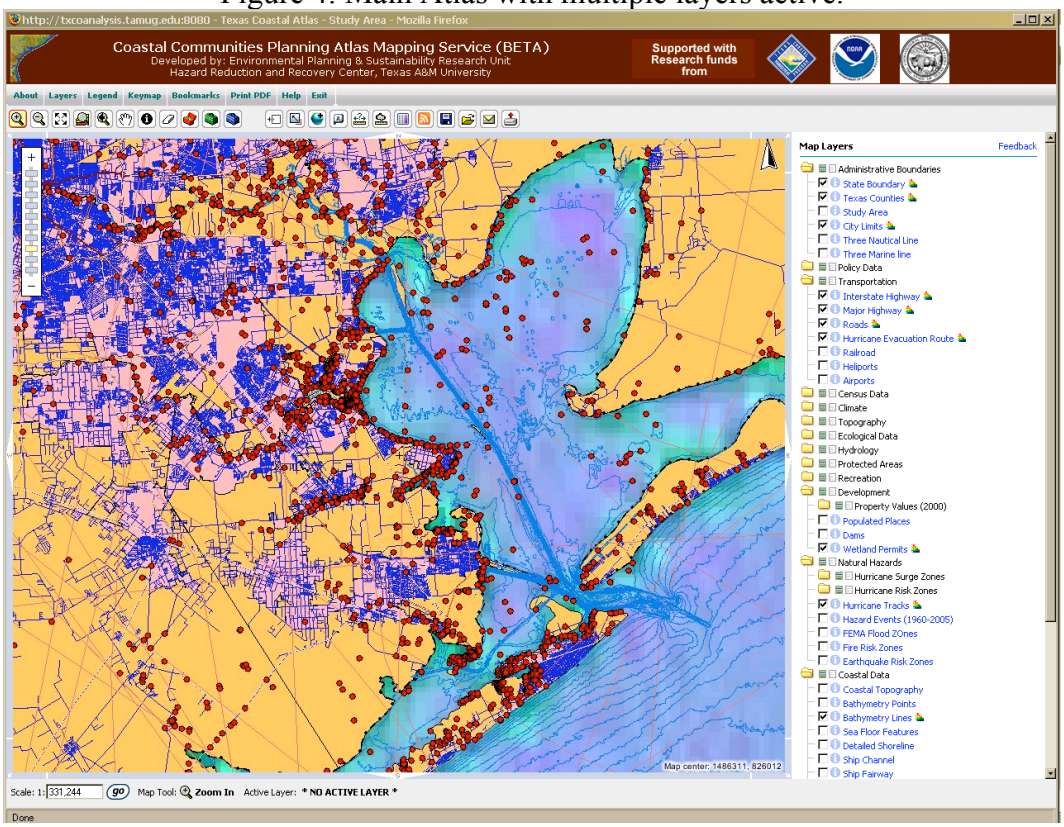
Coastal Data
65. Coastal Topography
66. Bathymetry Points
67. Bathymetry Lines
68. Sea Floor Features
69. Detailed Shoreline
70. Ship Channel
71. Ship Fairway
72. Coast Guard

Coastal Development
73. Resource Management Codes
74. Offshore Blocks
75. Oil and Gas Leases
76. Oil and Gas Units
77. Oil and Gas Platforms

Offshore Risks
78. Environmental Sensitivity Index
79. Erosion Areas
80. Tidal Influence
81. Coastal Barriers
82. Dredged Sites

A more detailed listing of these data can be found in Appendix 6.

Figure 4: Main Atlas with multiple layers active.

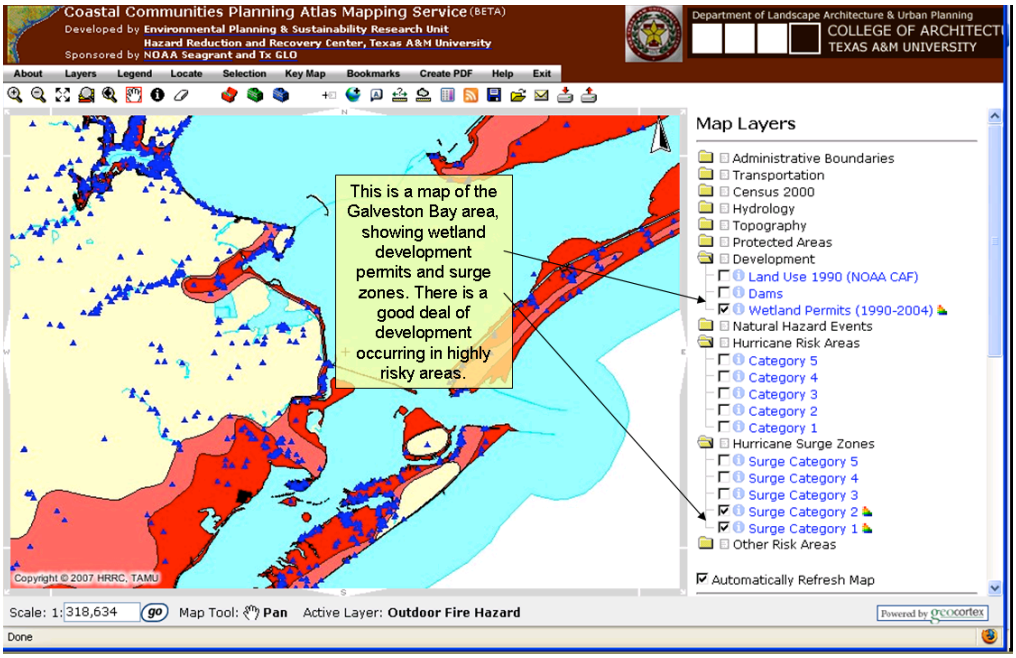


The example in Figure 4 shows the Atlas up and running with several data layers active, including: state, county and city boundaries; transportation routes; wetland permits (permits to develop wetland areas = red dots); and some bathymetry lines.

There is a whole set of basic GIS tools that are located in the upper left hand corner, just above the map itself. These tools include: zoom in (+), zoom out (-) query tool (***i***), and a tool to move the map (the hand symbol). In addition, there are more advanced tools that can be opened in the red, green, and blue tool box icons. The red tool box contains tools to print, save, and email, as well as a tool that allows the user to use "Virtual earth," or "Google earth". The other tool boxes contain mark up tools.

The map below (Figure 5) illustrates a closer perspective of the same area with layers for storm surge zones and wetland permit data active. On this map, one can clearly see development occurring in hurricane surge zones around Galveston Bay and Galveston Island. The surge areas are, of course, likely to experience surge damage during a hurricane event. In this case, not only are wetland buffers lost through the development occurring in these areas, but because development is actually occurring in these zone, it means that more of a community's physical assets (physical vulnerability) are at risk due to exposure.

Figure 5: Zoom in using the Main Atlas



In addition to the main atlas page, the website also offers a hotspot page. This page provides more detailed data associated with counties in the northeastern portion of the Texas coast. It also provides a host of additional census data that allows one to assess social vulnerability.

Figure 6. Hotspot website mapping social vulnerability

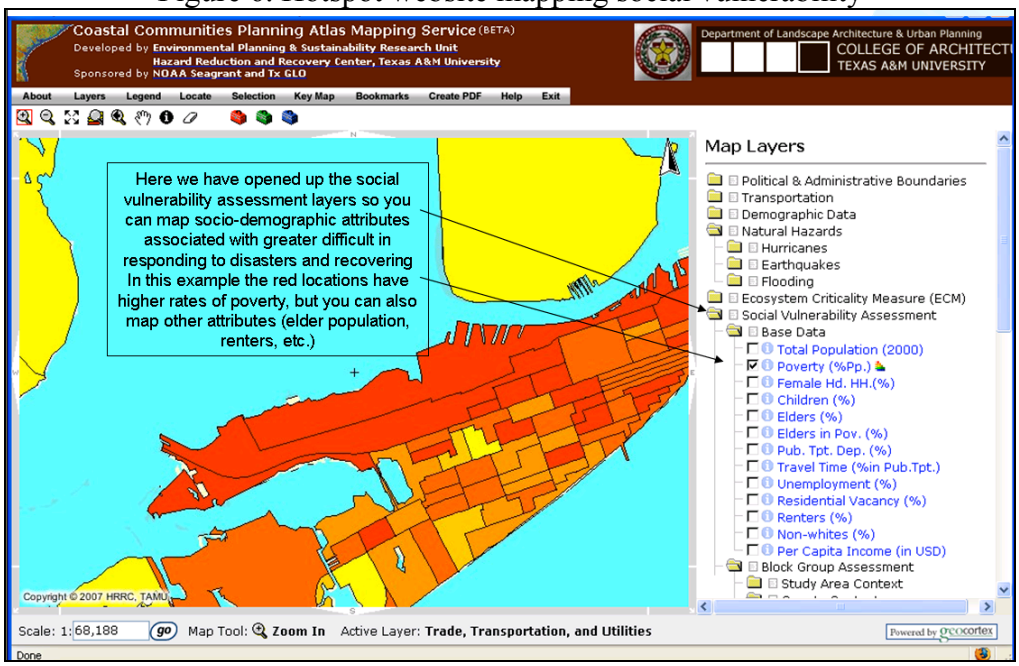


Figure 6 uses the hotspot webpage to display social vulnerability data at the census block group level in Galveston. These block groups are more ideal to use for planning purposes

in that they are more likely to conform to traditional neighborhoods. The use of census track data would not be as relevant for planning purposes. A variety of aspects associated with social vulnerability are available to display, including: poverty data, public transportation dependent populations, non-white, and elderly. These data can be important for response, warning, and evacuation analysis, as well as recovery analysis. But the critical application is overlaying social vulnerability data with potential hazard exposure data.

Figure 7. Social vulnerability and Cat. 1 surge zones.

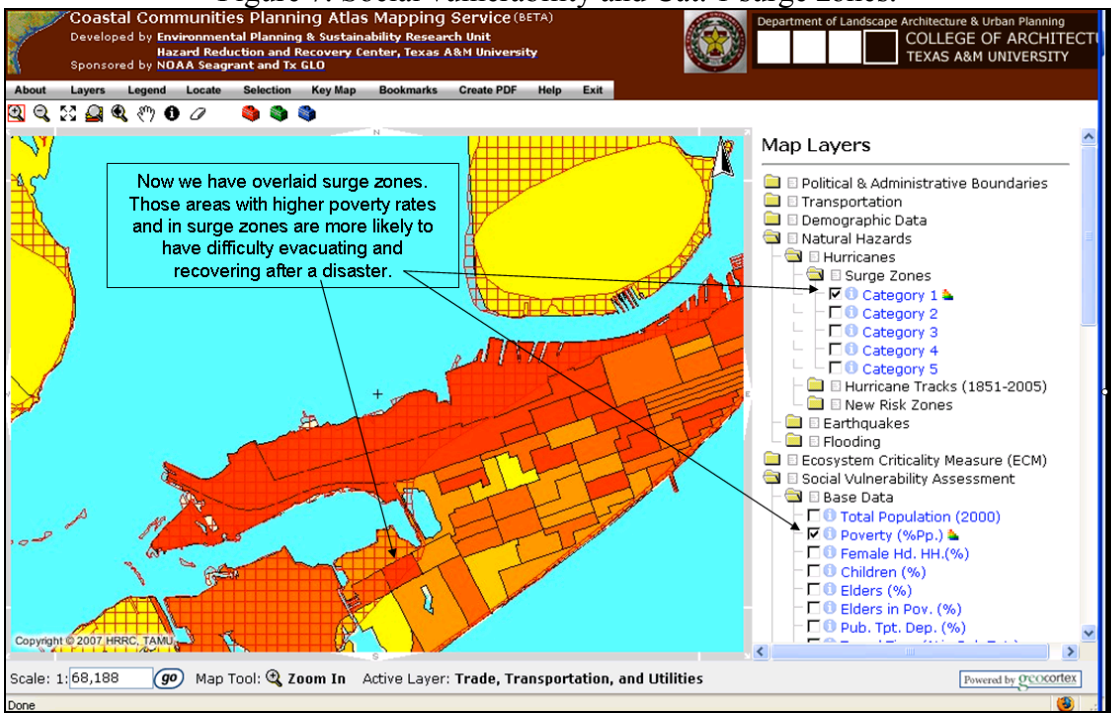
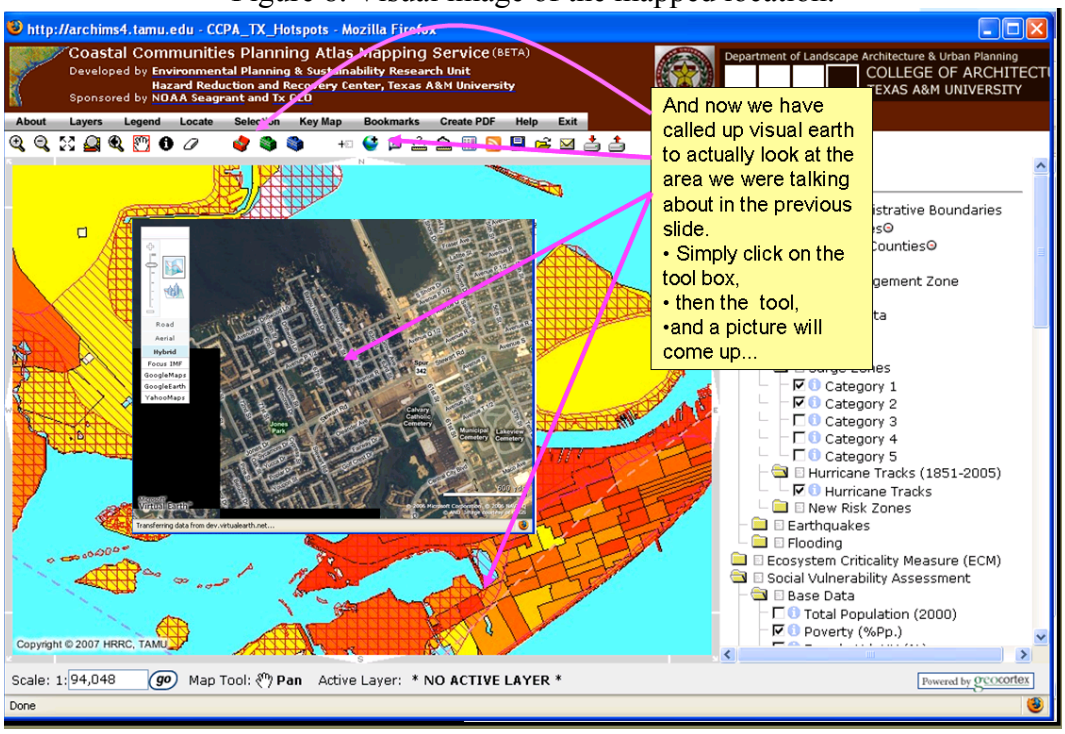


Figure 7 takes the social vulnerability analysis a step further by adding in Category 1 surge zones. Here we can see a block group with high rates of poverty that will be exposed to surge flooding with just a category 1 storm. This area is likely to need additional help with evacuation and post-storm recovery due to these individuals being less likely to have quality insurance and qualify for SBA loans. Hence, special attention will be needed with respect to recovery planning. In addition, housing in these areas is likely to be of lower quality and many residents may lack the ability to procure hurricane shutters. Mitigation programs targeting low income housing should be promoted in these areas as well.

In Figure 8, the red tool box is opened and either Google earth or Virtual earth is activated to capture a visual image of the neighborhood with high poverty rates located in a Category 1 surge zone. The purple arrows point to (from top to bottom) 1) the advanced (red) tool box that was opened, 2) the "earth with the cross-hair" icon which is clicked to activate virtual earth (in this case), and 3) the corresponding locations on the map displayed as a picture.

Figure 8. Visual image of the mapped location.



In addition to the 81 layers discussed above as part of the main atlas webpage, the hotspot webpage contains an additional 33 layers of data. These data have been processed with respect to the county or municipality to allow for county and city planners or stakeholders to undertake analysis that is relevant for their particular area of interest. These include ecosystem criticality measures that assess how critical ecosystem areas (defined by county area, census tract area, and census block area) are under stress due to development. The social vulnerability analysis, discussed above, can be carried out using the census data that have been standardized for block groups using the base data. These data have also been analytically combined to examine areas with particular types of needs (child care, elder care, public transportation, housing recovery, and overall social vulnerability hotspots) at the municipality or county level. Finally there are basic economic analyses, based on Location Quotient Analysis, included at the county level as well. The full list of data available for the hotspot webpage is listed in Table 3 below and in more detail in Appendix 6.

Table 3. Data Available on the Hotspot Website.

I. Ecosystem Criticality Measures (ECM)
- 1. Land Cover 1990
- 2. Land Cover 2000
- 3. County Growth rate
- 4. Low-lying coastal areas
- 5. County Level ECM
- 6. Tract Level ECM
- 7. Block Level ECM

II. Social Vulnerability Assessment (Block Group Level)
- 8. Population 2000
- 9. Poverty (% below)
- 10. Household Structure
- 11. % of Children
- 12. % of Elders
- 13. Elders in poverty
- 14. Public Transportation Dependency measure
- 15. Travel time Characteristics
- 16. Unemployment
- 17. Residential Vacancy
- 18. Racial distribution
- 19. Per-capita Income

Study Area Context
- 20. Child Care Needs
- 21. Elder Care Needs
- 22. Public Transportation Needs
- 23. Housing Recovery Needs
- 24. Social Vulnerability Index

County Level Context
- 25. Child Care Needs
- 26. Elder Care Needs
- 27. Public Transportation Needs
- 28. Housing Recovery Needs
- 29. Social Vulnerability Index

III. Location Quotation Index (County level Index)
- 30. Natural Resources and Mining
- 31. Construction
- 32. Manufacturing
- 33. Trade, Transportation, and Utilities

In sum, activities associated with Tasks 5 and 6 produced a multifunctional website that offers stakeholder access to over 100 data layers and a host of GIS and web-base tools to facilitate planning activities with respect to a coastal hazards, ecosystem characteristics, and physical and social vulnerability analysis.

The website has been presented in a number of venues and locations, including: Gulf of Mexico Alliance; City of Galveston Planning Department; GLO headquarters; TAMU-Corpus Christi Harte Marine Research Institute; TAMU- College Station, College of Architecture External Advisory Committee and to the Landscape Architecture and Urban Planning Faculty, TAMU- College Station, Department of Ecosystem Science and Management, and in various class room settings; sea-grant extension agents; League of Women's Voters, Houston, Texas; Texas Sea Grant Researchers Conference; and to the Managing for a Healthy Gulf Coast Conference, TAMUCC. The presentation of the website is always well received regardless of venue. To date, there have been approximately 500 different users on the Atlas website.

Form a status and trends project advisory committee.

The goal of this task is to develop a project advisory committee. The advisory committee will serve as a sounding board for project activities, particularly the development of the coastal atlas website. The advisory committee membership consists of planners, extension personnel, coastal managers and representatives of stakeholders that are likely to find the coastal atlas as a useful tool and provide feedback on how it might perform better. This feedback will better ensure that project outcomes will be useful for stakeholders through the coastal management community.

The advisory committee membership includes individuals from state and local agencies, as well as members from various non-profit organizations and associations concerned with coastal mitigation issues. These members include: Lori Field-Schwarz, Historic Preservation, City of Galveston Planning Department; Penny Goode, Former Administrator, Brazoria County Floodplain, Robert Harris, President, Houston Advanced Research Center, Tracy Hughes, Planning Coordinator, Galveston County Office of Emergency Management; John Jacobs, Director of Coastal Watershed Program and Community Development Specialist; John Lee, Mitigation Coordinator, Galveston County Office of Emergency Management, Gregory Pekar, State Hazard Mitigation Officer, GDEM; Wendy Odonohoe, Director of Planning, City of Galveston Planning Department; Logan Respess, formerly Aransas County – Sea Grant Extension now Associate Director and Extension Program Leader; Linda Shead, Program Director, Trust for Public Land; Bob Stickney, Director, Texas-Sea Grant; Jim Weatherford, Hazard mitigation Program, GLO; Shannon Van Zandt, Member, Texas American Planning Association Board of Directors.

Summary and Conclusions:

Despite a late start due to contracting difficulties and the evolving and changing nature of the project, particularly with respect to Task 2, the project has undertaken a wide variety of activities and has made significant progress. The development of the Coastal Atlas website, with over 100 layers of data, provides coastal management stakeholders – or more broadly, any member of the concerned public – with access to a wealth of information that they can utilize without demanding exceptional levels of experience or resources. These data can facilitate the examination of the social and physical vulnerabilities of coastal communities to a host of coastal hazards, with a particular emphasis on hurricanes. Furthermore, project staff has developed a comprehensive, valid, and reliable protocol for assessing MAPs and has already applied this protocol for evaluating regional, county and city plans for areas located within the CMP boundary.

During Phase 2, data collection, with respect to the elite survey will be completed. This survey will also provide a wealth of information regarding different land-use policies, building codes and innovative mitigation strategies being undertaken by municipalities and agencies throughout the CMP boundary. Finally, major strides undertaken with respect to the Coastal Planning Atlas website will continue as new data are introduced, better tools and methodologies for spatial analysis are developed, and website enhancements are added.

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Appendix 1.

Integrating Coastal Zone Management and Hazard Mitigation: Assessing the potential compatibilities of The Coastal Management program and State Mitigation plan.

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. Changes in vulnerability are driven by changing land use patterns, population growth, rising sea levels, and the historically limited regulation of construction practices, among other factors. The Texas Coastal Management Program (TCMP) is designed to address precisely these issues, yet it is not specifically linked to the State of Texas Mitigation Plan (STMP), developed by the Governor's Division of Emergency Management

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 TCMP is described as a networked program, administered by the Coastal Coordination Council (Council), eighteen local governments, and eight state agencies, including the General Land Office/School Land Board, Texas Natural Resource Conservation Commission, Railroad Commission, Texas Parks and Wildlife Department, Texas Transportation Commission, Texas Historical Commission, Public Utility Commission, Texas State Soil and Water Conservation Board, and the Texas Water Development Board.

Coastal zone management involves a number of issues. The TCMP 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. For instance, the location of power plants, transmission lines, levees and flood control projects, managed by the Public Utility Commission, TxDOT

and TNRCC under the Major Development division has a great deal to do with the state's hazard vulnerability under §201.6©(2)(ii)(A) of FEMA's Interim Final rule on the HMGP.

This report begins with a brief description of the TCMP and its most important documents. The programs goals and policies will be described, and 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 relationship 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 was developed in compliance with the federal Coastal Zone Management Program under the leadership of the Texas General Land Office, beginning in 1989. The result was the creation of the Coastal Coordination Council as mandated by the Coastal Coordination Act of 1991 (33 TEX. NAT. RES. CODE ANN. § 201 et. seq, amended by HB 32226 in 1995). The CCA 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 (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. Goals with particular relevance to issues of emergency management covered in the STMP are italicized.

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.*

The principal coastal hazards covered by the STMP are tropical storms and hurricanes and the flooding and tornadoes that can accompany them. Other secondary hazards resulting from tropical storms and hurricanes not specifically

addressed by the STMP are chemical spills and coastal erosion. Five out of the ten TCMP goals have direct relationships to mitigating these 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 the 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 development and protection in 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. In the same manner, Category 12 (Development in coastal hazard areas) regulates the expansion of human activities in the CNRAs that increases exposure to loss of life and property in disasters. The third column of Table 2 shows the results of a keyword search in the Policies section of each Policy Category, 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	2

	on submerged lands	
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 shows that some opportunities to emphasize and integrate hazard mitigation in the TCMP have been missed. A holistic approach to planning and development is encouraged, in order to encourage members of the CCC to recognize the linkages between policy areas and their relationship to coastal hazard mitigation.

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	

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 material should be of material assistance during implementation of 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. These projects have been implemented by local governments, NGOs, state agencies and educational institutions.

III. Description of State of Texas Mitigation Plan

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 adopts the less precise FEMA definition nearly verbatim: "any action taken to eliminate or reduce the long-term risk to life and property from natural and human-caused hazards." Mitigation "consists of a variety of both pre-incident and post-incident actions" (STMP p. 3-1). Much of the funding for hazard mitigation is in fact provided in the aftermath of disasters, under the federally funded Hazard Mitigation Grant Program (Section 404 of the Stafford Act) "provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration" (FEMA 2006).

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 seven attachments with more detailed information on hazard analysis and other specifics.

The planning process was coordinated by the Governor's Division of Emergency Management, and included a wide variety of state agencies, local governments, and regional agencies. A State Hazard Mitigation Team was created that includes at least three of the same agencies as the CCC created by the TCMP: Texas Parks and Wildlife Department, General Land Office, and the Railroad Commission of Texas. The process was also coordinated with FEMA to ensure compliance with federal requirements.

The 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.

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 list of coastal priorities for hazard mitigation. However, this list does not appear in the plan.

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.

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, established by "the Council" (CCC?), 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. Most of these would tend to increase development within the coastal surge zone rather than reduce it.

Annexes A (HMGP Administrative Plan) and B (PDM Administration Plan) are posted on DEM's website. The hazard analysis maps are finished and included in the STMP as Attachment 6. However, the State Hazards Analysis (Attachment 1) is apparently still under revision and not readily available. There is a link to the

Drought Preparedness Plan (Attachment 2), developed by the Drought Preparedness Council, and a Firefighting Annex (Attachment 4). Attachment 5 is a list of DMA 2000 Implementation Milestones. 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. This table will be useful to local governments.

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 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 local governments because the state and county levels of government have little or no control over land uses and building standards. Therefore it is important that the state take real steps to assist local governments in development and implementation of their mitigation plans. The Hazard Mitigation Annex gives the GDEM responsibility for providing "guidance and assistance to local governments for development and implementation of local mitigation action plans," assisting local governments to do hazard analysis, conducing hazard mitigation workshops, publicizing available assistance, in addition to basic planning, information gathering and reporting functions.

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:

> (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:

(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 STEMP adheres to planning conventions that are not very relevant or adaptable to the coastal zone management and coastal hazard mitigation. The plan would be more useful if it followed city comprehensive planning practice rather than military style strategic planning conventions.

Goal Matrix

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 adhere to all 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 all the relationships shown in this table as well as depict specific steps that should be taken to increase integration of these two state efforts.

The Texas Mitigation Plan was implemented in 2004 some eight years after NOAA's preparation of the Texas Coastal Management Program. In the 1996 publication of the Texas Coastal Management Program Final EIS, it was stated that, "an agency or subdivision that takes an agency or subdivision action listed in 33.2051 or 33.2053 that may adversely affect a coastal natural resource area shall comply with the goals and policies of the coastal management program" (National Oceanic and Atmospheric Administration (NOAA) and the State of Texas, 1996). Although this is spelled out in Chapter 5 of the TCMP, it is not always inherent in the STMP.

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 are required to comply with the TCMP's goals and policies. As shown in Table 4, the sections of the STMP

that address or associate with coastal natural resource areas do adhere to 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 coastal natural resource areas.

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 covered in both the TCMP goal and the STMP section. This 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. All ten TCMP goals, A – J, are addressed in sections Three (Mitigation Strategy) and Four (Local Mitigation Planning Coordination) of the TMP. Section Five (Comprehensive State Mitigation Program) addresses almost as many TCMP goals as sections Three and Four, as it addresses goals A – D of the TCMP. Finally, section One of the STMP (Planning Process) addresses goal A of the TCMP. As the table shows, the first five goals, A – E, are addressed the most by the STMP. The remaining five goals, F – J, are addressed, but only by sections Three and Four of the STMP

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	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 three main ways in which the GLO can better integrate hazard mitigation into the TCMP that will be addressed in this section. They are the promotion of a clearer understanding of and commitment to hazard mitigation, the promotion of land use planning and zoning, and partnering with the TDI and TWIA to promote the adoption and implementation of building codes.

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), 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.

The plan does recognize that Texas state law places the burden of actual mitigation actions on local governments, meaning cities (STMP p. 3-2). Counties in Texas, unlike in 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 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 government 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, the ways 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.

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.

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.

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).

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.

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. The direct economic signal of high insurance rates is an important element of information that may be currently missing from the luxury housing market. Disruptions at other market levels low-income housing) generated by raising coastal insurance rates could be addressed through targeted reductions or vouchers if necessary. Finally, the TDI inspection process must be adequately funded and staffed, to ensure broad and full compliance with building codes.

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.

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Appendix 2: Semi-structured elite interview schedule

City/County/ Organization name_____

Date _____

Individual name and title_____

Contact information_____

1. The Texas Coastal Management Program (TCMP) addresses 16 Coastal Natural Resource Areas (CNRA's) along the Texas coastline and adjacent waters. Examples of the TCMP's activities and projects in existence today are as follows: Shorefront Planning, Shoreline Erosion Response, Energy Facility Siting, Coastal Wetlands Management, Areas for Preservation and Restoration (Texas Parks and Wildlife Department, Texas Historical Commission, General Land Office and Texas Parks and Wildlife Department), and Plan Coordination.

2. Have you ever heard of the TCMP?

3. Do you as a planner, emergency manager, etc believe it is important to manage economic development in order to prevent any damage to the coastal zone? Why?
4.
5. Do you see transportation problems along your coastal zone?

    - If yes, what are they and how is it a detriment to the CNRA's?

6. Are your aware of any projects related to the TCMP in your jurisdiction?

    - If yes, can you tell me about them? (May I have a list of them?)
    - If yes, were you involved in any way in developing and/or implementing them?

7. Have you received any Federal grant funding to implement projects related to the TCMP?

    - If yes, can you tell me which of the following Federal revenue streams this was funded through?
        - **306 Administrative Grants?** (May be used to fund the administration of the TCMP as well as planning, mapping, GIS, and research projects).
        - **306A Coastal Resource Improvement Grants?** (May be used to fund projects that meet one or more of the following objectives: 1) Preservation or restoration of CNRAs or restoration and enhancement of shellfish production of clutch material on publicly-owned reef

tracts, 2) Redevelopment of deteriorating and underutilized urban waterfronts and ports, 3) Provision of access to public beaches and other coastal areas and to coastal waters, 4) Development of a coordinated process among state agencies to regulate and issue permits for aquaculture facilities in the coastal zone).
    - **309 Coastal Zone Enhancement Grants?** (May be used to develop program changes and support in one or more of the following nine coastal zone enhancement areas: wetlands, public access, coastal hazards, cumulative and secondary impacts, energy and government facility siting, marine debris, ocean resources, special area management plans, and aquaculture).
    - **6217 Non-point Source Pollution Control Grants?** (Funds are used to implement the management measures that are part of the Coastal Non-point Source Pollution Program. Examples include the establishment of the Clean Texas Marina Program, implementation of best management practices on agricultural lands, and funding of a seafood-composting project).

- If yes, how much grant funding did you receive per year/over the last 5 years?
- Do you think this funding has facilitated coastal planning in your area?
- In general, do you think these projects have facilitated economic development in your area? If yes, which projects seemed to work best?

8. Are you familiar with the Small Business and Individual Permitting Assistance Program offered through the TCMP? (The Small Business and Individual Permitting Assistance Program provides individuals, small businesses, and local municipalities in the coastal zone with environmental permitting assistance).

    - Have you used this program in your city/county?
    - If yes, were they useful to you?
    - Which permits did they help you obtain?
    - From which Federal, State, or Local agencies were you applying for an environmental permit? (Texas General Land Office, Texas School Land Board, Texas Commission on Environmental Quality, Texas Parks and Wildlife Department, Railroad Commission of Texas, Texas Department of Transportation, Public Utility Commission of Texas, Texas Historical Commission, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers).

9. Do you have any special departments that address and deal with hazards, emergency management, zoning, etc?

10. Who else should we talk with?

STATE OF TEXAS MITIGATION PLAN QUESTIONS

1. Does your city/county have a mitigation plan?

2. What type of issues does it address? (Sea level rise, storm surge, wind, evacuation planning, flooding issues, etc?)

3. Does your city/county have a recovery plan?

4. Is the recovery plan a part of the mitigation plan or is it a stand-alone plan?

5. Does your city/county have zoning or special land use planning in place for hazard mitigation and environmental preservation? (Related to sea level rise, storm surge, wind, evacuation planning, flooding concerns)

6. Are there specific building standards/codes in place in your city/county as mitigation measures against hurricanes? (Roofing, glazing of windows, shutters, hurricane straps, etc)
    - If yes, are these international building code standards?
    - Does that include codes related to wind hazards appropriate for the wind risk zones for your area?

7. Do you know of homeowners and/or businesses that are having trouble getting or having insurance/wind coverage dropped?

8. What wind standards have your city/county population adopted?

9. Are members of your city/county aware of the Texas Windstorm Insurance Association (TWIA)?

10. Do members of your city/county have or are they able to obtain insurance through the TWIA? (Have they accepted the state codes and received a WPI-8 Certificate, Windstorm Insurance Inspection Certificate? Property to be considered insurable property by the TWIA must be inspected or approved by the Commissioner for compliance with the TWIA plan of operation. Additionally, the TWIA plan of operation in 28 TAC §5.4001 (d)(2)(D) provides that the TWIA board may issue a TWIA policy on certain types of risks without an inspection and requires the TWIA board to submit a set of regulations for such risks to the Commissioner for approval.)

11. Has your local mitigation plan been reviewed by a state and regional liaison officer?

12. Are you aware of the Texas Hazard Mitigation Plan (TMP)?

13. The State of Texas Hazard Mitigation Plan addresses a number of natural hazards that occur across Texas. Do you as a planner/emergency manager/etc have any

projects in and around your city/county that would do the following (If yes, please list them):

- Reduce or eliminate hazardous conditions that cause the loss of life, inflict injuries, cause property damage, or that would degrade important natural resources?

14. Has your city/county been able to acquire any of the mitigation funding stated in the TMP to help plan or implement mitigation strategies?

15. To what extent does the TMP influence the development of your local hazard mitigation plan?

16. Did you help in any way with the development of your local hazard mitigation plan?

17. What department oversees mitigation efforts for your city/county?

18. Do the emergency management department and/or personnel oversee mitigation efforts exclusively or does your planning department participate as well?

19. What types of planning tools or policies are used to promote hazard mitigation in your local area?

    - Tax Incentives?
    - Impact Fees?
    - Special Planning Areas?
    - Storm Water Retention Requirements?
    - Dune and Wetland Protection Factors?

20. Do you attend mitigation-training sessions/seminars when available?

    - If yes, what are they?
    - Who conducts these training sessions? (FEMA, the state, etc.?)

21. Have you had or do you have implementation responsibilities for projects related to your local mitigation plan?

22. Has your city/county ever in the past had to evacuate from your area to a shelter or elsewhere?

    - Was an evacuation order issued?
    - If yes, did you have good compliance rates?
    - What were your compliance rates?
    - How did you get your compliance rate estimates?
    - Who did the compliance rate estimates?

- Were the transportation routes functioning as planned?
- Were there trouble spots in the transportation system? If yes, where at?

23. Do you see any relationship between the TMP and the TCMP? If yes, what is it?

- If yes, are there ways you see that the TCMP and the TMP could work together better to target funding, enhance mitigation, and promote development that reduces vulnerabilities?

24. Do you have a GIS Department? Do you use GIS in your planning projects?

Appendix 3

Preliminary report on the perception of State, County, and local officials regarding the State of Texas Mitigation Plan and Coastal Management Plan with implications for the compatibility between the Two

As part of the Status and Trends project a purposive elite survey was initiated in Year 1 and it will be completed in Year 2. The purpose of this survey is not to gain data on a representative sample of leaders at the state, county and local levels in order to have findings that are necessarily representative of the "population" of these individuals. Rather, the purpose of this survey is to gain detailed information and individual insights regarding the State of Texas Mitigation Plan, the Coastal Management plan, and general issues concern with and surrounding mitigation planning along the Texas coast.

These data will be utilized in a number of ways. First, they will provide project staff with an understanding of the complexities of mitigation issues in the state of Texas, with an emphasis on the coast and with respect to coastal hazards. Simply stated the whole issue of mitigation in Texas is highly complex because there are, in general, few comprehensive policies that one often finds in other states. For example, there is no statewide building code, there is no requirement for comprehensive planning, there is very limited planning that can take place at the county, state, or regional level. Rather, all planning is based on the municipality and to the extent that other forms of mitigation planning occurs, it is because of cooperative agreements or incentives based on federal and sometimes state dollars. Hence, by interviewing knowledgeable leaders and individuals, we can gain a more comprehensive picture of the complex processes involved in mitigation planning in the state.

A second important function of these data is to provide us with critical information regarding mitigation issues in general and how best to ask future questions, particularly on more structured surveys that will be based on some form of random sampling. These surveys are likely to be self administered mailed surveys or structured telephone interviews. In such cases it is critical to know how to ask the question such that potential respondents will understand what you are asking and provide you with useful responses. It is also critical to have some knowledge about the issues in the first place.

The third reason for these surveys is to actually gather useful information on the part of knowledgeable individuals related to the STMP, the CMP, and potential compatibilities and consistencies. These insights will be utilized to supplement our documentary analysis of these two plans.

The initial sampling frame for this survey will be based on positional leaders. In other words the first phase of this survey will target individuals who are filling

particular positions within state, county and local governmental departments and agencies. The targeted individuals are those holing key staff members with the GLO, the Governor's Division of Emergency Management, Texas Department of Insurance (TDI), the Texas Wind Insurance Association (TWIA); and individual holding key positions in county and municipal emergency management departments, planning departments, building departments, flood plain managers, county judges, etc. As part of the survey these individuals will be asked who are other individuals (reputational leaders or influentials) that should be interview. By using this snowballing technique, we will be able to get a good purposive sample of individuals who are likely to know about or be involved with mitigation activities in our target areas of Harris, Brazoria, and Galveston counties as well as at the state level.

While the above outlines the sampling strategy as it will be fully played out during the Status and Trends project, during the first year the Project Team was unable to devote as much time and energy to the elite interviewing process because of a focus on assessing the quality of Mitigation Action Plans. Nevertheless a number of interviews were conducted. Specifically interviews were completed with staff from the GLO, Texas Department of Insurance (TDI), Texas Windstorm Insurance Association (TWIA), Sea-grant extension agents, local planning agencies in Galveston and Houston, local building departments; and with local Emergency Management department. In total interviews were conducted with approximately 25 individuals.

The interview instrument utilized for this survey was a semi-structured interview. In other words, the interview process was more fluid and open, with the interviewers having a set of questions to guide their interactions, but they allowed the interviewee to answer the questions in a more open fashion and these were often followed up with prompts to gain specific information. The interview was designed to gather information on the CMP, various CMP policies and funding streams, as well as the GLO; 2) the State of Texas Mitigation Plan (STMP), 3) local community and county mitigation policies, actions and incentives, other forms of planning utilized by their city, 4) building codes, and 5) wind and flood insurance.

Some of the findings and observations gained from the preliminary interviews include the following:

1) The inclusion of a representative from the Governor's Division of Emergency Management on the Coastal Coordinating Council may well insure greater coordination and concerted action between the STMP and the CMP.

2) The relationship between the GLO and GDEM, through changes in the 2007 STMP, should enhance the working relationship between the two and should also help ensure greater consistency between the STMP and

CMP in terms of their implementation. This also means that some discussion of the 2007 STMP in the final report will be important.

3) There is a good deal of commonality in goals between the TDI and CMP for they both are concerned with reducing losses related to coastal hazards, although the former is much more concerned with wind hazard, since flood hazards are covered by the National Flood Insurance Program. This commonality in mission could have implications for joint efforts to better model and assess coastal wind hazards along the Texas Coast and for the CMP consistency reviews.

4) TWIA exposure to property losses is rising exponentially along the Texas Coast as insurers refuse to underwrite wind hazard.

5) The TDI is putting a concerted effort to constantly improve coastal building codes through material testing and the adoption of new International Residential and Building Codes (IRC/IBC) building codes with "stronger" Texas amendments. For example, the new IRC/IBC 2006 was recently adopted. Yet there is little knowledge with respect to the adoption of these codes by local municipalities.

6) While local communities in the coastal zone, first tier counties, are required to adopt the TDI sanctioned code, there is no enforcement or way to enforce this mandate.

7) The insurance market in Texas has a tripartite structure consisting of the: 1) voluntary market made up of licensed private sector insurers, 2) involuntary market made up of the TWIA (the insurer of "last resort") and 3) the surplus market made up of insurers who are not licensed in the state but can sell insurance without any restrictions.

8) Local municipalities often do not inspect residential or other built structures for wind related hazards. Any inspection related to wind, for example roof inspections, are undertaken by the TDI if at all.

9) Many insurers including the TWIA require roof inspection and a WPI-8 certificate indicating that the roof has been inspected by a certified state inspector/engineer before wind coverage will be issues.

10) Planning staffs have good general knowledge of the GLO, working quite closely with them on a variety of funding programs and permitting activities. The knowledge of the CMP is for the most part confined to funding programs related to beach re-nourishment activities, public access support, signage, and public education materials.

11) There seems to be a rather clear differentiation between planning and emergence management activities at the local levels. In general emergency management appears to be less familiar with the CMP or the GLO, particularly as it relates to mitigation.

12) Mitigation is not completely understood, nor is the relationship between normal development or planning activities and mitigation. Nevertheless, planning agencies are often attempted policy changes and planning actions do have mitigation components; they are simply not viewed as "mitigation" actions.

13) There may be a whole host of policies related to historic dwellings, special zoning areas, etc. that can enhance or sometimes thwart mitigation. For example, modifications to a home above 50% of the value of the structure can require the complete retrofitting of the home to meet new building code standards. This can have negative consequences on low valued homes or on fixed income households that can not afford bring a home up to code. In the case of the former even seemingly minor mitigation retrofitting can trigger the 50% rule because the property (just the structure) is valued that highly.

14) Emergency management is much more focused on emergency and response activities, with little time, energy or commitment for mitigation and recovery planning.

16) Building officials are very aware of building code issues, the importance of coastal setbacks for mitigation purposes. They also appear to be knowledgeable of the CMP and GLO.

17) There is considerable concern about debris removal, which is seemingly considered a mitigation activity.

18) There are novel programs in the State to help provide immediate access to "recovery" dollars on behalf of municipalities. These funds, it is hoped, can jumpstart the recovery process.

The above observations, it must be stressed, are very tentative, given that they are based on so few interviews and the interviewing process is still ongoing. Furthermore, it must be remembered that these observations are not based on a random sampling technique, assuring the representativeness of the findings. Rather they are based on a purposive non-random sample, utilizing snowballing techniques. This technique can provide excellent insights into the perceptions of those interviewed which in turn gives a richer insight into many problems and issues. However, it is difficult to determine what they mean with respect to population characteristics.

Appendix 4.

Revised Coastal Zone Management/State Mitigation Plan Elite Survey
June-August 2008

1. Objectives/Goals:
   - To assess the connection or relationship of the Costal Management Program and the Texas Mitigation Plan
   - To assess the perception and adoption of hazard mitigation policies and actions by the planners and emergency managers in local jurisdictions
   - To assess the perception of local jurisdiction towards Texas General Land Office on Texas Coastal Mitigation Plan.

2. Period of Time: June 18 – August 15, 2008 (interviews and transcripts)

3. Interviewers: Gabriel Burns and Ama Husein

4. Areas:
   a. Houston- Galveston Area Council Regional Hazard Mitigation Plan (HGAC Plan) :
      1. Galveston County
         - City of Galveston
      2. Brazoria County
         - City of Angleton
         - Freeport

   b. Harris County Mitigation Plan:
      1. Harris County
         - Pasadena and
         - Jersey Village

   c. City of Houston Mitigation Plan
      - City Of Houston

   Total areas: 9 jurisdictions: (1) Galveston County, (2) City of Galveston, (3), Brazoria County, (4) City of Angleton, (5) Freeport , (5) Harris County, (7) Pasadena, (8) Jersey Village and (9) City Of Houston.

   Background of area selection:
   - Population, coastal city, adopted local mitigation actions plan, have started mitigation and coastal programs.

Summary background facts:

Areas	Population	Local action mitigation plan	Budget (million)
City of Galveston, Galveston County	57,466 (2005)	15 (only 8 have budget)	1,219
City of Angleton, Brazoria County	18,130 (2000)	10 (actions taken if funds available)	0.3945
Freeport, Brazoria County	12,708 (2000)	21 (completed/ within progress	7.572
Pasadena, Harris County	141,674 (2004)	13 (4 have budget)	0.105
Jersey Village, Harris County	6,880 (2000)	17 (4 actions)	324.91
City of Houston	2,144,491 (2006)	18 (9 approved)	58.95

5. Survey design:
   Unstructured – open ended question – qualitative information
   - contacting agencies and persons (list attached)
     - Sending email:
       1st email: introduction – HRRC logo and professor signature
       2nd email: sending questionnaire and scheduling meeting
     - Arrange meeting: 2-3 contacts everyday (noon for interview, evening for transcripts)
     - Thank you note/email and notify contacts for getting further information if needed.

   - Preparing questionnaire and interview guide
     - It will be set apart depend on the subject
       - Planner, Emergency Manager (county and city), City Manager
     - TCMP questions - will be sent to Planners and during the interview will be asked the understanding and perception on mitigation plan (including connection and coordination)
     - Texas Mitigation Plan Questions will be sent to Emergency Managers and during interview will be asked the understanding and perception on TCMP (including connection and coordination).
     - Interview will be carried out face-to-face (preferable)
     - Phone interview will be used if it is necessary

6. Appendices
   a. List of contacts
   b. Interview protocol

TEXAS COASTAL MANAGEMENT PROGRAM QUESTIONS

11. What do you know about the Texas Coastal Management Programs (TCMP)?

12. Do you know of any TCMP related projects in your jurisdiction?
    - If yes, please list the project.
    - Of those listed, how were you involved?

13. Did you work or have any involvement with Texas General Land Office (TGLO) in regard to question number 2?

14. Have you received any Federal grant funding to implement projects related to the TCMP?
    - If yes, please list the grants names, amount and type of projects

15. Are you familiar with any other programs (i.e.: environmental permit, small business etc) offered through the TCMP?
    - If so, please list them.
    - Where did you learn about them?

16. Have any of these programs or funding opportunities helped facilitate coastal planning in your area?
    - If yes were there any changes in planning practices?

17. Does your city/county have zoning or special land use planning?

18. What are specific building standards/codes in place in your city/county?

19. How many departments address or deal with coastal management, emergency management, zoning and planning?

STATE OF TEXAS MITIGATION PLAN QUESTIONS

25. What do you know about the Texas Hazard Mitigation Plan (TMP)?

26. To what extent does the TMP influence the development of your local hazard mitigation plan?

27. Which departments participated in the development of hazard mitigation for your city/county?

28. What was your involvement in your city/county hazard mitigation plan?

29. Have you participated in any workshop/seminar/course on hazard mitigation?

30. What types of hazards are identified and how are they prioritized?

31. Are there any programs that reduce or eliminate hazardous conditions that cause the loss of life, inflict injuries, property damage, or would degrade important natural resources?

32. Does your city/county have zoning, special land use planning, and/or building standards/codes in place for hazard mitigation and environmental consideration?
    - If yes, please state the types.

33. Was your city/county able to acquire any funding to help plan or implement mitigation strategies?

34. How the city/county implement projects related to hazard mitigation plan?

35. What hazard related insurance are applied in this city/county?

36. How was the emergency response that you experienced in your city/county related to hazard mitigation strategies?
    - Transportation
    - Evacuation
    - Shelter in place
    - Clean up

37. How is the review process of your hazard mitigation plan?

38. How would you grade your hazard mitigation plan? How would others grade your plan?

QUESTIONS FOR TCMP AND TMP

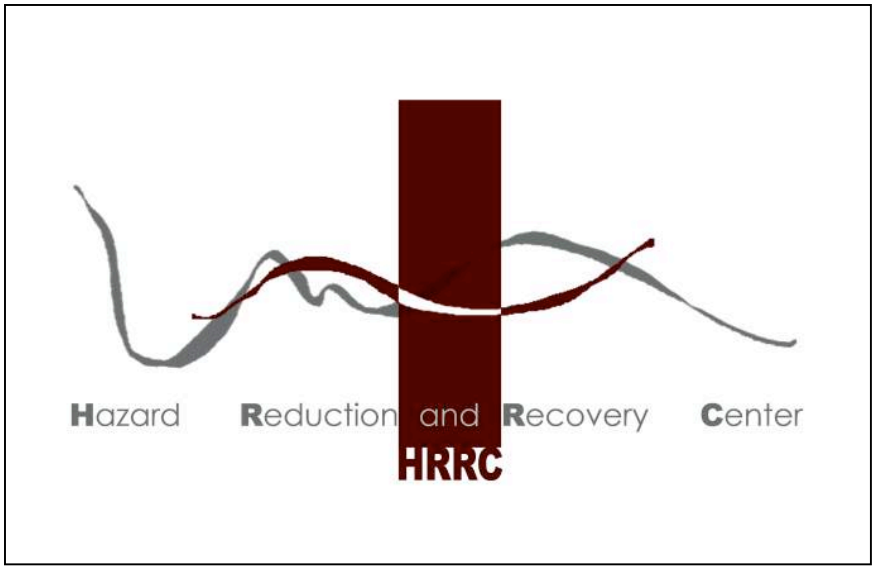
1. How would you define the relationship between the TCMP and the TMP?
    - If you think there is any relationship, how would you start to integrate the TCMP and the TMP?

2. In what ways the TCMP and the TMP could be integrated?

3. How have you used GIS in your planning process?

4. Beside GIS, is there any other tool used for the TCMP and the TMP?

Appendix 5
Local Mitigation Plan Evaluation Protocol



Conducted by Hazard Reduction & Recovery Center
Supported by General Land Office
February, 2008

Title of Plan: _____

Jurisdiction: _____

Organization that prepared document: _____

Date adopted: _____

Date of most recent plan update: _____

Hazards evaluated

Flood _____

Hurricane _____

Wildfire _____

Landslide _____

Others _____

Name of Coder: _____ Date coded: _____

Coding Categories: 0 = not mentioned in plan; 1 = no detailed coverage; 2 = detailed coverage of topic in plan

Part I. Plan Contents Quality

Items		Score	Page No. Reference	Comment
Vision Statement (0 - No mention, 1 - mentioned, 2 - described in detailed)				
1. Problem description	1.1 Description of community and historical hazard threats			2- only if community profile and the Hazards situation, both are discussed 1- if partly or obliquely mentioned
	1.2 Description of the local hazards impact on the entire state			2 – if the nature of relationship and consequences are discussed 1- if there is only a mention of relationship with state
	1.3 Currently or potential hazards issues			2 – a more detailed discussion of hazard issues 1- a mere mention of issue
2. Vision	2.1 A statement identifying an over-all image of sustainable and hazard resilient community			2 – only if the statement seems holistic and satisfactory 1- a mere mention of broad vision
	2.2 General goals and objectives			2 – if the goals and objectives seem comprehensive and holistic 1 – If goals are not followed with objectives or reasoning
Planning Process				
3. General Description	3.1 General description of the process to develop a plan			2-how the planning team was formed, how were the team members involved, and how the plan was prepared 1 – just a mention of the process
4. Proposed participation Techniques in planning process	4.1 Formal public hearings			2- when, how, where and why was the hearings happened 1- just mention
	4.2 Open meetings			2- When, how, where and why the open meetings was held. 1- just mention

	4.3 Workshops or forum			2- when, how, where the forum were organized and who participated to forums 1- Just mention.
	4.4 Call-in hot lines			2- yes, with data on usage 1 – yes but no details
	4.5 Citizen advisory committees			2 – yes with details 1 – yes, but no details
	4.6 Household survey			2- When they conducted survey, how. And what kind of questionnaire was surveyed. 1-just mentioned
	4.7 Interviews with key stakeholders			2 – Who was interviewed as key stakeholders, what and why are they interviewed. 1- identified but not detail
	4.8 Website/internet/email			2-yest with detail 1- yet, but no detail
	4.9 data acquisition and data management			2- Mention data source, how they get and manage data. 1 – just mention
Fact Basis (0- No data, 1- Some data, 2-detailed data/satisfactory data)				
5. Hazard Identification	5.1 General description of projected growth and population			2-detailed data with description/maps/visuals 1- Some data,
	5.2 Hazard profile			2: Mentions **all** hazard by county 1: mention some of hazards or mention some of counties
	5.3 Hazard identification			2- If they describe "Which hazard should have priority for mitigation" as low, medium and high priority for all counties 1 - If mentioned only hazard threats, not mention priority
	5.4 Delineation of natural resource areas			2- If the areas are mapped legibly 1- if resource areas are mentioned and identified (they exist). Includes poor quality maps.

6. Vulnerability Assessment	6.1 Identifies all hazards to the study area			2- Evaluator to ascertain if all hazards are included. 1- If the evaluator ascertains that some hazards have been ignored or overlooked.
	6.2 Social vulnerability (special needs population etc.)			2 – Identification and assessment special needs population; elderly, disable, children……. Etc.
7. Emergency management	7.1 Emergency shelter demand and capacity data			2 – estimated of shelter demand and capacities 1 – one of the above is missing
	7.2 Evacuation clearance time data			2 – Details of methodology and the final estimates 1 – one of the above is missing
	7.3 Location of emergency shelter			2– Only if mapped location of shelters along with designation (nuclear, general etc.) 1 – just mentioned
Mitigation Goals & Objectives (0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects)				
8. Economic Impacts	8.1 Any goal to reduce losses or protect property from loss			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	8.2 Any goal to minimize fiscal impacts of hazards			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	8.3 Any goal to distribute hazard mitigation cost equitably			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
9. Physical and Environmental impact	9.1 Any goal to reduce hazard impacts on and preserve open space and recreation areas			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	9.2 Any goal to reduce hazard impacts on and maintain good water quality			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	9.3 Any goal to reduce hazard impacts on and protect wetlands/ forests (critical natural areas)			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
10. Public Interest	10.1 Any goal to protect safety of population			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects

	10.2 Any goal to promote hazard awareness program or improve information exchange			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	9.1 Any goal to use available resources efficiently			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	10.3 Any goal to improve preparedness and response to hazard			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
	10.4 Any goal to promote partnership with other agencies			0- not mentioned, 1- just mentioned, 2- mentioned with some detailed aspects
Inter-organization coordination & Capabilities (0-no mentioned, 1-just mentioned, 2- identified with sufficient detail)				
11. Cooperation	11.1 Identification of other govt. organizations and specification of their roles and responsibilities			2– Identify all levels (federal, state and other local governments) of governments. 1- mention about some of them
	11.2 Identification of representatives for each of above			2- mention about specific names or titles of representatives 1. just mentioned
	11.3 Identification of other stakeholders and specification of their roles and responsibilities			Other stakeholders include interested parties such as business industry, professional associations, non-profit groups and community representatives (neighborhood groups)
	11.4 Identification of representatives for each of above			2 – mention about specific names or titles of representatives
	11.5 Consistency with state plan/state mitigation plan			2: mentioned with detail 1. just mentioned
	11.6 Integration with other local comprehensive plan			1: just describe the existing plans. 2: describe the existing plans and then describe how they consolidated the actions from other plans and what actual actions are as the result of integration.

	11.7 Integration with FEMA mitigation programs and initiatives (for example, Flood Mitigation Fund)			1: just describe the existing programs and initiatives 2: describe the existing programs and then describe how they consolidated the actions from other programs and what actual actions are as the result of integration.
	11.8 Integration with other independent governments such as Municipal Utility Districts and Independent School Districts			1: just mention other independent governments. 2: describe other independent governments and describe how they will integrate with them. (includes any other special districts)
	11.9 Intergovernmental agreements			2- Indentified with sufficient detail. 1- Just mentioned or need identified..
12. Proposed participation Techniques in proposed actions	12.1 Formal public hearings			2- when, how, where/ for which projects/actions would it be necessary 1- just mention
	12.2 Open meetings			2- when, how, where/ for which projects/actions would it be necessary 1- just mention 1- just mention
	12.3 Workshops or forum			2- when, how, where/ for which projects/actions would it be necessary 1- just mention 1- Just mention.
	12.4 Call-in hot lines			2- when, how, where/ for which projects/actions would it be necessary 1- just mention
	12.5 Citizen advisory committees			2- when, how, where/ for which projects/actions would it be necessary 1- just mention
	12.6 Household survey			2- when, how, where/ for which projects/actions would it be necessary 1- just mention
	12.7 Interviews with key stakeholders			2- when, how, where/ for which projects/actions would it be necessary 1- just mention

13. Information sharing on the planned actions	13.1 Brochures or other literature			2- yes, with details of steps taken for higher efficacy 1 - yes
	13.2 Newsletters			2- yes, with details of steps taken for higher efficacy 1 - yes
	12.1 Educational workshops			2- yes, with details of steps taken for higher efficacy 1 - yes
	13.3 TV/Radio			2- yes, with details of steps taken for higher efficacy 1 - yes
	13.4 Video			2- yes, with details of steps taken for higher efficacy 1 - yes
	13.5 Internet (Web-site)			2- yes, with details of steps taken for higher efficacy 1 - yes
14. Capacity Development and improvement	14.1 Funding sources for citizen participation and cooperation with other organization			2 – identified with funds availability 1 – mention of sources
	14.2 Staffing levels (FTE, part time staff, etc.)			2 – includes technical, advisory and administrative staff 1 – just a simple estimation or identification of need
	14.3 Joint database			2: describes what kind of database (for example, GIS etc.), purpose and the process which the database was developed. 1- identifies to the need of creating a joint database
	14.4 Technical assistance to other organization or citizen			2 – kind of assistance along with access details 1 – identification of the need/ just mention
	14.5 Improving communications and institutional capability through training, workshop etc.			2- yes, with detail info on when, how, what projects/actions would it be necessary 1- just mention
	14.6 Develop and improving technical capabilities (GIS, database etc.)			2- yes, with detail info on when, how, what projects/actions would it be necessary 1- just mention
15. Conflict management Strategy	15.1 Specification of conflict management procedures and processes			2 – details of conflict resolution procedures along with identification of responsible organization./agency

				1 – identification of the need
Specific Mitigation Policies & Actions (0-no mention, 1-just mention, 2-write specific details/more than mention (when/where/how etc.)				
16. General Policy	16.1 Discourage development in hazardous areas			2 – identifies areas with maps/locations 1 – identifies the need
	16.2 Support adoption of new regulatory legislation at local level			2 – Mentions what legislations. 1 – identifies/ mentions the need to do so
17. Regulatory tool	17.1 Permitted land use			2 – identifies areas with maps/locations 1 – identifies the need
	17.2 Low density conservation or other hazard zone			2 – identifies areas with maps/locations 1 – identifies the need
	17.3 Overlay zone with reduced density provisions			2 – identifies areas with maps/locations 1 – identifies the need
	17.4 Dedication of open space for hazards			2 – identifies areas with maps/locations 1 – identifies the need
	17.5 Policy to locate public facilities in zones not subject to hazards			2 – identifies areas with maps/locations 1 – identifies the need
	17.6 Transfer of development rights			2 – identifies areas with maps/locations 1 – identifies the need
	17.7 Cluster development			2 – identifies areas with maps/locations 1 – identifies the need
	17.8 Setbacks			2 – identifies areas with maps/locations 1 – identifies the need
	17.9 Site plan review			2 – identifies areas with maps/locations 1 – identifies the need
	17.10 Special study/impact assessment for development in hazard zones			2 – identifies areas with maps/locations 1 – identifies the need
	17.11 Building standards/ Building code			2 – identifies areas with maps/locations 1 – identifies the need
	17.12 Land and property acquisition			2 – identifies areas with maps/locations 1 – identifies the need

	17.13 Impact fees			2 – identifies areas with maps/locations 1 – identifies the need
	17.14 Retrofitting of private structures			2 – identifies areas with maps/locations 1 – identifies the need
	17.15 Separate hazard mitigation plan			2 – identifies areas where it is required 1 – identifies the need
	17.16 Relocation of structures out of hazard zones			2 – identifies areas of from and relocation areas 1 – identifies the need
	17.17 Drainage ordinance			2 – identifies areas of from and relocation areas 1 – identifies the need
Modeling technique	17.18 Modeling tools for evacuation			2 – identifies tools that are developed or applied 1 – identifies the need
	17.19 Modeling tools for flooding			2 – identifies tools that are developed or applied 1 – identifies the need
	17.20 Modeling tools for others (debris etc.)			2 – identifies tools that are developed or applied 1 – identifies the need
Floodplain regulation	17.21 Floodplain management/development			2 – identifies areas with maps/locations 1 – identifies the need
	17.22 Floodplain ordinance			2 – identifies areas with maps/locations 1 – identifies the need
	17.23 Down zoning floodplains			2 – identifies areas with maps/locations 1 – identifies the need
18. Incentive-based tool	18.1 Tax abatement for using mitigation			2 – identifies areas where it is required 1 – identifies the need
	18.2 Density bonus			2 – identifies areas where it is required 1 – identifies the need
	18.3 Low interest loans			2 – identifies areas/ population groups where it is required 1 – identifies the need
	18.4 Participation in National Flood Insurance Program (NFIP)			2 – identifies areas with maps/locations 1 – identifies the need
	18.5 Join CRS (Community Rating System)			2 – identifies areas with maps/locations 1 – identifies the need

19. Structural tool	19.1 Levees			2 – identifies areas with maps/locations 1 – identifies the need
	19.2 Seawalls			2 – identifies areas with maps/locations 1 – identifies the need
	19.3 Riprap			2 – identifies areas with maps/locations 1 – identifies the need
	19.4 Bulk heads			2 – identifies areas with maps/locations 1 – identifies the need
	19.5 Detention ponds			2 – identifies areas with maps/locations 1 – identifies the need
	19.6 Channel maintenance			2 – identifies areas with maps/locations 1 – identifies the need
	19.7 Wetland restoration			2 – identifies areas with maps/locations 1 – identifies the need
	19.8 Slope stabilization			2 – identifies areas with maps/locations 1 – identifies the need
	19.9 Storm water management			2 – identifies areas with maps/locations 1 – identifies the need
	19.10 Sewage			2 – identifies areas with maps/locations 1 – identifies the need
	19.11 Drainage			2 – identifies areas with maps/locations 1 – identifies the need
	19.12 Maintenance of structures			2 – identifies areas where it is required 1 – identifies the need
20. Awareness/ Educational tool	20.1 Awareness program for community			2- yes, with details of steps taken for higher efficacy 1 - yes
	20.2 Education/awareness for city staff			2- yes, with details of steps taken for higher efficacy 1 - yes
	20.3 Education/awareness for private stakeholders (industry, business, or homeowners etc.)			2- yes, with details of steps taken for higher efficacy 1 - yes
	20.4 Education/awareness for students			2- yes, with details of steps taken for higher efficacy 1 - yes

	20.5 Real Estate Hazard Disclosure			2 – identifies areas where it is required 1 – identifies the need
	20.6 Disaster warning and response program			2 – identifies areas where it is required 1 – identifies the need
	20.7 Posting of signs indicating hazardous areas			2 – identifies areas where it is required 1 – identifies the need
	20.8 Technical assistance to developers or property owners for mitigation			2 – identifies areas where it is required 1 – identifies the need
	20.9 Maps of areas subject to hazards			2 – identifies areas with maps/locations 1 – identifies the need
	20.10 Inclusion of floodplain boundaries			2 – identifies areas with maps/locations 1 – identifies the need
	20.11 Education and training in several languages			2- identifies areas and with details of steps taken 1 - yes
	20.12 Hazard information center			2- identifies areas and with details of steps taken 1 - yes
Social consideration	24.1 Identification of special needs population and preparedness of assistance			2. having their list, giving information to them, preparedness for them
21. Public Facilities and Infrastructure	21.1 Capital Improvements Plan based on hazard analysis			2 – identifies areas where it is required 1 – identifies the need
	21.2 Retrofitting public structure			2 – identifies areas where it is required 1 – identifies the need
	21.3 Retrofitting critical facilities			2 – identifies areas where it is required 1 – identifies the need
22. Recovery Planning	22.1 Land use change			2 – identifies areas where it is required and with maps/locations 1 – identifies the need
	22.2 Building design change to meet enhanced safety standards			2 – identifies areas where it is required 1 – identifies the need
	22.3 Moratorium			2 – identifies areas where it is required 1 – identifies the need

	22.4 Recovery organization			2- mention about specific names or titles of representatives 1. just mentioned
	22.5 Private acquisition			2 – identifies areas where it is required and with maps/locations 1 – identifies the need
	22.6 Financial recovery			2 – identified areas and with funds availability 1 – mention of sources
23. Emergency Preparedness	23.1 Evacuation			2 – yes with details 1 – yes, but no details
	23.2 Sheltering			2 – yes with details 1 – yes, but no details
	23.3 Contingency plan/ Preparedness plan			2 – yes with details 1 – yes, but no details
	23.4 EOC(Emergency Operation Center)			2 – yes with details 1 – yes, but no details
	23.5 Require emergency plans			2 – yes with details 1 – yes, but no details
	23.6 Purchasing rescue materials/purchasing emergency stuff			2 – yes with details and meet the need 1 – yes, but no details
24. Natural resource protection	24.2 General description of best management practice			2- yes with details on how the management will be implemented 1 – just a mention of the process
	24.3 Forest and vegetation management riparian areas			2 – identifies areas with maps/locations 1 – identifies the need
	24.4 Sediment and erosion control regulations			2 – identifies areas with maps/locations 1 – identifies the need
	24.5 Stream dumping regulations			2 – identifies areas with maps/locations 1 – identifies the need
	24.6 Urban forestry and landscape			2 – identifies areas with maps/locations 1 – identifies the need

Implementation (0- no mention, 1- mention without details, 2- mention with sufficient details)				
25. implementation	25.1 Description of implementation process			2- yes with details on steps need to be taken 1 – just a mention of the process
	25.2 Identification of process for prioritizing assistance to local governments			2- yes with details on steps need to be taken 1 – just a mention of the process
	25.3 Clear designation of responsibility for implementation			2- yes with details (mentioned the agency/ institution) 1 – just mentioned
	25.4 Provision of technical assistance for implementation			2- yes with details, mentioned how and what type of assistance 1 – just mentioned
	25.5 Identification of costs for implementation			2 – yes with details 1 – yes, but no details
	25.6 Identification of funding sources			2 – identified with funds availability 1 – mention of sources
	25.7 Provision of sanctions			2- yes with details, mentioned how and what type of sanction (no grants) 1 – just mentioned
	25.8 Clear time-table for implementation outlined			2 – yes with details 1 – yes, but no details
	25.9 Enforcement specified			2- yes with details on what type of enforcement 1 – just mentioned
26. Evaluating, Updating and Monitoring	26.1 Description of the overall evaluating, updating and monitoring process			2- Description of overall process and concrete time schedule for the update, evaluation and monitoring. 1 – just mentioned
	26.2 Identification of participants in the evaluating process			2- mention about specific names or titles of representatives 1. just mentioned
	26.3 Clear designation of responsibility for evaluating, updating and monitoring process			2- yes with details (mentioned the agency/ institution) 1 – just mentioned

	26.4 Evaluation of funded mitigation projects			2 – identified with funds availability 1 – mention of sources

Appendix 6: Coastal Atlas : Data Layers

I. Administrative Boundaries
   1. State Boundary
      - Name, geographic extents, area
   2. Texas Counties
      - Name, geographic extents, area
   3. Study Area
      - Name, geographic extents, area
   4. City Limits
      - Name, geographic extents, area
   5. Three Nautical line
      - Geographic extents, area
   6. Three Marine line
      - Geographic extents, area

II. Policy Data
   7. Coastal Management Zones
      - Name, geographic extents, area
   8. Building Code
      - City, Code type, adopted on

III. Transportation

   9. Interstate Highway
      - Name, location, alignment, type
   10. Major Highway
      - Name, location, alignment, type
   11. Roads
      - Name, location, alignment, type
   12. Hurricane Evacuation Route
      - Name, location, alignment, type
   13. Railroad
      - Name, location, alignment, type
   14. Heliports
      - Name, location, alignment, type
   15. Airports
      - Name, location, alignment, type

IV. Census Data (2000)
   16. County Population (Census 2000)
      - Population, race, income, age distribution, education level
   17. Census Tract Population (Census 2000)
      - Population, race, income, age distribution, education level

18. Block Group Population (Census 2000)
    - Population, race, income, age distribution, education level
19. Block Population (Census 2000)
    - Population, race, income, age distribution, education level

V. Census 1980-1990

20. County Population Growth Rate
    - Change in Population, race, income, age distribution, education level
21. Census Tract Population Growth Rate
    - Change in Population, race, income, age distribution, education level
22. Block Group Growth Rate
    - Change in Population, race, income, age distribution, education level

VI. Climate

23. Rainfall
    - Rainfall contours

VII. Topography

24. Elevation
    - Contours

VIII. Ecological Data

25. Eco-regions
    - Geographic extents, designation, type
26. Vegetation
    - Geographic extents, designation, type
27. Seagrass
    - Geographic extents
28. Washover Areas
    - Geographic extents

IX. Hydrology

29. Hydrological Units
    - Geographic extents, designation
30. Rivers and Streams
    - Geographic extents, layout, name, discharge
31. Lakes and Reservoirs
    - Geographic extents, layout, name

X. Protected Areas

32. Federal Lands
    - Geographic extents, layout, name
33. National Parks
    - Geographic extents, layout, name
34. State Parks
    - Geographic extents, layout, name

35. Wildlife Refuge
    - Geographic extents, layout, name, major species
36. Marine Sanctuaries
    - Geographic extents, layout, name
37. Audubon Sanctuaries
    - Geographic extents, layout, name
38. Coastal Preserves
    - Geographic extents, layout, name
39. Burn Exclusion Zones
    - Geographic extents
40. Habitat Priority Areas
    - Geographic extents, name, priority species
41. Wetlands Inventory Data
    - Geographic extents, name
42. Historic Places (National Register)
    - Location, name, nature
43. Species
    - Locations, type of site
44. Rookery
    - Locations, type of site
45. Hard Reefs
    - Locations
46. Open gulf
    - Extent of conservation area

XI. Recreation

47. County and City Parks
    - Locations, type of site
48. Beach Access
    - Locations, type of site
49. Marinas
    - Locations
50. Boat Ramps
    - Locations

XII. Development

Property Values (2000)

51. Census Counties
    - Total property value, built value, construction value
52. Census Tracts
    - Total property value, built value, construction value
53. Census Block Groups
    - Total property value, built value, construction value

54. Populated Places

- Location, name, population, area

55. Dams
    - Location. type, purpose, maximum storage, normal storage, built
56. Wetland Permits
    - Location, permit type, year

XII. Natural Hazards

57. Hurricane Surge Zones
    - Extent, category
58. Hurricane Risk Zones
    - Extent, category
59. Hurricane Tracks
    - Track, Year, wind speed, pressure, name category
60. Hazard Events (1960-2005)
    - Location, type of event, property loss, crop loss, deaths and injuries
61. FEMA Flood Zones
    - Extent, type of zone
62. Fire Risk Zones
    - Extent, type of zone
63. Earthquake Risk Zones
    - Extent, type of zone

XIV. Coastal Data

64. Coastal Topography
    - Elevation contours (high resolution)
65. Bathymetry Points
    - Location, elevation (high resolution data)
66. Bathymetry Lines
    - Location, elevation (high resolution data)
67. Sea Floor Features
    - Location, name (high resolution data)
68. Detailed Shoreline
    - High resolution shoreline contour
69. Ship Channel
    - Geographic extent
70. Ship Fairway
    - Geographic extent
71. Coast Guard
    - Location

XV. Coastal Development

72. Resource Management Codes

- Geographic extent, category

73. Offshore Blocks
    - Geographic extent, category
74. Oil and Gas Leases
    - Geographic extent, type
75. Oil and Gas Units
    - Geographic extent, type
76. Oil and Gas Platforms
    - Geographic extent, type

XVI. Offshore Risks

77. Environmental Sensitivity Index
    - Geographic extent, category
78. Erosion Areas
    - Geographic extent, category
79. Tidal Influence
    - Geographic extent, category
80. Coastal Barriers
    - Geographic extent
81. Dredged Sites
    - Geographic extent

HOTSPOT ANALYSIS SITE
(Includes the following in addition to most of the above layers)

XVII. Ecosystem Criticality Measures (ECM)

Base data

82. Land Cover 1990
    - Geographic extent, type, detailed category
83. Land Cover 2000
    - Geographic extent, type, detailed category
84. County Growth rate
    - Estimated data linked to geographic extent
85. Low-lying coastal areas
    - Extent of low lying areas along the coast

Index

86. County Level ECM
    - Estimated data linked to geographic extent
87. Tract Level ECM
    - Estimated data linked to geographic extent
88. Block Level ECM
    - Estimated data linked to geographic extent

XVIII. Social Vulnerability Assessment (Block Group Level)

Base Data

89. Population 2000
    - Census data linked to geographic extent
90. Poverty
    - Estimated data linked to geographic extent
91. Household Structure
    - Estimated data linked to geographic extent
92. % of Children
    - Estimated data linked to geographic extent
93. % of Elders
    - Estimated data linked to geographic extent
94. Elders in poverty
    - Estimated data linked to geographic extent
95. Public Transportation Dependency measure
    - Estimated data linked to geographic extent
96. Travel time Characteristics
    - Estimated data linked to geographic extent
97. Unemployment
    - Estimated data linked to geographic extent
98. Residential Vacancy
    - Estimated data linked to geographic extent
99. Racial distribution
    - Estimated data linked to geographic extent
100. Per-capita Income
    - Estimated data linked to geographic extent

Study Area Context

101. Child Care Needs
    - Estimated data linked to geographic extent
102. Elder Care Needs
    - Estimated data linked to geographic extent
103. Public Transportation Needs
    - Estimated data linked to geographic extent
104. Housing Recovery Needs
    - Estimated data linked to geographic extent
105. Social Vulnerability Index
    - Estimated data linked to geographic extent

County Level Context

106. Child Care Needs
    - Estimated data linked to geographic extent
107. Elder Care Needs
    - Estimated data linked to geographic extent
108. Public Transportation Needs
    - Estimated data linked to geographic extent
109. Housing Recovery Needs
    - Estimated data linked to geographic extent

110. Social Vulnerability Index
    - Estimated data linked to geographic extent

XIX. Location Quotation Index (County level Index)

111. Natural Resources and Mining
    - Estimated data linked to geographic extent
112. Construction
    - Estimated data linked to geographic extent
113. Manufacturing
    - Estimated data linked to geographic extent
114. Trade, Transportation, and Utilities
    - Estimated data linked to geographic extent

GALVESTON SITE (-under construction includes following layers for Galveston city in addition to the above data)

115. Parcel boundaries
116. Land use
117. Ownership
118. Land value
119. Property value

Appendix 7: Project Advisory Committee

Trust for Public Land
Linda Shead, Program Director
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Suite 117
Houston, Texas 7700

Galveston County Office of Emergency Management
John Lee, Mitigation Coordinator
Tracy Hughes, Planning Coordinator
Email: john.lee@co.galveston.tx.us
Tracy.Hughes@co.galveston.tx.us
Phone: 281-309-5035
Address: 1353 FM646 West
Suite 201
Dickinson, TX 77539

Texas General Land Office
Contact: Jim Weatherford, Hazard Mitigation Program
Email: Jim.Weatherford@glo.state.tx.us
Phone: 512-463-2572
Address: Texas General Land Office
P.O. Box 12873
Austin, TX 78711-2873

Coastal Community Development
Contact: John Jacob, Director of Coastal Watershed Program
Email: jjacob@tamu.edu
Phone: 281-218-0565
Fax: 281-218-6352
Address: Texas Coastal Watershed Program
17000 El Camino Real #301
Houston, TX 77058

Texas Division of Emergency Management
Contact: Gregory Pekar, State Hazard Mitigation Officer
Email: gregory.pekar@txdps.state.tx.us
Phone: 512-424-2429
Address: Governor's Division of Emergency Management
Texas Department of Public Safety
PO Box 4087
Austin, Texas 78773-0220

City of Galveston Planning Department
Contact 1: Wendy Odonohoe, Director of Planning
Contact 2: Lori Field Schwarz, Historic Preservation
Phone: (409) 797-3660

Phone: (409) 797-3660
Address: 4th Floor City Hall
823 Rosenberg
Galveston, TX 77553

Brazoria County Floodplain/911
Contact 1: Penny Goode, Former Administrator
Contact 2: Kelly Hamby, Administrator
Phone: 979-864-1295
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Angleton, TX 77515

Texas Sea Grant College Program
Contact 1 : Robert Stickney, Director
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