

**Is Hazard Mitigation Being Incorporated into  
Post-Katrina Plans in Mississippi?\***

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*Hurricane Katrina caused the worst hurricane damage ever seen on the Mississippi Gulf Coast. Immediately following the hurricane, the Mississippi Governor's Commission for Recovery, Rebuilding, and Renewal provided teams of planners and designers to work with communities along the coast to prepare rebuilding plans. The initial plans have been followed up with further long-range planning. This paper examines the degree to which hazard mitigation has been incorporated into the long-range plans developed in the communities along the coast in Harrison County, Mississippi, 18 months after Katrina. It finds that hazard mitigation has been significantly integrated into some community plans, whereas in other cases it has been ignored. Although the literature suggests that immediate experience with a natural disaster should increase citizen and local government response to disaster mitigation, this study found that the degree of storm surge inundation did not have a significant impact on whether communities integrated hazard mitigation measures into their plans. The paper concludes by offering recommendations on how these communities can improve their plans relative to hazard*

*mitigation measures as they move into their next phase of long-range planning.*

**Key words:** Land use plan evaluation, disaster recovery, hazard mitigation, Hurricane Katrina

### **Introduction**

Hurricane Katrina had a significant impact on the Mississippi Gulf Coast. The 35-foot tidal waves and 130-mile-per-hour winds resulted in the total loss of 65,000 housing units and severe damage to 55,000 homes. Some communities, such as Pascagoula, had 90 percent of their housing stocks damaged (Thompson 2005). Between January 2005 and July 2006, more than 24,000 people left the Mississippi coastal counties and, initially, unemployment rose to 25 percent (Mississippi Beyond Katrina 2006). Most of the hurricane destruction was sustained by the 11 cities and three counties on the Gulf coast. The damage left these communities struggling to plan for rebuilding.

Hurricane Katrina is not the first hurricane to have devastating impacts on the Mississippi Gulf Coast, which regularly receives the impact of hurricanes. Hurricane Camille, a Category Five hurricane, hit in 1969, and the unnamed hurricane of 1906 also had devastating impacts. Other hurricanes have also hit the Mississippi coast, including Hurricane Elena (1985) and Hurricane Georges (1998). The devastation associated with Hurricane Katrina is in part attributable to the recent rapid increase in development along the Mississippi coast.

Mississippi is a largely rural state that had a total population of 2.8 million in 2000 (U.S. Census Bureau 2006). The state's Gulf Coast has experienced a significant increase in population since the legalization of gaming, increasing the population of the three coastal counties by 16.5 percent between 1990 and 2000 to 360,936 (U.S. Census Bureau 2006). Much of the new development has occurred in areas that could be easily impacted by hurricanes. For example, all of the casinos were placed

along the bays and the Mississippi Sound, which, in turn, drove demand for commercial and residential development in close proximity. While development has increased significantly, much of it happened in small- to medium-sized communities that have limited capacity for planning. For example, Harrison County adopted its first comprehensive plan in 1999 and first enacted zoning in 2000. Although Harrison County has planning staff, many of its small communities do not have planners on staff.

Hurricane Katrina demonstrated how vulnerable communities along the Mississippi Gulf Coast are to storm damage. Immediately following the hurricane, both state and local governments scrambled to identify how to best respond. At the local level, communities realized that they desperately needed rebuilding plans to guide the future rebuilding and growth. The planners in the region began meeting on a daily basis to discuss how they could work together to recover. They discussed the need to rework building and zoning codes and to work collaboratively to ensure that redevelopment occurs in a consistent manner (Carbo 2006).

At the state level, Mississippi Governor Haley Barbour created the Governor's Commission for Recovery, Renewal and Rebuilding, a privately funded group with significant contributions from Knight Foundation. It was charged to explore "big ideas" for rebuilding the coast—and doing it right (RebuildingMississippi.org 2005). The Governor's Commission sponsored the Mississippi Renewal Forum, a first step in creating rebuilding plans for the Gulf Coast. Governor Barbour stated that "the Commission will lead, but local governments and the private sector will decide" (Barbour 2005).

During October 2005 more than 200 architects, planners, and community leaders came together to create rebuilding plans for each of the incorporated communities along the Mississippi Gulf Coast at the state's request. Some communities have adopted the plans created out of the Forum, others have hired the firms that helped during the Forum to do further planning, and still others have created their own plans. Local plans in Mississippi communities aim to reshape land development patterns as the Gulf Coast rebuilds. The plans are designed to advance the principles of

New Urbanism and promote smart growth. While these principles are admirable, given the scope of the disaster and the likelihood of future hurricanes, to what degree did communities incorporate hazard mitigation measures into their plans? That is the central question addressed in this paper.

Harrison County was selected for this study based on its storm impacts, its population, and its economic importance. Harrison County has five cities as well as eight unincorporated communities. It is the most populous county on the Mississippi Gulf Coast and it contains the two largest cities on the coast, Gulfport and Biloxi. The county has played the role of economic engine for the Mississippi Gulf Coast following the influx of casinos and accompanying development after the state's legalization of gaming during the early 1990s. Additionally, all of the communities in Harrison County experienced housing damage as a result of the storm. There are two other coastal counties in Mississippi, Hancock and Jackson. Hancock County is mostly federal land in the Stennis Space Center. The limited population of 42,000 and its limited non-federal lands made it less suitable for selection as a study county. Jackson County has a population of 131,000 and is growing, but it was the least devastated of the three counties. Therefore, Harrison County serves as an appropriate study area to measure the existence and need for hazard mitigation planning.

As of February 2006, eighteen months after Hurricane Katrina, most communities along the Mississippi Gulf Coast have adopted plans for guiding their communities' futures. The term "long-range" is used rather than "comprehensive" because not all of them meet the requirements for a comprehensive plan as established under Mississippi law—which does not require comprehensive plans to contain a hazard mitigation element. All of the plans created include land use, transportation, and community facilities components and are designed to be comprehensive in nature. However, they do not fully meet the state's definition of a comprehensive plan because some do not define the time period for the plan, others do not address schools, and still others do not provide projections of population and employment. It is clear from

a review of the plans that some do meet these criteria and others do not. Some plans can be more specifically characterized as traditional comprehensive plans with timeframes, implementation strategies, and attention to elements ranging from housing to economic development to land use. Others are better described as design-based plans that include some similar elements, but focus more centrally on specific design elements of selected nodes in the community. That said, all of the plans were created with the intent to serve as the long-range redevelopment plans for their communities.

This study attempts to answer one central question, whether the long-range plans for Harrison County, Mississippi integrate hazard mitigation measures for hurricanes and flooding. The paper begins by exploring the literature related to plan evaluation and hazard mitigation. This is followed by a description of the plans created in Harrison County and the results of the evaluation. The paper concludes with a discussion of policy decisions and recommendations for improving hazard mitigation planning along the Mississippi Gulf Coast.

### **Literature Review**

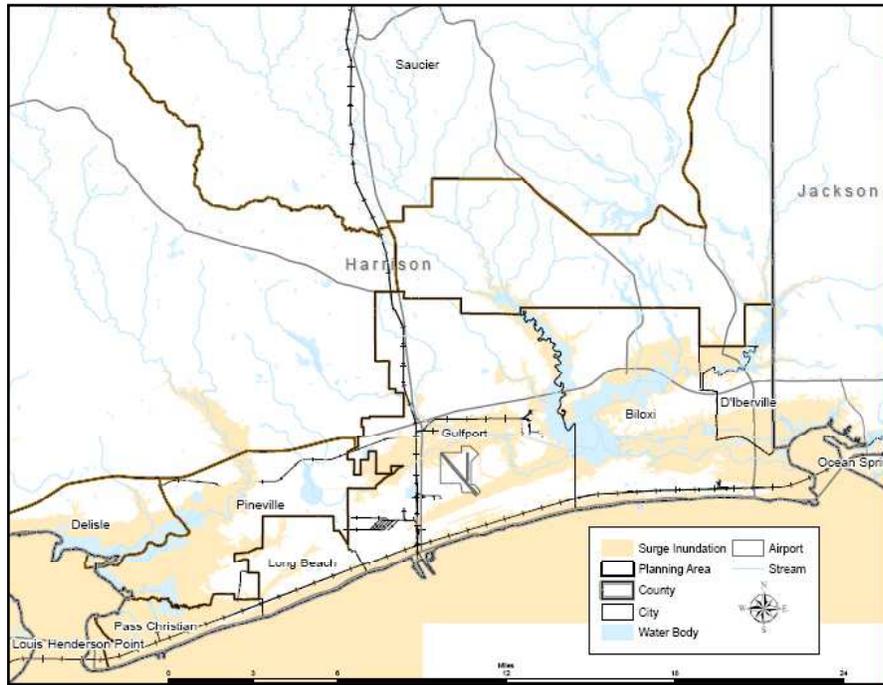
The literature on hazard mitigation planning finds that proactive planning to avoid future disasters is more sustainable than responding to disasters with post-disaster reconstruction (FEMA 2004). While proactive hazard mitigation should be a goal, Burby and French (1981) found that communities tended to enact strong hazard management programs only after damage to development in a flood plain occurred. Hazard mitigation strategies were then enacted as a reactive strategy rather than a proactive measure. In the case of Hurricane Katrina, little pre-impact planning had been implemented in many of the Mississippi coastal communities, and the cost of post-disaster reconstruction is astronomical. Post-Hurricane Katrina, the State of Mississippi has allocated more than \$1.1 billion in aid for housing reconstruction alone (Governor Barbour 2007). As of April 2007, debris removal was still being

undertaken in Harrison County, fully funded by FEMA (Ladner 2007). More than a year and a half after the storm, reconstruction was only just beginning, and it is expected to take many years before communities are fully restored.

Hurricanes have the biggest impact when people, buildings, and structures are located in harm's way (Schwab et al. 1998). There are a number of hazard mitigation planning approaches that can restrict development and divert growth to less hazard-prone areas through land use regulation (Mileti 1999, Damm 2006). In part, hazard mitigation planning can best be achieved through incorporation of hazard mitigation into community land use plans (Burby et al. 1999, Burby et al. 2000, Nazwadzky 1995). Land use plans can effectively mitigate natural hazards through avoiding development in hazard-prone areas, placing restrictions on the use of land in hazard-prone areas, placing public facilities in safer areas, and requiring increased building standards to reduce structural vulnerability (Dalton 1989). When a citizen participation element is implemented, community plans have the added value of providing citizens with information about hazard mitigation and best building practices (Srivastava and Laurian 2006).

Mitigation against hurricanes can be achieved through structural measures, such as flood walls, sand dunes, and levees, or it can be achieved through land use policies that discourage growth in flood-prone areas (Berke and French 1994, Berke et al. 1999, Brody 2003b, Bechtol and Laurian 2005). Mitigation techniques can be regulatory, such as limiting the density in a flood-prone area, or they may be voluntary, such as design guidelines for creating hurricane-resistant homes. These strategies require local governments to engage in land use planning to change the development patterns in their communities. Along the Mississippi Gulf Coast, storm surge occurred not just along the beach, but also along the bayous and wetlands that are located throughout the southern portions of Harrison County, as illustrated in Figure 1. Therefore, both structural mitigation and land use restriction measures are important to the Mississippi coast.

**Figure 1. Harrison County communities and storm surge inundation**



Source: Southern Mississippi Planning and Development District

Citizen involvement in land use planning is critical in order to implement the land use elements that citizens feel are most important to the future of their communities. Typically, in a land use planning process, citizens are invited to offer their opinions about the priorities in their community. Several researchers have identified a “window of opportunity”, in which public interest peaks after a focusing event, such as a hurricane, and then declines (Birkland 1996, Birkland 1997, Lindell and Perry 2000, Olshansky 2006, Prater and Lindell 2000). Following Hurricane Katrina, one would expect that citizens would have a high degree of interest in planning for hazard mitigation, therefore incorporating mitigation measures into their communities’ land use plans.

Some researchers find that, in every post-disaster recovery, a tension exists between “speed and deliberation” (Olshansky 2006). Citizens anticipate quick response to recovery needs in order to allow residents and businesses to start rebuilding and reclaiming their community. Community officials must make decisions quickly in order to set the standards for how and where the rebuilding will take place. At odds with the need for speed in post-disaster recovery, community and planning officials have an inherent responsibility to complete a planning process that will result in the best plan possible. In the cases of post-Katrina Harrison County, this means designing plans as quickly as possible that intend to create disaster-resistant communities via hazard mitigation elements.

Given the importance of hazard mitigation planning, how can it best be incorporated into long-range plans? Also, how can the effectiveness of the long-range plan best be measured? Researchers throughout the United States have developed methodologies for evaluating land use plans that are discussed in the following method section.

### **Method**

In order to answer this study’s questions, each of the local governments in Harrison County was contacted one year after Hurricane Katrina to determine the types of planning activities they had undertaken since the storm. All of the communities participated in discussions about their planning efforts. Each local government was asked to provide a copy of the long-range plans that had been developed and had adopted at that time. The State of Mississippi, under Governor Barbour, made a decision to expedite the long-range planning process in the communities along the coast by hosting the Mississippi Renewal Forum and providing grant funds through the Mississippi Development Authority to assist with long-range planning. By September 2006, all of the communities in Harrison County had completed their long-range plans and were using them to help guide

redevelopment and new development activities. Typically, in a non-emergency situation, a long-range planning process would take from six months to two years to fully develop a plan for a community. While one year following a hurricane is a short period of time, local governments recognized the need to immediately develop and adopt plans that would guide citizens and developers as rebuilding began. Given that these plans have been adopted and are being used to guide development, the authors believed it was appropriate to undertake an evaluation of these initial plans.

All of the cities and the county participated, and they have all developed different types of long-range plans, as shown in Table 1. The plans are all comprehensive in nature, but they differ in their central focus. The plans for Biloxi and Pass Christian have a strong policy focus, while the plans for D'Iberville, Gulfport, and Long Beach have a strong design focus. The plans for Harrison County are a mix of design and policy, with more emphasis on policy. However, the plans' consistent comprehensive nature and intention as each community's official long-range plan justified the use of a single plan evaluation protocol across different plan types.

### **Coding Instrument**

In order to systematically evaluate the hazard mitigation elements of the community plans, the methodology relies on a detailed plan evaluation protocol that is designed specifically for the evaluation of flood and hurricane mitigation. This protocol is built on the idea that natural hazards are best mitigated if the community's comprehensive plan identifies local hazards, sets hazard mitigation goals and objectives, and utilizes hazard mitigation policies as identified by previous researchers (see Chapin and Kaiser 2006, Berke and French 1994, Berke et al. 1999, Srivastava and Laurian 2006). The method used in this study utilizes the protocols developed in previous evaluations of floods, hurricanes, tsunamis, and other disasters in comprehensive plans (Berke and French 1994, Berke et al. 1999, Brody 2003a, Brody 2003b, Srivastava and Laurian 2006).

**Table 1. Plans received by Mississippi Gulf Coast planning agencies**

	Population (2000)	Name of Plan	Organization Preparing Plan	Plan Type	Date of Plan
Harrison County	33,262 (unincorp.)	Community Plans for DeLisle, Henderson Point-Pass Christian Isles, Pineville, and Saucier <sup>1</sup>	Ohio State University <sup>2</sup>	Mix of Design and Policy	April, 2006 January, 2007 February, 2007 April, 2006
Biloxi	50,644	Building Our Future, Enhancing Our Past	Biloxi Reviving the Renaissance Steering Committee	Policy	July, 2006
D'Iberville	7,608	Citizen's Master Plan	Jaime Correa and Associates	Design	June, 2006
Gulfport	71,127	Redevelopment Master Plan Charrette Book	Mississippi Renewal Forum	Design	October, 2005
Long Beach	17,320	Long Beach, Mississippi Concept Plan	Ayers/Saint/Gross Architects and Planners	Design	August, 2006
Pass Christian	6,579	The City of Pass Christian Comprehensive Plan	Gulf Regional Planning Commission	Policy	October, 2006

<sup>1</sup> Harrison County has eight unincorporated communities that have been divided into six planning areas. Plans had been completed for four of the six communities by January of 2007. Plans for the remaining two areas are expected to be complete in 2008

<sup>2</sup> The authors of this study are from Ohio State University, and have been involved in the long-range planning efforts in the county. Harrison County invited the City and Regional Planning program at Ohio State University to assist it with planning for the unincorporated areas, initially on a volunteer basis and later on grant funds. The result is a five-year commitment to addressing all of the long-range planning and implementation issues in the county. Studio classes are fully responsible for the development of the community plans for unincorporated Harrison County.

Although they evaluate for multiple hazards while this study focuses specifically on flood and hurricane hazards, the work of Srivastava and Laurien (2006) provides the most relevant examples of indicators related to hazard mitigation. Previous studies evaluated hazard mitigation based on identification of local hazards, inclusion of goals and objectives to mitigate hazards, and the use of policies and strategies to promote hazard mitigation.

Sixty indicators were selected based on a careful review of plan evaluation criteria related to hazard mitigation, as discussed above. This established literature was used to determine which indicators were the most important for hazard mitigation evaluation. The factual basis is determined through 11 indicators, such as the delineation of the locations exposed to a hazard. An example is whether the 100-year flood plain is identified. Another example is an assessment of emergency shelter demand and capability to determine if communities have identified how to safely protect residents during a storm. Plan goals and objectives are determined through nine indicators, such as a goal to improve preparedness and response to a hurricane and protection of environmental quality. A goal to protect environmental quality could lead to protection of the natural areas that absorb a hurricane's impact. Strategies to achieve hazard mitigation goals are determined through 40 indicators, such as encouraging the use of transfer of development rights, low-interest loans, and stream dumping regulations. Limiting stream dumping will help to protect the natural systems, allowing them to better handle floods. The list of criteria is included in Table 2.

### **Coding Process**

Each of the plan criteria was evaluated on a scale of 0 to 2. A score of 0 indicates that the criterion was absent in the plan, 1 indicates that the criterion was present but not detailed, and 2 indicates that the criterion was present and detailed. For goals and strategies, a score of 0 indicates that the goal/strategy was absent in the plans, 1 indicates that the goal/strategy is recommended, and 2 indicates that the goal/strategy is required. The difference between recommendations and requirements is determined through the language used. Phrases such as *consider*, *could*, *encourage*, and *should* were rated as recommendations. Phrases such as *must*, *require*, *shall*, and *will* were rated as requirements.

Following the development of the plan evaluation criteria, each plan was coded twice, once by each author, in order to reduce the subjectivity and increase reliability in the interpretation of

evaluation criteria. The reviewers evaluated several trial plans in other communities outside of Harrison County in Mississippi, each time comparing results, resolving differences in interpretation, and further refining the protocol. This process continued until the protocol was standardized. Each person developed her own scoring system and then the complete scores were compared to create the intercoder reliability score. Differences in the scores on each indicator were discussed until agreement was reached on the final assigned score.

An intercoder agreement score was computed that equaled the number of coder agreements for the plan evaluation criteria divided by the total number of criteria. An overall agreement score of 89 percent was achieved for the plan evaluation. A score of 80 percent or above is considered an acceptable intercoder agreement score (Miles and Huberman 1994).

**Score Calculation.** Scores were calculated in two steps. The first step was to sum the scores assigned in each evaluation category. For example, a community may score 15 out of 120 points. The second step was to divide this score by the total number of points available and multiply it by 100, resulting in a percentage score. Higher percentage scores indicate a higher degree of integration of hazard mitigation. The overall plan score indicates the degree to which the plan identifies the local hazards, analyzes hazard potential, specifies hazard mitigation goals and objectives, and promotes hazard mitigation policies and strategies to achieve the hazard mitigation goals.

## Results

The scores range from a low of 5.5 percent to a high of 60.1 percent (see Table 2). The lowest score was for the City of Gulfport, which has the largest population. The highest score was for the community of Henderson Point, which has a population of less than 1,000, but where 100 percent of the community was impacted by storm surge.

**Table 2. Hazard mitigation evaluation results**

Factor	Biloxi	D'Iberville	Gulfport	Long Beach	Pass Christian	DeLisle	Henderson Point	Pineville	Saucier
<i>1. Factual basis Identification of hazards</i>									
Hazard threat recognition	1	0	1	2	1	2	2	2	2
Delineation of location of hazard	0	1	1	2	1	2	2	2	2
Delineation of magnitude of potential hazard	0	0	0	0	0	2	2	2	2
Description/analysis of characteristics of hazards (precipitation, water sources, future demand, etc.)	0	0	0	0	1	2	2	2	2
<i>Vulnerability assessment</i>									
Assessment of population exposed	0	0	0	1	1	1	2	1	1
Assessment of value of property exposed to hazard	0	0	0	0	0	0	0	0	0

Assessment of critical facilities exposed to hazard	0	0	0	0	1	1	1	0	1
Assessment of danger from secondary hazards	0	0	0	0	0	0	0	0	0
Assessment of emergency shelter demand and capability	1	0	0	0	0	1	0	1	0
Assessment of environment impacts of disaster	0	0	0	0	0	0	2	1	1
<i>Risk Analysis</i>									
Probability of suffering from hazard	0	0	0	0	0	0	1	0	0
<i>Total Percentage Score for Category</i>	9.1%	4.5%	9.1%	22.7%	22.7%	50.0%	63.6%	50.0%	50.0%
<i>2. Goals and objectives Vulnerability reduction</i>									
Goal to reduce damage to property	1	0	0	0	2	0	2	0	0

Goal to minimize fiscal impacts of natural disasters	0	0	0	0	2	0	0	0	0
Goal to distribute hazards management cost equitably	0	0	0	0	0	0	0	0	0
Goal to improve preparedness and response	0	0	0	1	2	2	2	2	2
<i>Environmental quality</i>									
Goal to reduce hazard impacts that also achieves preservation of natural areas, open space, and recreation areas	0	0	0	1	2	2	2	2	2
Goal to reduce hazard impacts that also achieves maintenance of water quality	0	0	0	0	1	2	0	0	0
<i>General public interest</i>									

Goal to protect health and safety of population	0	0	0	0	2	2	2	2	2
Goal that promotes hazards awareness program or improve information exchange	0	0	0	0	0	2	2	2	2
Goal to reduce government liability	0	0	0	0	0	0	0	0	0
<i>Total Percentage Score for Category</i>	5.6%	0.0%	0.0%	11.1%	61.1%	55.6%	55.6%	44.4%	44.4%
<i>3. Mitigation strategies and policies Legislative and interagency coordination</i>									
Discourage development in hazardous areas	0	0	1	2	2	1	0	1	1
Impose limits on urban development	0	0	0	2	0	1	1	1	1
Support adoption of new regulations at local level	2	2	0	2	2	2	2	2	2

Comply with specific federal or state policy/regulation	2	2	0	2	2	2	2	2	2
Establish partnership/ coordination between agencies	0	2	0	1	2	2	2	2	2
Conflict resolution	0	0	0	0	0	0	0	0	0
<i>Awareness building</i>									
Educational awareness programs	1	1	0	0	2	2	2	2	2
Disaster warning and response program	0	0	0	0	2	2	2	2	2
Post signs indicating hazardous areas	0	0	0	0	2	0	0	0	0
Technical assistance to developers/ property owners for mitigation	2	0	0	0	2	2	2	2	2
Information flow between bankers, govt. agencies, businesses	0	0	0	0	1	0	2	0	0
Education and training in several languages	0	0	0	0	0	0	0	0	0

Hazard information center	0	0	0	0	1	0	0	0	0
Public participation	0	0	0	0	2	2	2	2	2
<i>Development controls</i>									
Special use permit on rezoning	0	0	0	0	0	0	0	0	0
Transfer of Development Rights	0	0	2	2	0	2	2	2	2
Cluster development	0	0	0	0	1	2	2	2	2
Setbacks/easements	0	0	0	2	1	2	2	2	2
Site plan/design review	0	2	0	1	2	0	0	0	0
<i>Assistance and incentives</i>									
Density bonus	0	0	0	2	0	0	0	0	0
Low-interest loans	2	0	0	0	0	2	2	2	2
Incentive for business diversification	2	0	0	0	0	0	0	0	0
Land or property acquisition by state	0	0	0	0	0	2	2	2	2

<i>Control of hazards</i>									
Storm water management/ wastewater treatment	0	0	0	0	2	1	1	2	1
Maintenance of structures	0	0	0	0	2	0	0	0	0
<i>Protection of public facilities and infrastructure</i>									
Capital improvements	1	0	0	0	2	2	2	2	2
Retrofit community facilities	0	0	0	0	2	2	0	2	0
Hazard proof new facilities	0	0	0	0	2	2	2	2	0
<i>Recovery Measures</i>									
Land use change/ coordinated growth	0	2	0	1	2	2	2	2	2
Building design change	1	2	2	1	1	1	2	1	0
Moratorium	0	0	0	0	0	0	0	0	0
Recovery organization	0	0	0	0	0	0	2	2	0

<i>Emergency preparedness</i>									
Evacuation plan	0	0	0	2	2	2	2	2	0
Sheltering health/safety/maintenance	0	0	0	0	2	2	2	2	0
Preparedness plan (water banking)	0	0	0	0	0	0	2	0	0
Emergency plan (supplies and response)	0	0	0	0	0	0	2	0	0
<i>Natural resource protection</i>									
Best management practices	0	0	0	0	2	0	0	0	0
Forest and vegetation management in riparian areas	0	0	0	0	0	0	2	0	0
Sediment and erosion control regulations	0	0	0	0	2	0	0	0	0
Stream dumping regulations	0	0	0	0	2	0	0	0	0
Urban forestry and landscape	1	1	1	2	2	0	1	0	0

<i>Total Percentage Score for Category</i>	17.5%	17.5%	7.5%	27.5%	61.25%	50.0%	61.25%	38.75%	17.5%
<i>Total Percentage Score</i>	14.2%	12.5%	6.7%	24.2%	54.2%	50.8%	60.8%	51.6%	34.0%
<i>Total Percentage Scores across Categories</i>	10.7%	7.3%	5.5%	20.4%	48.3%	51.8%	60.1%	49.3%	44.4%

**Factual Basis**

The plans generally received low scores for the factual basis. Overall, the average percent scores across categories ranged from 4.5 percent to 63.7 percent. Many of the plans recognized that there are hazards, but only some of them identified the locations exposed to these hazards. While the long-range plans in some communities identified the preservation of land along bayous and rivers, they did not identify that areas in the community contained wetlands or flood plains. Some plans completely ignored the issues of hazards and the natural environment. For example, while the Biloxi plan put significant emphasis on economic development and social services, hazard mitigation in the community is never discussed. An example of the identification of a hazard threat is the delineation of the hazard location through Base Flood Elevation (BFE) maps. The issue of FEMA elevation requirements has been one of the most significant topics in the news media and in conversations with public officials and citizens in areas in the flood plain. Only the Henderson Point-Pass Christian Isles and Pineville plans show maps of the FEMA Advisory Base Flood Elevations (ABFE). Gulfport and Long Beach partially maps areas that are part of the ABFEs. Biloxi does recommend adoption of the ABFEs, but they do not include them as part of the identification of hazards in the plan. D'Iberville's plan states "the issue of the new Base Flood Elevation provided by FEMA does not interfere with the goals and objectives of this plan. It is important to take into consideration their recommendations; nevertheless, as presented by FEMA, the coastal areas are the only ones clearly affected by their decisions; ... the design team produced a new FEMA interpretative drawing showing parcel by parcel the implications of the proposed base flood elevations." (City of D'Iberville 2006:9). While the plan discusses this map and the elevations, they are not included in the plan itself. Pass Christian's plan states that "the increase in FEMA base flood elevation guidelines post-Hurricane Katrina requires that additional consideration be given to the development of low-lying land as it appears that it will be necessary for structures to be elevated to comply with FEMA's

new BFE's" (City of Pass Christian 2006:40). The plan then later goes on to say that "FEMA's increased post-Katrina base flood elevations may effectively remove additional undeveloped acres from the developable pool of property" (City of Pass Christian 2006:46). However, while the plan mentions the BFEs, it does not discuss where or how these elevations may impact the community. In the case of DeLisle, the plan identifies the importance of the ABFEs but notes the map is not yet available.

The *Community Plan for Henderson Point-Pass Christian Isles* received the highest number of points for factual basis. Henderson Point was the most heavily impacted community on the coast, with 100 percent of the community impacted by up to 30 feet of storm surge. Its plan identifies the location of hazards, describes the characteristics of hazards, assesses the population exposed, and describes the environmental impacts of the disaster. The fact that this plan only received 63.6 percent of the total factual basis points available may in part be attributable to the community's size—a population of less than 1,000 in an unincorporated area.

### **Goals and Objectives**

Many of the plans received low scores for their goals and objectives because there were no explicit goals related to hazard mitigation. Two plans received zero points and two plans received two or fewer points for goals related to hazard mitigation.

The most common goal was preservation of natural areas, open space, or recreational areas, but these goals could lead to hazard mitigation actions. In some cases a goal might call for increasing open space, which in turn might result in greater flood protection. For example, the Long Beach plan has a goal to "develop thoroughfares throughout Long Beach to encourage residents to bike and walk for transportation as well as recreation" (City of Long Beach 2006:44). This goal is generally about recreation and not specific to hazard mitigation, but it could result in the protection of land adjacent to waterways since they could be developed as hike/bike paths rather than for development. The Pass Christian Plan scored the highest, receiving 61.1 percent

of the available points for goals related to hazard mitigation. It directly integrates the goals and objectives from the city's hazard mitigation plan. For example, the first goal is to "empower individuals, families, and businesses to make informed decisions about mitigation and the protection of life and property" (City of Pass Christian 2006:127). The DeLisle plan has a broad goal to protect the health and safety of residents. Within this goal there is a specific objective related to hazard mitigation: "ensure there is an updated emergency management plan in place for DeLisle, one that meets the needs of the current population and adjusts over time as the community develops" (Harrison County 2006:38).

### **Strategies**

The plans received low scores for their hazard mitigation strategies, with a low 7.5 percent and a high of only 61.25 percent of the total strategy points available. While most had low scores, there are some examples of communities that did a good job in identifying some hazard mitigation strategies. The plan for Long Beach has a one-page section devoted to private property rights issues as they relate to the acquisition of land in velocity zones (City of Long Beach 2006:48). As mentioned previously, the Pass Christian plan directly integrates portions of the hazard mitigation plan into the comprehensive plan. Some of the plans call for the use of transfer of development rights (TDR) and others call for urban forestry, for example. The most commonly mentioned strategy includes complying with specific federal or state policy regulations—in this case with the revised National Flood Insurance Program requirements for elevation of structures. The plans also support the adoption of new regulations at the local level, typically through zoning and subdivision regulation changes. Partnerships and coordination among agencies were also common strategies mentioned in the plans. When it comes to development controls, the use of TDRs and the modification of setbacks were the most commonly adopted (see Table 2). In the DeLisle plan, TDR is specifically cited as a strategy to help landowners in environmentally sensitive areas. The Long Beach

plan refers to the use of TDR as a strategy to help coastal property owners. Other plans, such as Gulfport's, mention the strategy in passing without providing a context in which it would be appropriate to use. The reason TDR is emphasized as a common strategy is because the SmartCode calls for the use of this tool. All of the plans, except Biloxi, were created with the intent of having the SmartCode as one of the options for implementation. Unfortunately, although TDRs are a point of common discussion, there is no enabling legislation in Mississippi that authorizes their use, making it uncertain whether this is a viable tool. In addition, there has not been a regional TDR framework established to allow the transfer of rights across Harrison County or the region. This tool as currently proposed would be used by each individual city and transfer development rights within that city. Although two cities in Harrison County have adopted the SmartCode, it has not yet been translated to the zoning map and therefore no TDR program has yet been undertaken.

### **Factors Affecting Integration of Mitigation Measures into Plans**

After evaluating the plans based on criteria related to factual basis, goals, and strategies, the next step was to take a look at the factors that may have led to the integration of mitigation measures into the plans. The authors expected that the immediate experience with Hurricane Katrina would have increased citizens' interest in planning for hazard mitigation. The citizen participation elements of the plans were examined to determine the degree to which citizens had discussed hazard mitigation. While all of the plans included citizen participation in their development, the level of documentation of this participation varied widely. For example, the D'Iberville plan states that "During this memorable meeting, citizens were given an opportunity to voice their concerns and to express, by means of drawings, their wish lists for improvements and revitalization of the City. This information was also received from a number of stakeholders, and public officials who, by their own volition, decided to participate in posterior workshops and presentations led by members of the design team" (City

of D'Iberville 2006, p.9). While this statement indicates that citizens were listened to, it does not clearly state the priorities of the citizens. Gulfport took a similar approach, describing when citizens were engaged but not what they said.

Other communities engaged citizen input through surveys or citizen committees. Pass Christian included the results of its community survey in which citizens were asked about the importance of drainage and flooding in their community. Sixty-one percent of respondents believed that addressing drainage and flooding was essential, 35 percent believed that it was important, and only 3 percent believed that it was not important (City of Pass Christian 2006, p. 121). Long Beach chose to create committees to address key issues, but none of these committees addressed hazard mitigation. The committee that came closest to addressing hazard mitigation was the infrastructure committee, which identified the need to find funds to upgrade drainage systems (City of Long Beach 2006, p. 49). Biloxi took a similar approach with committees, but none addressed hazard mitigation.

The community plans for the unincorporated areas of Harrison County most thoroughly documented citizen participation, providing results of surveys and summaries of comments at public meetings and other forms of communication. Citizens were asked several questions related to hazard mitigation, such as the degree to which they would support limiting development in flood-prone areas and whether they would support public buy-outs of private property. In Henderson Point, where 100 percent of homes were impacted by storm surge, 69 percent of survey respondents indicated that they would not support a property buyout. Although the majority of plans didn't specifically provide detail on citizen comments, it is clear from the content of the plans that hazard mitigation is not a high priority to citizens.

### **Comparison to Other Studies**

Plans scored on the low end of the evaluation criteria scales, but are the results in Harrison County comparable to the results of other studies? There have been a limited number of studies

evaluating long-range plans on hazard mitigation factors, making it difficult to determine if the results of this study are comparable to results in other communities. In a study by Srivastava and Laurien (2006) in Arizona, plans were evaluated based on the integration of flood mitigation provisions, among others. The overall scores ranged from 16 to 34 percent of the total points available for flood mitigation, compared to 5.5 to 60.1 percent range in the Harrison County study. In the Arizona analysis, one county included goals, objectives, and policies related to hazard mitigation for flooding. However, the other five plans in the study did not address flood risk assessment and one did not recognize flooding as a threat. The plans typically had goals and objectives related to environmental quality. Like the Harrison County plans, the Arizona plans received low scores on policies and strategies. The following section interprets the meaning of the results presented and provides discussion of the reasons that these plans received low scores.

### **Discussion**

Hazard mitigation is critical to the long-term sustainability of communities in Harrison County. As the communities rebuild they need to do so in a safer manner in order to minimize the impacts of future flooding and hurricanes. The variation in plan scores is wide. While the authors expected variation, the fact that many simply did not address hazard mitigation was surprising given that the plans were developed in the wake of Hurricane Katrina. There are a number of possible explanations for why communities did not fully integrate hazard mitigation into their plans.

One partial explanation for the lack of hazard identification in the plans may be the lack of available information and time constraints. This points to the tension in a post-disaster situation to move with speed (Olshansky 2006). Many physical records, such as past community plans and water and sewer line locations, were washed away in the storm. Given the speed with

which plans were needed, planners may not have had the time to find hazard identification data. For example, the planners in Pineville finally gave up after six months of phone calls trying to find someone with maps of the locations of their community's water lines. These records were washed away when the utility authority's waterproof safe was inundated during the hurricane. While the Southern Mississippi Planning and Development District maintains GIS layers on flood zones, wetlands, and storm surge inundation areas, the consultants and local governments may have been unaware of its availability or how to find this information. However, this should not be an absolution for not providing some level of hazard identification, as the participants in the Mississippi Renewal Forum had access to the region's GIS system, which included such basic information as the location of flood plains, wetlands, and storm surge areas. The authors were able to obtain this information on CD through one phone call, indicating that information about mitigation related features of the landscape was not difficult to obtain.

Another partial explanation for limited hazard mitigation elements may be that communities think that hazard identification is obvious in the region and that everyone knows that their community is prone to damage from hurricanes and flooding. For example, since the city of Pass Christian is almost entirely in the 100-year flood plain, hazard identification may seem obvious.

The lack of goals and objectives related to hazard mitigation may be the result of direct citizen input. For example, citizen committees created the goals in Biloxi. Godschalk et al. (2003) found that citizens are more focused on immediate issues, which may be the case in the study communities. The plans reflect goals focused on rebuilding housing, job creation, and parks, all of which impact daily activities. Similarly, the limited discussion of hazard mitigation in some of the plans may result from the fact that the D'Iberville, Long Beach, and Gulfport plans were created with decidedly more design elements and fewer elements concentrating on health and safety that are

more typical of traditional long-range plans. When the authors asked citizens about their priorities the answer heard repeatedly was that “I just want things back the way they were before the storm.” This often heard expression placed no emphasis on hazard mitigation. People understood that another storm could come, but they were unable to overcome their emotional loss of place in order to cope with rebuilding with hazard mitigation in mind. They just wanted their houses back the way they were before the storm and they wanted to adopt a plan that would allow that to happen.

As a result of minimal emphasis on hazard identification and hazard mitigation related goals, a lack of mitigation strategies is not surprising. The criteria for the strategies present a wide range of options available to communities for implementing hazard mitigation goals. One would not expect each community to receive points on every indicator; one would expect each community to choose strategies most suitable for its situation. The researchers found that a number of communities did not explicitly include any hazard mitigation strategies in their plans but chose strategies that might unintentionally achieve some level of hazard mitigation. A focus on urban forestry, for example, was chosen for beautification rather than hazard mitigation. It might seem that the large number of strategies evaluated within the category of mitigation strategies would artificially produce consistently low scores in the analysis. However, this does not seem to be the case. Communities with low scores on mitigation strategies also had low scores on hazard mitigation goals and in the factual basis.

Because citizens are focused on immediate rebuilding issues there was little demand for mitigation measures. Following Hurricane Katrina, it appears that planners were not able to capture the “window of opportunity” to focus public interest on mitigation strategies (Birkland 1996, Birkland 1997, Lindell and Perry 2000, Olshansky 2006, Prater and Lindell 2000). From the strategy perspective, there has been significant resistance in the most devastated communities to comply with the Advisory

Base Flood Elevations. Citizens repeatedly told the authors they thought the elevations were pointless, one citizen said “I had 30 feet of water in my house. I’m going to be required to build 18 feet in the air. What difference would that make, I’d still have had 12 feet of water in my house. I don’t want to live in a bird house. These regulations make no sense. Why should I support a policy that isn’t going to protect me?”

While the plans generally received low scores in each of the evaluation categories, two plans stand out—the plans for Henderson Point-Pass Christian Isles and Pass Christian. The *Community Plan for Henderson Point-Pass Christian Isles* received the highest overall score for hazard mitigation. It has several goals directly related to hazard mitigation and it promotes a wide range of actions and implementation strategies to create a more disaster-resistant community. One might expect this community to have a strong hazard mitigation emphasis in its plan because only 24 homes were left standing after Hurricane Katrina (Mixon 2005). Although the plan integrates hazard mitigation measures, it is clear from the citizen participation element that the residents, who want to rebuild their community the way it was, have little interest in hazard mitigation. Citizens repeatedly expressed strong displeasure with the Advisory Base Flood Elevations, which required houses in the community to be built as much as 25 feet above ground level. Citizens were appalled by Army Corps of Engineers plans for a levee and buyout program for the community. The plan addresses the hazards in the community and sets goals and policies, but citizens are still likely to experience property damage after the community is rebuilt and another hurricane hits because almost all of the land area is in the 100-year flood zone.

The City of Pass Christian’s comprehensive plan is the only plan that explicitly links the City’s hazard mitigation plan and comprehensive plan. It took the goals and objectives from the hazard mitigation plan and included them directly in the comprehensive plan. For example, the first goal related to hazard mitigation is to “Empower individuals, families and businesses

to make informed decisions about mitigation and the protection of life and property” (City of Pass Christian 2006:127). While the plan is excellent in this regard, it does not include hazard identification. Also, the plan acknowledges that 75 percent of the city’s housing was damaged during Hurricane Katrina, but it does not identify the areas that were impacted, the risk of future damage, or other factors. The plan is disjointed, with the mitigation plan elements included as an afterthought rather than as an integral part of the plan.

Overall, the plans for the unincorporated communities in Harrison County achieved substantially higher scores than those of the other communities in the county. Several differences exist between plans created by new urbanist consultants and those created by other groups. This difference can in part be attributed to the planning processes adopted by these different groups. While most of the plans use the transect, the Congress for New Urbanism (CNU) plans focused on rebuilding devastated areas and started from a position of rebuilding the urban core. They also proposed rebuilding to make memorable spaces and create patterns that capitalized on the waterfront for rebuilding opportunities. The plans created in the unincorporated areas of Harrison County used a different process that took into the environmental feasibility of rebuilding options. These plans started the planning process with a land suitability analysis, which accounted for natural hazard threats and pushed development away from waterfronts. The challenge in the cities is that there had been development near the waterfront and the plans propose to redevelop these areas and generally promote an increase in density. In some ways, these may be safer as the buildings can be built of more storm-resistant materials, but on the other hand it puts more people adjacent to the water and in flood prone areas.

The initial intent of the CNU plans differed from that of the other plans. As shown in Table 1, some long-range plans can be more specifically characterized as traditional comprehensive plans. Many of the plans created under the CNU are better

described as design-based master plans that focus on schemes for rebuilding selected areas in the community close to the water. The initial charge for the CNU consultants in the Mississippi Renewal Forum was to create concept plans for community rebuilding. As a result, these plans mostly centered on the core of the community, and identified key proposals that the community should focus on for rebuilding. By contrast, the plans in the unincorporated areas were initially created to serve as more traditional rebuilding plans, including typical comprehensive plan elements and attention to the entire community. Although the *initial* intent of the plans may differ, all of the plans reviewed for this study were current as of January 2007—18 months after the initial planning processes began. During this extended time period, all communities completed their planning processes and created new versions of plans to serve as the long-range plan for the communities. Therefore, despite the differences in the initial charge to the consultants, the result was similar for all communities: the working long-range plan upon which future development depends. It is the responsibility of all the consultants to create the best long-range plan possible for these communities to serve as their guide for rebuilding. In these hazard-prone coastal communities, this means that all long-range plans should include hazard mitigation measures.

For mayors and other elected officials there is an intense pressure to “make something happen”. Residents want to see construction activity and signs of rebuilding, so mitigation is a secondary concern. The critical need to rebuild the tax base to support the expenses of rebuilding and hazard mitigation is another major concern of public officials. In interviews, department heads and elected officials repeatedly expressed rebuilding housing and businesses in order to recreate their tax base as a top priority. Hazard mitigation measures are long-term in scope and elected officials expressed that they have to first think about helping people get back into their houses. The emphasis on rebuilding over mitigation is clear in the plans reviewed.

## Conclusion

The findings of this study are important for both planners and consultants in areas prone to natural hazards. The authors believed that the long-range plans would integrate mitigation measures because of the “window of opportunity” initiated by Hurricane Katrina (Birkland 1996, Birkland 1997, Lindell and Perry 2000, Olshansky 2006, Prater and Lindell 2000). However, the communities in Harrison County have only partially integrated hazard mitigation into their long-range plans.

The overall neglect of hazard mitigation may be attributable to McIvor and Paton’s (2007) contention that if citizens do not believe they can do anything about hazard mitigation they are unlikely to support adoption of personal and community protective measures (McIvor and Paton 2007). The authors believe that beyond this, the lack of interest in hazard mitigation may be a result of what has been termed “Katrina fatigue”. In talking with residents of Harrison County it is clear that most citizens are exhausted from having to constantly fight to rebuild their homes, get insurance settlements, and live in FEMA trailers. Citizens repeatedly told the authors that they just did not have the time or the energy to care about the long-term—they just had to focus their attention on trying to get through the day. The authors experienced many incidents during which citizens would erupt in anger during simple discussions about planning for the future of the community. These were often followed days later by profuse apologies, as citizens explained that they are so distraught over the loss of their community that they just are not able to respond in a reasoned manner anymore.

The noted tension between “speed and deliberation” (Olshansky 2006) in disaster recovery is alive in post-Katrina Mississippi. The interviews with public officials revealed a strong desire to “just get something going”. They acknowledge the necessity for speed in the rebuilding process, as their communities continuously risk losing more residents and businesses to communities further inland. There has been a focus on getting rebuilding started, with

hazard mitigation as a back burner issue. This study highlights the need for planners to recognize the other half of that tension: acknowledging the responsibility of making thoughtful plans for post-disaster reconstruction. Planners must accept the challenge of working both quickly and deliberately to design livable communities that meets the needs of citizens, while also ensuring the safety of these coastal communities. While there are examples of successful integration, planners on the coast will have to work harder to engage citizens in thinking about hazard mitigation.

Fortunately, these communities have another opportunity to integrate hazard mitigation into their land use planning. The Mississippi Development Authority recently approved significant grant funds to enable the communities along the Mississippi Gulf Coast to develop comprehensive plans and rewrite their land use regulations. This is a key opportunity to better address hazard mitigation in the long-range plans and implementation policies of these coastal communities.

The method used to evaluate plans for hazard mitigation demonstrates that there is a significant degree of difference in the extent to which plans address hazard mitigation. Natural hazards, such as floods and hurricanes, are of substantial concern in coastal communities in Mississippi and across the nation. Although it would have been helpful for these communities to adopt mitigation measures before Hurricane Katrina, now there is an opportunity to develop mitigation strategies through long-range plans that will ensure that a future disaster such as Hurricane Katrina does not have the same devastating impact. The plan evaluation highlights the need to improve flood and hurricane mitigation provisions. Some communities did not address the need to mitigate future storms to any degree, whereas others effectively identified hazards.

There are limitations in this research study. The sample size is small, and results might differ if a larger sample size were included. Additionally, a suitable comparison group was unavailable to participate in this study. Future research could evaluate all of the communities impacted by Hurricane Katrina along the Gulf

Coast. A pre- and post-Katrina study would have provided an interesting comparison, but the storm literally washed away many of the pre-Katrina plans, making it impossible to undertake this type of study. Additionally, many of these communities had not adopted similar long-range plans before the storm. Thus, future research could make comparisons between pre- and post-storm recovery planning. Additionally, a longitudinal study evaluating the plans developed over five or ten years following a storm would be helpful in better understanding how hazard mitigation is integrated into long-range plans. This study identifies a lack of hazard mitigation planning; future research could examine explanatory factors on why hazard mitigation measures are not adopted.

Harrison County offers an excellent example of an opportunity to plan for mitigation in the face of a possible future disaster. Whether these communities will take on this challenge and create a model for other coastal communities is questionable. For example, Biloxi has called for increased casino development to allow more and larger casinos and condominiums to line the waterfront. This, combined with a lack of discussion of hazard mitigation in its long-range plan, indicates that Biloxi is not prepared to address hazard mitigation in a serious way. At the same time, other communities are taking hazard mitigation seriously—Pass Christian and Henderson Point serve as examples.

As these communities continue their planning efforts, they should better integrate into their own long-range plans the hazard mitigation planning documents prepared by the local government's emergency management office, FEMA, the Army Corps of Engineers, and other organizations. A number of the plans in Harrison County call for intergovernmental cooperation. In the next phase of planning, these cooperative efforts should be implemented in order to gather more factual information and identify strategies that can be implemented to achieve effective mitigation. The planners undertaking the next phase of long-range planning should work closely with both the emergency managers in their communities and other agencies to gain a more thorough

understanding of the relationship between land use planning and hazard mitigation. Working in partnership would help aid discussions about where development is most appropriate. Citizens also need to be engaged in these discussions. Although citizens are worried about rebuilding their homes, they also need to consider how to protect their communities from future disasters.

Although long-range planning is important, the implementation of hazard mitigation policies and strategies is critical to the long-range protection of communities. Implementing effective hazard mitigation requires participation and coordination from numerous organizations. Future research should evaluate the degree of intergovernmental cooperation in hazard mitigation planning and implementation. The degree to which these plans are implemented in terms of hazard mitigation should also be studied in the future. Such studies should include an analysis of the degree to which development is permitted in storm surge and flood-prone areas. There is also a need to engage citizens in hazard mitigation planning. As citizens rebuild, they should understand the risks that they are personally taking and the ways that their communities can work together to help mitigate future hurricanes.

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