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**FROM STANDARDIZED TEMPLATES TO CONTEXT-APPROPRIATE  
PLANS: BARRIERS TO THE ADOPTION OF LOCALLY SUSTAINABLE  
COASTAL EVACUATION PROGRAMS**

by

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## ABSTRACT OF THE DISSERTATION

From Standardized Templates to Context-Appropriate Plans: Barriers to the Adoption of  
Locally Sustainable Coastal Evacuation Programs

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Federal and state involvement in emergency management planning is often aimed at low-frequency, high-impact events, or at specific weaknesses in “lessons learned” from actual events. However, such initiatives do not necessarily account for regional differences in hazard characteristics, planning processes, response structures and practical application. This research investigates the influence of externally-devised emergency management initiatives on coastal evacuation planning. Specific objectives are to identify factors dictating local coastal hazard planning activities, analyze the efficacy of local programs within the regional geography of coastal New Jersey, and assess the degree to which contextual hazard analysis can improve approaches to coastal evacuation planning. Surveys were provided to 83 coastal communities in New Jersey over a four-year period that addressed coastal evacuation planning needs and externally-devised emergency management initiatives since the events of September 11, 2001. Comments from 40

discrete communities, along with 10 follow-up interviews indicate disconnections between top-down “template planning” initiatives and local needs.

Research results demonstrate that 1) Federal initiatives are not necessarily congruent with needs and priorities at municipal levels, 2) such initiatives are not clearly and effectively incorporated into local planning, and 3) there is a lack of long-term support for program success from such initiatives. This research reveals that although such projects may have merit, that value is lost if critical local needs are subordinated in favor of the template planning initiatives. In order to increase efficacy of planning efforts, Federal and state initiatives should be integrated into local planning needs, possibly through formal regional designations, to enhance planning outcomes and emphasize needs unique to local geography.

## Acknowledgement and Dedication

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I dedicate this effort to my parents and sister, and to my loving husband, Eddie Leckner.

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## **CHAPTER 1 – INTRODUCTION AND OVERVIEW**

New Jersey coastal communities have experienced sporadic coastal storm events in their history (Ludlum, 1983; Savadove and Bucholtz, 1993; Mitchell, 1984, 2006, 2009; Schwartz, 2007). These events have infrequent recurrence intervals accompanied by minor to moderate damage, resulting in poor social and institutional memories. To compound problems related to lack of experience, the political structure of New Jersey provides each of its 566 municipalities with independent management and development of emergency response plans, each of which interpret hazard risk and planning priorities according to independent political, social and economic agendas. This is further complicated at the county and state levels, where additional political and economic layers influence planning. Finally, in the wake of the terrorist attacks of September 11, 2001, public resources for emergency management and planning have been fundamentally reorganized and redirected so that the amount of effort for natural event planning has been subordinate to terrorism, weapons of mass destruction, and other low-frequency/high-impact events.

Since the experience of Hurricane Katrina (August 29, 2005), efforts for natural disaster planning have increased at both local levels and through Federal legislation and initiatives (Waugh, 2006; Congressional Research Service, 2006; Hogue and Bea, 2006; Bea et al., 2006; U.S. Government Accountability Office, 2008). However, the ad hoc pattern of planning has prevailed in the public sector, resulting in application of planning initiatives that are driven by public opinion and social amplification of risk rather than a contextual assessment of hazard risk, vulnerability and planning needs (Mitchell, et al., 1989; Christoplos, et al., 2002; Kasperson and Kasperson, 2005). The emphasis of

governmental planning initiatives remains predominantly with terrorism hazards and media-driven priorities without research and analysis to support program justifications (Mitchell, 2003). As a result, efficiency and effectiveness of coastal hazard planning for New Jersey communities is undermined as disproportional efforts are expended under Federal and state programs.

Together, these factors translate into hazard preparedness that is insufficient for a hurricane event that would require significant evacuations of coastal tourists and residents. This dissertation analyzes the degree to which existing institutional structures and changes in emergency management mandates, funding and initiatives since 2001 influence local communities in planning for coastal storm evacuations. This is accomplished by collecting and analyzing data regarding institutional emergency management structures in New Jersey, histories of significant events and evacuations, major projects, and salient changes in these structures and events since 2001. Data is drawn from a variety of sources including New Jersey legislation, Sea, Lake and Overland Surge from Hurricanes (SLOSH) model data, census data, municipal, county, state and Federal planning documents, emergency management personnel surveys and interviews, review of scholarly works and mass media products.

## **A. Introduction**

Those who design public policies for the protection of U.S. coastal populations against natural extremes face a dilemma: namely, to what degree should they promote standardized responses that focus on certain issues of national importance and follow common procedures (i.e. “template initiatives”), or should local jurisdictions emphasize measures that are tailor-made for the complexities of particular places and specific

communities (i.e. “contextual initiatives”)? This dichotomy has always been present in U.S. approaches to hazard policy-making but it has taken on new importance in the wake of the terrorist attacks of September 11, 2001.

Since then, there has been a marked increase in Federal and state involvement in municipal-level emergency management planning. Much of this involvement has been aimed at coping with low-frequency, high-impact, human-caused events (chemical, biological, radiological, nuclear and/or explosive [CBRNE] as well as terrorism), or a limited range of truly catastrophic natural events (e.g. Hurricane Katrina). However, these are not the kinds of emergencies that affect most local jurisdictions, most of the time. Emergencies typical at the local level include structural fires, coastal flooding from tidal and storm sources, and severe thunderstorms. Sometimes the results of increased federal involvement can be counterproductive for more routine types of local emergencies. This is clearly evident at local jurisdictions in coastal New Jersey where Federal and state initiatives often make demands on local officials without doing much to improve security, thereby creating burdens at local levels without producing results desired by the spirit of such initiatives. These “template planning” initiatives by which jurisdictions are to create plans become high-priority, low-return projects intended to ensure continuation of funding sources, perception of progress and maintenance of mandated requirements rather than integrative planning for essential purposes. Potential chaotic conditions presented by coastal storm hazards are not easily accommodated in planning initiatives that are applied without contextual assessment. To add to this complexity, emergency management structures combined with traditions of “home rule” governmental authority in New Jersey fragment planning processes, resulting in an

overall planning situation that thwarts the intended purpose of systematic and issue-specific planning.

However this does not mean that programs cannot be efficient or produce desired results, rather it is in the implementation where success or failure is determined. Greater efficiency may be gained through regional planning efforts that integrate external initiatives with local and regional priorities. This regional approach can accommodate the desires of larger jurisdictional initiatives, along with the realities and needs of local jurisdiction constraints, creating a flexible functional planning region within rigid formal political jurisdictions. An example of such activities might include the collaboration of planning efforts for timing evacuations to ensure that barrier island municipalities, for example, begin evacuations in concert with mainland locations into and through which evacuees may travel. Public notifications and warnings would likewise benefit from the consistency of regional planning, rather than current practices wherein great variations exist, potential contributing to chaotic public actions during evacuations.

This research investigates how template planning initiatives impact coastal storm planning for municipalities in coastal New Jersey. A series of surveys in coastal municipalities to determine planning priorities and needs is coupled with specific interviews to present a snapshot of how initiatives may enhance or hinder local planning practices. Discussion and recommendations result from an analysis of this information, with an emphasis on regional contextual characteristics to improve planning goals from various jurisdictional levels.

Implicit in this approach is the importance of “synthesis” in geographical research. “Synthesis” is a systematic problem for researchers as well as policy makers,

particularly with regard to the synthesis of processes that operate across different spatial scales and multiple jurisdictions. This integration of specialized knowledge with the complexities of holistic, interdisciplinary research that are essential elements of geographic inquiry, therefore, creates a perfect match for this research subject matter (Turner, 1989; Kates [1967] in Turner, 1989). This research employs the interdisciplinary synthesis of specialized and generalized knowledge as an exploration of a practical application from the viewpoint of a “participant observer”, a unique perspective for geographic applications in hazard management.

### **B. Research Problem**

Federal initiatives to address disaster planning focus on relief efforts and organizational relationships with programs designed to facilitate state and local mitigation and preparedness efforts (Birkland, 2006). These programs are designed to be universally applicable and it is assumed that they will be modified on a case by case basis to take account of local hazard geography, population geography, and other essential regional functions. In the case of evacuation planning this downward-forced process of Federally-prescribed initiatives is what we will refer to in this research as “template planning”. In particular, coastal evacuation planning has remained outside major Federal initiatives, leaving local jurisdictions to address shortcomings and needs for such events without broader Federal guidance.

As a result, local planning efforts for coastal storm evacuations in New Jersey continue to lack funding, institutional support, guidance and application of technological, non-traditional and traditional tools for plan development. This is a critical point as evacuation of the Jersey shore is problematic at best: roadway infrastructure is

insufficient for existing populations and traffic, timeframes for hurricane evacuation decision-making are limited at New Jersey latitudes, a majority of evacuees in hurricane season are tourists and likely are unfamiliar with potential evacuation routes, and so large an area will be impacted that responders will be evacuees as well. Thus a great number of lives are inherently at risk in the event of a New Jersey coastal hurricane evacuation.

What is essential is the development and implementation of “tailored regional planning” that addresses needs for the common denominators of Federal preparedness yet allows the development of local planning approaches to resolve the disparity between jurisdictional priorities as well as to implement planning approaches that efficiently and effectively address hazard preparedness and reduce losses from disasters. It may be that regional cooperatives of local emergency management agencies are best poised to propose and apply actions within Federal and state initiatives.

There are several reasons that institutional responses to recent catastrophic events in the United States have not resulted in improved coastal evacuation planning initiatives in Atlantic coastal communities in New Jersey:

- 1) The initiatives put forth at non-local (Federal, state) levels are reactions to non-congruent events in other locations. For example, the experience of Hurricane Katrina (on the coast of the Gulf of Mexico) inspired special needs registries with dubious consideration of whether this is a priority or problem elsewhere, or whether sponsored programs will be effective on the long term (e.g. would “Special Needs” registries actually solve the problems experienced by “special needs” population in Hurricane Katrina or are other factors at play?);

- 2) There is an overall lack of integration planning with other related efforts, and;

3) Initiatives are not supported for the long-term via guidance or funding, as with the many “pilot” projects for few communities – there are not rubrics for program assessment or guidance for long-term sustainability (funding), or structures to ensure inter-jurisdictional consistency throughout a region with inevitable interdependence (planning, response, mutual aid, population movements, coordinated evacuations, similar resources bases, etc.).

### **C. Research Objectives**

The specific objectives of this research are to identify factors dictating local coastal hazard planning activities, analyze the efficacy of local programs within the regional geography of coastal New Jersey, and assess the degree to which contextual hazard analysis can improve approaches to coastal evacuation planning. I seek to analyze informational, bureaucratic and other societal barriers to the development of fully integrated, contextual hazards management as exemplified by the case of coastal evacuation planning in New Jersey.

No major evacuations have been required in New Jersey’s recent history despite the risk of exposure and impacts of occasional coastal storms. Thus, the situation of New Jersey is compared with those locations that have similar risk and have executed major evacuations, specifically those along the U.S. Atlantic and Gulf coasts with comparable geographic characteristics. Particular attention is given to changes in emergency management structures, planning and response since 2001 and issues of dense coastal development and hazard risk. Regional assessment and contextual analysis of hazards structures and guides the research process.

Central questions to be addressed in this analysis include the following:



1. How have major events, national and local, impacted coastal evacuation initiatives along New Jersey's Atlantic coast?
2. What are specific constraints are presented by New Jersey's institutional "prison of experience"?
3. What planning methods can be employed within existing institutional structures to improve coastal evacuation preparedness, particularly with regard to contextual and regional approaches?
4. To what degree can these recommendations be applied elsewhere to enhance coastal evacuation planning?

The answers to these four central questions can be merged to model a system that incorporates events, perception of events and institutional response structures. The specific focus of this research is on the overlap between these three elements as well as the application of this model to the case of coastal evacuation planning in New Jersey.

#### **D. Purpose**

The purpose of this doctoral dissertation is to address gaps in both the research and analysis of institutional responses to disaster events and to bridge gaps between academic research and applied research. There is a significant "practical" element of this work that seeks to join the theoretical with the applied so that both research areas benefit. Contributions to the discipline of geography and social ecological science in general, include development of a systemic model for events, institutional responses and management perceptions. Specific products from this research that will have practical benefits to researchers include addition of institutional investigations to analysis of hazards, theoretical assessments of scale as related to hazards research, and practical

applications to bridge gaps between theory and practice. Emergency managers can benefit from this work by assessing potentially new approaches to regional hazard planning and the utility of hazards research for aiding in collaborative planning decision-making.

This study investigates the links between hazard theory and execution in the areas of preparedness and response. The field of evacuation behavior is consistently addressed in hazard literature, as are case studies on the aftermath of evacuation, however, little attention has been given to the institutional mechanisms guiding and driving those evacuations – mechanisms that ultimately influence behavior, response and post-evacuation emergency management activities.

Additionally, this work contributes to the study of synthesis in geographical research by demonstrating an interdisciplinary, multi-variable synthesis of phenomena at a location and it has potential to improve the “expertise” of emergency management, a critical and growing sector of public management. The problem lends itself well to geographic analysis (e.g. hazards geography), and the results stand to benefit applied efforts through the synthesis of geographic perspectives with emergency management expertise. This benefit bridges a gap in the application of research to institutional needs of hazard response planning. Hazard management has historically been a reactive endeavor based on event “lessons”, rather than an integrative, deliberate development of synthesis between research, location, and possible action.

### **E. Dissertation Structure**

In Chapter Two this dissertation presents relevant geographic literature for investigations of scale in emergency management planning, followed by a discussion of

methodologies for interviewing emergency management professionals (Chapter Three). In Chapter Four the geographic context of the New Jersey example is investigated to provide context and to dissect specific issues that present barriers to improvement in coastal evacuation planning. Specific discussions include the human setting, the environmental setting and the political structures that emergency managers must consider in their decision-making processes. Chapter Five is an examination of survey data that tie theoretical ideas for integration of scale with emergency manager's perceptions and actions relative to local, state and national scales. These data demonstrate considerations of regional assessment and collaboration in creating solutions to local problems. The impact of national initiatives on local priorities and progress is explored as well, highlighting the importance for local input on evacuation planning. In Chapter Six conclusions are presented that augment both the theoretical framework for institutional and emergency management analysis and provide practical solutions for emergency managers in coastal New Jersey.

## CHAPTER 2 – LITERATURE REVIEW

### A. Introduction

Geographic research on hazards consists of a wide variety of approaches, from human ecological to political economic to contextual approaches, as well as a wide variety of interdisciplinary and collaborative works. Much of this work focuses on two realms: that of the physical aspects of hazard (scientific groundings, spatial distribution, risk and exposure, etc.), and behavioral research (human adaptations, policy responses, perception studies, etc.). Few researchers link policy to the physical and behavioral components of “hazard” beyond “cause and effect” analysis (e.g. the river floods, people react thus policy is made). What is compelling for this research in this complex arena of hazards is the additional variable of the impact of “scale” on the application of policy (“orderly” actions) to the physical attributes of hazards at a particular location (“disorderly” environments) (Mitchell, 2006).

In past research, individual case studies have illustrated connections between local events and national applications resulting from those events (White, 1973 in Cutter, 1994; Mileti, 1980; Mitchell, 1984). What is missing from these is an analysis of the role of “scale” in translating the local event-national policy relationship back to local non-event jurisdictions. The issue, academic and applied, is that the template-style policy based on the hazard geography of one location does not necessarily fit resolution of the “order/disorder” context of other geographic areas. The “order/disorder” relationship may be addressed in the context of geographic scale – in both functional and formal regional analysis (Mitchell, 2006). Thus, we have local events resulting in national policies that

are then imposed as templates for planning at other locations without the component of assessing the intended efficacy at locations that have not (yet) experienced similar events.

“Scale” is a theoretical issue belonging to a broader set of considerations in related issues, including not only changing risks and vulnerabilities at varying geographic scales, but also in the conflict between policy and management priorities between varying jurisdictions. The concept of scale, therefore, not only encompasses the natural environment and organizational structures, but also the method of analysis in hazards research – how we assess and resolve the socio-environmental nature of hazards research as conflict resolution. Not only is it necessary to address the overall *area* of impact and study, but also the *variable characteristics* of those areas in a planning context – dynamic demographics and hazard exposures (Mitchell, 2006).

Recent work identifies various research gaps and problems stalemating hazards theory. McEntire (2004) identifies ten “barriers” to development of hazards theory that include four items relevant specifically to this research: 1) avoiding “fad” hazards; 2) determining if it is “hazard” or “vulnerability” that is critical; 3) selection of appropriate variables to investigate; and 4) identification of stakeholders who should be involved in academic studies. We will see in this research that the emphasis on “fads” has become detrimental at local levels, consuming scarce resources and time from more urgent and salient needs. Likewise, failure to focus on the socially-defined concept of vulnerability over-emphasizes physical hazards, which alone may not be the critical element for study. The renewed focus on “civil defense” as formerly practiced in the US also detracts from development of theory and practice because approaches are narrowed and re-defined as

“security” issues rather than human/environment concerns (Alexander, 2002; McEntire, 2004).

Consideration of the needs and perspectives of local stakeholders is important to the success of local evacuation planning because they are the vulnerable populations. Therefore research on evacuation planning should not be concerned just with “behavior” of evacuees or the implementation of “best practices”, but with the mechanisms that hamper or prevent vulnerability reduction. This new focus will expose the nexus of the issue – where theory and practice converge and where hazards research theory has failed to translate into practical applications.

An additional research concern is that of the role of “synthesis” in geographic research; the multiple variables that are involved in assessing characteristics of action at a location (Turner, 1989). Several authors have grappled with the problems of integration and synthesis in the application of hazards management theory to “real world” management problems. Mustafa (2003) refers to work by Mitchell in mega-cities with complex contexts as well as his own research into poverty-disaster-mitigation linkages, demonstrating the multi-faceted nature of geographic research and need for synthesis of variables to understand vulnerability to hazards. Mustafa (2003) also addresses the essential nature of the post-event review (also known as post-audits and after action reports) following disaster and its role in addressing appropriate action for vulnerability reduction. This is exactly the approach taken for this dissertation in that the synthesis of hazard assessment, action, and post-event investigation are essential in producing appropriate local initiatives for vulnerability reduction – it is the synthesis of geographic paradigms with specialized expertise that provides for practical relevance as well as

theoretical advancement of analysis. Young (2002) addresses the same essential nature of synthesis in work on environmental change and institutions, particularly with regard to the many variables responsible for institutional action, including economics, decision theory, ethnography, collective-action models, and anthropology among others. His thesis focuses on “fit, interplay and scale” – the synthesis of physical and environmental systems, institutions, and the interactions between institutions over time and location (Young, 2002, p. 20).

Birkland (2006) and Platt (1999) also emphasize synthesis in research through discussions on public policy and natural disaster from “top-down” approaches. Policy applications, changes and action are viewed from Federal perspectives, or from archival viewpoints, rather than from local or participatory approaches, however, these analyses are critical for multi-faceted interpretations of greater detail for local jurisdictional levels. These research and application efforts are important in the context of this dissertation in that they reveal not only the complexity of coastal hazard research, but also the persistence of problematic issues related to scale, institutions and local decision-making.

## **B. “Scale” in Hazards Research**

The concept of “scale” is commonly applied to research that involves environmental and human-environment interactions, particularly when addressing topics such as ecosystem dynamics, climate change and other local-to global interactions (Lebel, 2006; Reid, et al., 2006; Mitchell, 2006). Lebel (2006) identifies not only the use of scale in determining location, but also as it determines stakeholders, influence and resource allocations when considered in policy applications. Likewise, “scale” is frequently applied to discussions of climate change, including the interdependencies

between local, regional, national and international policies, practices and impacts (Reid, et al., 2006; Agarwal, 2008). Reid et al. (2006) emphasize the role of democratic processes in bridging gaps of scale to foster successful environmental policies, particularly through the development of institutional frameworks and appropriate dialogue. Young (2002) employs the same horizontal and vertical relationships of scale as addressed in this research – cross-jurisdictional interactions through location and hierarchy.

Scale has been identified as a critical element in specific hazards research (Mileti, 1980; Kaspersen et al. 1988; Turner et al. 1990, Cutter 1994; Hewitt 1997) yet remains outside the assessment of local applications of national policies in hazards. In essence, we have viewed “scale” in reference to units for assessment and modeling of hazards themselves, and with regard to the scale of global impacts of events and actions such as sea level rise and global climate change (Cutter, 1994; Turner, et al. 1990). We need also to address “scale” from the perspective of top-down policy applications to reduce hazard losses at local levels. Additionally, the scale at which we consider both benchmarking events (e.g. Hurricane Katrina, 9/11) and the resulting policy applications (National Incident Management System [NIMS], planning legislation) is important in identifying those policies that are politically driven rather than based on rational and investigative principles.

Pelling (2003) notes that the concept of scale interacts with disaster policy insofar as the boundaries of the natural environment and policy boundaries (political jurisdictions) do not match, and insofar as differing jurisdictional and institutional scales (municipal, county, state, federal), may be beset with conflicts about issues that may



result in reduction of risk at one scale that increases risk at another scale. It is also noted that funding requirements influence local action in an effort to conform to the agendas of national agencies thereby introducing conflict between local and national priorities in addressing local risk and vulnerability (Pelling, 2003). Christoplos, et al., (2002) note that local governments and institutions are critical elements in disaster preparedness and mitigation success. Together, this suggests that State government may serve as a portal between local needs and Federal priorities in linking the scales of function and hazard.

The well-known human-ecological research model provides a valid point of departure for investigating the causes and consequences of hazard from both physical as well as human and policy perspectives, but does leave gaps in the closure, or resolution, of that system (White, 1973 in Cutter, 1994; Kates, 1971). As such, we lack the connection back to hazard identification that would predict or guide the reduction of impacts as a result of that policy, thereby committing resources to policies (intended order) that may not demonstrate the desired local effect (compounded system disorder). Rather, the cycle of hazard analysis should include adjustment to scale and assessment of the potential change in vulnerability as follows:

Identify Hazard → Determine Adjustments → Determine differences in  
choices → develop policy → *Adjustment of policy to contextual scale* →  
*Change in "vulnerability"* → Identify Hazard

The “missing link” in this framework is the assessment of policy applications at local levels (scales) to determine the impact on specific hazards, thereby completing the hazard research cycle as context change over time. What is essential to this research agenda is the inclusion of “scale” as a guiding variable – the human-environment relationship

involves choices and adjustments at many scales, and it does make a difference in the final analysis from what scale the policies are derived and applied. Too often hazard research has relied on assessment of behavioral adjustment as “individual” or “household” responses (subjective utility model, optimizing model, bounded rationality model (White, 1973), but there is lacking a focus on institutional behavior regarding these same responses leading to policy development, adaptation and application.

Mileti (1980) identifies the imperfect knowledge of institutional decision-making based on perceived risk and perceived benefits, as well as acknowledges the feedback mechanism link in the basic system of adjustments. Scale is also identified in this expanded human ecological approach inasmuch as Federal policy and local policy may be different based on differing perceptions of risk. What is not developed in this discussion is the link between policy based on Federal perception and implementation of that policy at local levels as it increases, reduces or does not affect disaster preparedness. Rather, preparedness as an adjustment to disaster is simply seen as an imperfect action from various levels of social organization that contribute to the systemic process of hazard adjustment. Policy is seen as a purposeful adjustment to address hazard preparedness based on best information at that time. Mileti (1980) does acknowledge the need to address the interaction between adjustments as well as implementation. Ostensibly this would include the relationships between scales of action (Federal to local) as well as between the order-disorder continuum of policy-hazard action.

This link may be addressed in terms of political economic approaches to hazard research wherein social variables are attributed to the causes and consequences of disaster although the human-environment interface is not dismissed, rather revealed as a factor of

vulnerability (O’Keefe, Westgate and Wisner, 1976). This is most appropriate in applying social factors to public policy constructions, specifically where post-policy assessments are lacking, where local application of policies fails to achieve the intended goal, or when local application of policies from hierarchical systems exacerbates local hazards.

There appears to be an implied rationality of adjustments in some human ecological interpretations (event – adjustment – policy system) (Kates, 1971; Burton et al. 1993), however, adjustment to hazards in a specific location translated into sweeping policy applied to non-event locations may serve as both cause and consequence of hazard. Thus, social factors are intrinsically tied to this research paradigm. Kates (1971) acknowledges this externality to the human-ecological model as elements not easily integrated into analysis. What is argued to be more productive is a *local* assessment to produce more accurate analysis – exactly what this research seeks to provide. Echoed in this is the political economic approach’s appeal to the analysis of vulnerability at local and regional levels (O’Keefe, Westgate and Wisner, 1976).

This leads to assessment of template-based planning policies through integrative frameworks that better accommodate both human and environmental systems in relation to the scale of hazard and scale of policy application (Mitchell, et al. 1989; Bogard, 1988; Kaspersen et al. 1988; Mitchell, 2006). Consideration of context allows for assessment closely tied to exogenous factors, including risk amplification. Although Mitchell, et al. (1989) noted no significant policy changes due to an extreme event in Great Britain being obscured by other current events, in the United States we see significant Federal policy responses to extreme events since 9/11, in particular. The creation of the Federal Department of Homeland Security (USDHS) and reorganization of responsibilities for

emergency management and response has ushered in an era in U.S. Federal policy that transcends traditional geographic approaches to hazard. Integrative approaches in a post 9/11 U.S. must now consider the scale of adjustments to local events as a part of the hazard context, as “local” hazards become “transplanted” priorities to other local jurisdictions.

Kasperson, et al. (1988) address the “social amplification of risk” as the continuum of “true” risk and “distorted” risk, resulting from influence on information and decision-making processes. Specifically identified, and germane to this research, are the responses of both individuals and groups. This is also reflected in work by Mileti (1980) in addressing differing risk of like events at various levels of government, exemplified by flood risk as determined federally and locally. This is an essential distinction as public policy responses since 9/11 reflect the *institutional* amplification of risk. In addition to the individual choices of human ecology, the social vulnerabilities of political economy, and the exogenous and endogenous factors of contextual approaches, the injection of the concept of “institutions” as central to U.S. hazard analysis is indispensable for understanding the success or failure of the link between orderly policies and disorderly environment.

Evacuation as a coping mechanism for certain hazards is undisputed (Perry, p. 208 in Cutter, 1994). Literature on evacuation, however rarely addresses institutional preparedness and activities, rather focuses on behavioral studies (Perry, 1979; Drabek 1994; Baker 2003) and case studies of specific event failures and successes (Mitchell et al. 1989; Cutter, 1991). Institutional activities to evacuation planning are not well-documented, to include mandated planning requirements, voluntary preparedness

initiatives, decision-making processes or prioritization of evacuation planning activities. This lack of data exists despite mass evacuations due to hurricanes in 1999 (Floyd), 2004 (Charley, Francis, Ivan and Jeanne), and 2006 (Katrina).

### **C. Survey Research**

Geographic and sociologic literature concerning evacuations in disaster does not focus on the programmatic aspects of evacuation planning, despite the close connection between the activity of evacuation and the geographic and social conditions that inherently influence evacuation outcomes. Rather, research and reports are concentrated in three general categories: 1) pre-disaster evacuation surveys to identify intended public behavioral responses to evacuation orders, 2) post-disaster surveys to identify trends in actual public behavior and, 3) government reports surveying jurisdictional planning. This reflects survey work for hazards as well, as detailed in the forthcoming section.

A variety of survey approaches are applied to emergency management and disaster research, most frequently based on perception and behavioral studies of disaster victims or potential victims (Baker, 1991; Bourque, et al. 2002; Peacock et al. 2005; Rosenkoetter et.al. 2007; Landry et al. 2007). These surveys poll public perception on factors such as risk, attitudes, anticipated behavior of general populations often through responses to questions about various scenarios. Respondent surveys are commonly conducted via mail, phone, web-based tools or in-person interviews, with exact method determined by the targeted population. Surveys of public behavior are typically conducted in person (e.g. survey personnel on a beach, shopping area or other public location), via mail or telephone. These surveys are viable for assessing public intent or

perceived behavioral responses to dictated events, e.g. evacuation from hurricane at different times, locations, or storm parameters.

Surveys are also used to canvass public and private sector activities, although these are not as common. Drabek (1991) conducted 65 private sector interviews in Florida to investigate decision-making in tourist-oriented business as one example, and the US Department of Homeland Security applied a survey for self-reviews of state emergency management personnel for the 2004 Nationwide Plan Review (NPR). However, these efforts have had limited development for organizational applications and are the exception rather than the rule in disaster research.

A shortcoming of traditional public questionnaire-based research is that the emphasis is on change over time in behavior as a response to experiencing disaster (opinions on evacuation over time, pre- and post-event) which implies that the individual's perception is an accurate representation of the actual outcome (Baker, 1991; Bourque, et al. 2002; Peacock et al. 2005; Whitehead, 2005; Rosenkoetter et.al. 2007; Landry et al. 2007). Similarly, traditional organizational surveys focus on static inquiry (status of plans, hypothetical situations and responses), which result in answers to a question but not revelation of practices to demonstrate cause and effect relationships influencing institutional decision-making (Drabek, 1991; Urbina and Wolshon, 2003; U.S. Department of Homeland Security, 2006).

Applied to organizational investigation, these approaches limit the researcher to a single moment in time (a person's opinion at that moment, preference in a hypothetical scenario), rather than providing clues to addressing the catalysts for changing institutional patterns that may prevent innovation and progress in planning for various hazards. What

is needed is an integration of expectations and experiences with a focus on decision-makers to reveal alternative planning approaches that resolve human-environment interactions in planning initiatives.

#### **D. Research Contribution**

There is a noted need to broaden hazards theory to effectively address the complex nature of hazard and hazard policies as they relate to vulnerability reduction, resiliency and loss reduction (McEntire et al. 2002). We are clearly in an era in the U.S. where legislation and activities seeking to modify losses dominates practices of modifying our hazards or distributing losses from hazards. The experience of flood control efforts have shown that despite national regulation to control the hazard (through floodplain management), losses continue to mount from flooding and desired outcomes of policies based on cost-benefit analysis do not necessarily produce desired results (Mileti, 1980). Still, loss modification policies rely on “cost-benefit analysis” (CBA)-based management tools. Similarly, the failure of insurance companies following significant disasters in the 1980’s, 1990’s and 2000’s has resulted in little change in our adjustment to hazards beyond emergency measure such as response-oriented programs and mitigation planning. Our experiences and adjustments do not feed back into the cycle of research, analysis and policy development to effectively reduce losses at local levels (McEntire, 2004). White (1973) clearly identifies this missing element – assessment of initiative efficacy – as absent from CBA processes in the Army Corps of Engineers “308 reports” addressing utility of construction projects for hazard reduction. Instead, our landscape is becoming more hazardous on the whole, with increasing demands for local action to compensate for increasing risks. This, in turn, overwhelms

local management structures resulting in a perpetuation of the disorder of the environment and only a veneer of order in our management systems.

Rather than embracing contextual and interdisciplinary research and collaboration to produce comprehensive, flexible “post-industrial” responses (White, 1973 in Cutter, 1994) that may be more locally appropriate, our national policies and centralization of hazard adjustment policies remains mired in the inflexible stove-piped programming based on template-style planning and an absence of contextual evaluation including impacts of “scale” on policy applications. “Stove-piping” - the commonly encountered practice of separating activities by function or organization resulting in the lack of integration of activities between potential common stakeholders - is not a unique problem in addressing emergency management policy, and appears with inter-agency activities as well as within single organizations in public and private sectors (Cairns, et al. 2006; Parker and Byrne, 2000). In fact, “function” and “organization” are important in considering impacts of jurisdictional scale assessments in hazard management. In his 2008 speech at Johns Hopkins University, then-Homeland Security Secretary Michael Chertoff defended the integration of the Federal Emergency Management Agency (FEMA) and other agencies into the Department of Homeland Security in that “emergencies don’t come neatly packaged in stovepipes”, and that the multi-agency DHS structure allows for rapid exchange of information and timely action (Johns Hopkins University, 2008).

While that may assist response mechanisms, the reality is that preparedness and mitigation initiatives continue to be “stove-piped” in the United States. This results in the perpetuation of disparities between local and national goals as well as between events by



catalyst (e.g. terrorism, hurricane, etc.). This is in contrast to Waugh's critique that "overcentralization of decision-making" at the national level is a failure obviated by the events of Hurricane Katrina, in addition to the redirection of resources from natural hazard planning to terrorism preparedness (Waugh, 2006, p.7). The challenge is to bridge the gaps in scale to ensure that the holistic needs of the system (Federal priorities) are met as well as the local preparedness needs (municipalities) that address community vulnerabilities and resources (Christoplos, et al. 2002).

As we will see in this research, the range of adjustments is not truly a consequence of "choice" for local emergency managers, nor is local vulnerability a driving force – the exogenous influence of Federal, and to a degree state risk perception creates policy that disregards contextual application at local levels. This perpetuates the hazard dynamic between systemic order and disorder. Policy, rather than leading to corrective actions, results in diversion of resources, distraction of efforts, and reduced morale at local levels. Measures may not be implemented as intended also resulting in no corrective action (Mileti, 1980) or possibly negative results due to opportunity costs associated with scarce resources for multiple efforts and programs at local levels. With the addition of "scale" in a flexible, post-industrial policy application and closure of the research path of hazard→choices→adjustments to include contextual assessment of policy and re-assessment of hazard, improvements will be made in applications of geographic hazards research, as well as policy development as a bridge between the order-disorder system of policy and environment.

As noted previously, it is not just a concern of "behavior" of evacuees as the predominant quantity of research explores, nor is it summary items of best practices,

what is done or what should be done, *but of the mechanisms preventing vulnerability reduction in local planning*. This new focus will expose the nexus of the issue – where theory and practice converge and where hazards research theory has failed to translate into practical applications. Thus, this research addresses the essential elements of main themes in geographic research with the addition of a critical, often-recommended element: the integration of “scale” as a contextual component – specifically to address those local and regional levels where greater accuracy of analysis is experienced as well as the addition of policy itself (the orderly system) as perpetuating hazard (the disorderly environment).

## CHAPTER 3 – METHODOLOGY

### A. Introduction

As a participant-observer and emergency management professional in New Jersey since 1997, this researcher often considered the reasons for the lack of progress in resolving repetitive issues and major concerns of local emergency management coordinators, non-governmental organizations and others involved in preparedness and response to emergencies. In particular, it became obvious that extreme coastal events and hydrologic events were underestimated in their potential toll and our preparedness, as a whole, is overestimated. Each level of government has different priorities and varying perceptions of responsibility about hazard preparedness and response, and Federal priorities arising after 9/11 created even greater conflict in these areas. What was desired at local levels was not what was being funded from Federal or state levels.

The shift from an “all-hazards planning” focus to a Federally-charged “homeland security” focus ensured that Federal initiatives would overshadow local goals in natural hazard planning and entrench the application of top-down, “template” planning. In an effort to reveal what relationships may work between local, county, state and Federal levels, this research considers that the geographic *scale* at which programs are assessed and applied is not considered by higher jurisdictional levels regardless of political, social, economic or physiographic conditions locally. Thus, this investigation seeks to reveal needed changes in the framework of changing Federal and state agendas, with the purpose of determining an alternate approach to hazard analysis and assessment that would suit coastal New Jersey – and other – locations. The core of this framework is the concept of geographic scale and how local program integrity may be maintained while

minimizing inefficiencies in resource applications. Regional collaboration on a more formal level will permit communities to share resources and efforts for more effective planning applications, particularly with infrastructure and shelter planning, but spanning the spectrum of needs for coastal evacuation operations. The following survey discussions demonstrate specific patterns that are further developed in the context of geographic scale.

The data sought in the research surveys included information relevant to structures and forces that guide decision-making for coastal evacuation planning. Such information covers topics ranging from authority for local action, regional collaborative practices, relationships between local planning perceptions and externally dictated planning initiatives, and commentary on resolution of the conflict between local, state and national priorities. Surveys were used to ensure that similar data was collected from each participating jurisdiction and to allow for both discrete data collection as well as commentary that enhanced tallied data. This approach impacted the data collected in that there may be oversimplification of items where numerical data is provided, but commentary allowed for the respondent to explain important or unique points related to each answer.

Some of the respondents were known to the researcher prior to and during the survey and interview period. This may be a reason for a higher response rate and willingness to forego anonymity by some responders, as topics had been familiar conversation points in previous discussions. Lower rates of responses were noted from those locations where persons were not previously known. Individuals volunteering for face-to-face interviews were entirely known to the researcher, and it is assumed that

personal trust is responsible for their willingness to go “on the record” with such detail. In some cases, known respondents reached out to colleagues to encourage them to respond. Overall, by self-initiated response, direct knowledge or colleague recommendation, approximately half of the shore communities participated in at least one of the three investigative efforts.

It is assumed that during the research period (2004-2008) there were changes in personnel in the positions canvassed for responses. This did likely change perspectives for some jurisdictions, as many decisions, local initiatives, collaborative efforts and other planning activities are tied to personality and individual power, however, generally low turnover rates in emergency managers discount sweeping differences in respondents. For example, all local managers interviewed in 2008 (7) were also respondents in both the 2004 and 2006 surveys. Rates of change in personnel for anonymous surveys are unknown, of course.

Questions remained the same for the 2004 and 2006 surveys to provide a longitudinal view of activities framed within the context of post-9/11 initiatives for the 2004 survey and post-Hurricane Katrina for the 2006 survey. Thus, although the same questions were posed, the context was different and yielded different results. The 2008 interview questions were selected to address items needing clarification or explanation from the surveys (e.g. changing priorities, specific local needs, etc.). This investigation did not originally set forth to provide a longitudinal analysis, but as events unfolded during research it became apparent that a comparison of events over time would be of interest, particularly due the rapid shifts in priorities at the Federal level between the terrorism and natural catalysts benchmarking major institutional changes (e.g. creation of

the Department of Homeland Security and institutionalization of National Incident Management System [NIMS] and Federal planning priorities). There were no significant hazardous events occurring in New Jersey during the years of 2004-2008. This may have resulted in the decay of perceptions as the events of 9/11 and Hurricane Katrina became more distant in memory, however, the emphasis of this research is not on the perception of events, but on the relevance of externally-mandated initiatives, so perceived distance from each event is not as relevant as perceptions of currently active initiatives – the essence of the surveys.

A consideration during this research period was the increased reluctance of the emergency management community to provide data and information in the post-9/11 era. As has been my experience as a professional emergency manager many emergency managers do not share planning information, with terrorism as the rationale for secrecy. Emergency operations plans are public domain and provisions can be made to withhold sensitive and secure information while allowing public review of general information and procedures. In general, however, there has been a shift away from open access to formal requests of data through the Open Public Records Act or other official channels. Some plans may be found online from other jurisdictions, particularly at state levels (emergency operations plans, evacuation plans, mitigation plans), however, neither the State of New Jersey nor the counties of New Jersey provide emergency operation plans or evacuation plans publicly.

## **B. Defining the Research Framework**

This research embraces a broad contextual approach that takes account of many physical, social, economic, political and other factors that affect emergency planning

efforts for coastal hazards in New Jersey. Evidence includes the author's first-hand experience as a participant in this process together with surveys and interviews administered to other emergency planners and archival research that supplies additional background data for purposes of comparison and analysis. These three different types of data – observational, surveyed and archival – permit use of a “triangulation” strategy that increases the reliability of findings. Events, perception of events and institutional responses form the corners of this “triangle”, with methods of observation, action and perception surveys, and archival research linking them together. The relationships between event, perception and institutional action are not linear rather they influence each other in context, thus requiring a multi-faceted methodological approach. All three methods are used for each facet of analysis – event, perception and institutional response – in order to provide checks and balances on researcher, respondent, or reporting bias. This multi-faceted strategy also serves to incorporate variations in scale as well as organizational function.

### ***Basic Methods***

This study employs a mixture of quantitative and qualitative methods. Qualitative method applications in disaster research are widely accepted and practiced, and are compatible with interdisciplinary work (Philips, 1997). Qualitative methods combined with quantitative data, however, expand the horizon of investigative and interpretive potential, allowing the researcher to arrive at greater integrative and contextual interpretations of information. A combination of quantitative and qualitative methods best reflects the “pragmatist” approach, which allows for flexibility in methods, approaches, contextual situation, and the relative relationship between “truths” (Creswell,

2003, p. 12). These methods also support modes of research including surveys, case studies, narratives, participant observation and grounded theory, where data collection is completed in stages for temporal and group comparisons (Creswell, 2003; Montello and Sutton, 2006). The collection of data is such that quantitative and qualitative data may be collected, assembled and assessed in tandem. The primary tools for data collection are surveys, interviews and archival research.

Surveys include both closed-ended and open-ended questions to maximize the amount of information presented while still producing response categories that are comparable (*Municipal Survey*, Attachment A). There is the use of “forced-choice alternatives” with options for additional information to prevent spurious representation of alternative selected (Montello and Sutton, 2006, p. 86). Drawbacks of this system of surveying include the possibility that some respondents may not answer all questions due to absence of a desired answer, or the incongruity of data collected due to individuality of responses. Interviewees are also assumed to be “boundedly rational”, or limited by the individual’s experience, knowledge and resources (Herbert Simon, 1957, in Birkland, 2006, p. 9). Thus, answers may be misleading as reasonable “truths”. Benefits of surveys include the ability to assess nuances and variations on research assumptions to better avoid forcing answers into a hypothesized result. The use of open-ended survey questions allows for respondents to provide commentary to explain their answers, provide unanticipated information or express conjecture -- broadening the opportunity for information analysis (Montello and Sutton, 2006).

Interviews were applied as a research method where additional data, explanation and/or anecdotal and illustrative information were desired. Interviewees were selected



from the initial pool of original survey respondents who indicated that they would be willing to provide an “on-the-record” interview. Interviews were used primarily to expound upon data and information already presented or to clarify existing information rather than to derive primary data. Benefits of interviews include flexibility in light of unanticipated information, while drawbacks include researcher bias during interpretations and the variability of articulation skills among interviewees (Creswell, 2003).

### ***Project-Specific Methods***

Participant observations were included in this methodology to take advantage of the researcher’s employment experience as a professional emergency manager. Although this experience provided invaluable “inside” information, care was taken to accommodate personal biases and preconceptions. Additionally, ethical considerations were paramount to avoid accidental disclosure of classified or sensitive material.

Archival data supported temporal, spatial and comparative analysis. This data was collected primarily through library and internet research with governmental and private sector sources to augment data as needed and available. Information included, but was not limited to census data, publicly available plans, legislation, transportation mapping, media reports and other primary data sources. Previous studies concerning coastal hazard planning and evacuation were essential for comparison and enhancing findings in this research. Archival information was constrained for certain programs, specific funding sources and private sector activities, however, public bid projects and many taxpayer-supported programs exist as part of the public record. Mapping was applied to demonstrate geographic variations in contextual characteristics.

### **C. Survey Methodology**

In the academic literature there is a distinct absence of survey studies that pertain to the nexus of emergency managers' perceptions and actions. Nonetheless, within the broad field of disaster research there are a variety of survey approaches that are most frequently used for perception and behavioral studies of disaster victims or potential victims (Baker, 1991; Bourque, et al. 2002; Peacock et al. 2005; Rosenkoetter et.al. 2007; Landry et al. 2007). These surveys poll public perceptions of risk, attitudes, and anticipated behavior of general populations, most often through responses to questions about various scenarios. Respondent surveys are commonly conducted via mail, phone, web-based tools or in-person interviews commonly, with specific methods for different target populations. Surveys of public behavior are typically conducted in person (e.g. on a beach, shopping area or other public location), via mail or telephone. These surveys are useful for assessing public intent or perceived behavioral responses to events in scenarios devised by investigators, e.g. evacuation from hurricane at different times, locations, or storm parameters.

Surveys are also used to canvass public and private sector activities, although these are not as common. For example, Drabek (1991) conducted 65 private sector interviews in Florida to investigate decision-making in tourist-oriented business, and the U.S. Department of Homeland Security used surveys to allow each state to self-evaluate emergency readiness as part of the 2004 "Nationwide Plan Review". However, these efforts have had limited development for organizational applications and are the exception rather than the rule in disaster research.

A shortcoming of traditional public questionnaire-based research designs is that they typically assume reports of individual's perceptions are accurate guides to actual outcomes (Baker, 1991; Whitehead, 2000; Bourque, et al. 2002; Peacock et al. 2005; Landry et al. 2007; Rosenkoetter et.al. 2007), which implies that the individual's perception is an accurate representation of the actual outcome. Similarly, traditional organizational surveys tend to be static with respect to temporal dimensions (Drabek, 1991; Urbina and Wolshon, 2003; U.S. Department of Homeland Security, 2006; Donner, 2008). They limit the researcher's purview to a single moment (an opinion, a preference in a hypothetical scenario), rather than providing clues to the catalysts that spur change or prevent innovation and progress in planning for various hazards.

The surveys in this study were completed over a four-year time frame, and were coupled with narrative contributions. The multi-year analysis was designed to reveal patterns in organizational responses as well as more stable institutional contexts. Factors of particular interest include hierarchical systems of information exchange, preconceptions and accuracy of information regarding emergency management programs and program requirements, contextual or holistic consideration of policies and programs, and experience – frequency of hazard experience at local levels compared to state and Federal levels, as well as differential experience between local jurisdictions.

#### **D. Research Location and Description**

Surveys were administered to 83 coastal municipalities in four New Jersey counties (Table 4.1 Municipalities Surveyed). These include Monmouth, Ocean, Atlantic, and Cape May -- the four jurisdictions bordering the Atlantic Ocean (Figure 4.1 Location Map). Also included were municipalities in these counties along estuaries that would be

exposed to hurricane storm surge. Respondents to the surveys consisted of municipal emergency management coordinators. While other counties are likewise exposed to coastal storms either directly or through inland flooding, these four counties form a continuous compact region for purposes of analysis. All have similar hazard exposure to coastal events, large seasonal populations, potential for mass evacuations, shared transportation networks, common regional grouping in planning and funding, and large vulnerability and risk of infrastructure as well as year-round populations.

Mailed surveys were first administered in 2004, after the terrorist attacks of 9/11/2001 had prompted a number of Federal, state and local policy changes that affected evacuation planning, and again in 2006 in the wake of Hurricane Katrina (2005), which brought more such changes. Face to face interviews with specific emergency managers were conducted in 2008 to add greater depth and provide a final review of activities during the duration of the project. The purpose of these surveys and interviews was to investigate the municipal practices following two recent milestone disasters, and to gather information about funding opportunities, program changes, frequency of planning and preparedness activities, legal frameworks, and general impressions of shifts in practices at local levels.

Each municipal survey (2004, 2006) consisted of 17 questions, both closed-ended and open-ended in format. There were a total of 27 responses for the 2004 survey (33% response rate) and 22 responses for to 2006 survey (27%), for 49 responses in total for the two surveys (30%). Seven surveys were completely anonymous because the participant chose to provide no identifying information. Only nine municipalities were represented in both the 2004 and 2006 surveys, resulting in 40 confirmed unique

locations participating overall, or 48% of the municipalities polled. This response rate, as well as the rates for the surveys separately, is above the 25% average reportedly experienced with organizational research (Drabek, 1991).

**Table 3.1 Municipalities Surveyed**

<b>County</b>	<b>Municipality</b>
Atlantic	Brigantine City, Galloway Twp., Atlantic City, Absecon City, Pleasantville City, Ventnor City, Margate City, Longport Borough, Northfield City, Corbin City, Egg Harbor City, Linwood City, Estell Manor City
Cape May	Ocean City, Sea Isle City, Avalon Borough, Stone Harbor Borough, North Wildwood City, Wildwood City, Wildwood Crest Borough, Upper Township, Dennis Township, Middle Township, Lower Township, Cape May Point Borough, West Cape May Borough, Cape May City, West Wildwood
Monmouth	Keyport Borough, Union Beach Borough, Keansburg Borough, Middletown Township, Atlantic Highlands Borough, Highlands Borough, Middletown Township, Sea Bright Borough, Rumson Borough, Fair Haven Borough, Monmouth Beach Borough, Oceanport Borough, Long Branch City, Deal Borough, Interlaken Borough, Allenhurst Borough, Loch Arbor Village, Asbury Park City, Bradley Beach Borough, Neptune Township, Avon-By-The-Sea Borough, Belmar Borough, Spring Lake Heights Borough, Sea Girt Borough, Spring Lake Borough, Manasquan Borough, Brielle Borough, Wall Township
Ocean	Point Pleasant Borough, Point Pleasant Beach Borough Bay Head Borough, Mantoloking Borough, Brick Township, Dover Township, Lavallette Borough, Island Heights Borough, Pine Beach Borough, Seaside Heights Borough, Ocean Gate Borough, Berkeley Township, Lacey Township, Ocean Township, Barnegat Light Borough, Barnegat Township, Harvey Cedars Borough, Surf City Borough, Ship Bottom Borough, Stafford Township, Eagleswood Township, Long Beach Township, Beach Haven Borough, Tuckerton Borough, Little Egg Harbor Township

Ten face-to-face interviews were conducted in 2008 to include participants from Ocean, Monmouth, Atlantic and Cape May Counties. These interviews were selected based on willingness to participate as indicated on the anonymous surveys, as well as ad hoc participation from the counties. As such, all interviews conducted represent locations previously submitting responses. Interview questions focused on specific programs to provide “case study” detail of priorities and needs. Of particular interest were

requirements and programs promulgated by the Disaster Mitigation Act of 2000, the National Incident Management System (NIMS), Incident Command System (ICS), and the New Jersey-sponsored “Register Ready” project.

Participation was thorough for those who did respond to each of the surveys. Few questions were left unanswered and many respondents chose to write additional comments on their forms. This provides a rich source of information for analysis and interpretation of local activities and public policy adjustments following major national disasters. Formal analysis of these data was supplemented by the author’s experience as a participant observer in New Jersey emergency management who has also been a non-profit employee, government employee, consultant and researcher in the New Jersey since 1996.

#### **E. Data Analysis**

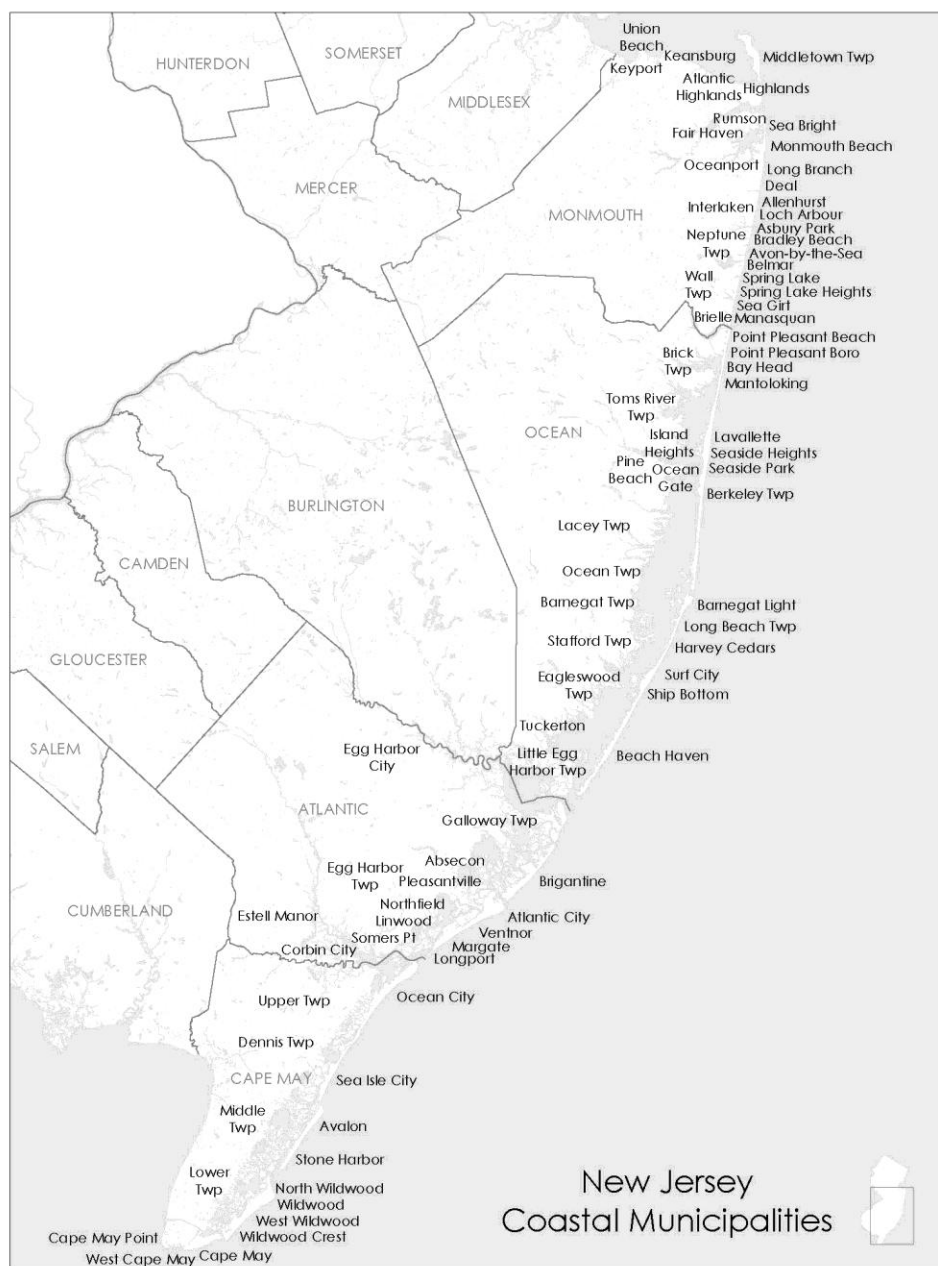
Data collected from the 49 surveys and 10 interviews were tallied into three sets – 2004 survey results, 2006 survey results and 2008 interview results. Qualitative information was coded with brief descriptors and summarized for ease of interpretation and to reveal trends for similar answers. For example, discussions on lack of funding were condensed in the data tallies to “funding gaps”. Numerical data (ratings) were tallied directly and averaged. Additional interpretation by location, when available, is incorporated into discussions to reveal regional comparisons.

Data collected from the surveys are represented in a variety of formats, including narratives and tables. Narratives supply information about actions and priorities both with respect to natural hazards and evacuation planning. Data from the narratives also provide the primary evidence used to confirm or refute findings from existing academic research.

Tables represent discrete information with simplicity and ease, revealing priorities and needs. Data collected from the municipal surveys and interviews were analyzed to provide cross-checks on archival data, information gathered from participant observation and analysis of characteristics.

#### **F. Contributions to Methodological Research**

This methodology contributes to contextual analysis for emergency management programs at local levels. Specifically, the integration of time-series surveys (questionnaires) with statistical survey data (hazards) and Federal State and local emergency management initiatives provides a clearer representation of program priorities than is currently available elsewhere. Hopefully, this information will contribute to increasing institutional innovation and flexibility at local emergency management jurisdictions. Future surveys could incorporate online survey methods in addition to mailed and e-mailed versions, providing another avenue to increase response rates.

**Figure 3.1 Location Map**

Data sources: NJ Office of Information Technology, Office of Geographic Information Systems, "Municipal, County, and State Boundaries of New Jersey", 2004;  
 NJ Department of Environmental Protection, "Waters of New Jersey", 2008.



## CHAPTER 4 – THE GEOGRAPHIC CONTEXT

“The barrier shore of New Jersey is segmented into small coastal jurisdictions that can be compared to ‘beads on a string’. (Heinz Center, 1990, p. 6).

New Jersey coastal areas are subject to various natural hazards. The population density of the state is the greatest in the nation and increasing, typically small jurisdiction size creates unique management challenges for land use concerns, and a large tourism industry brings transient populations to the Jersey Shore from May through November. This creates a planning scenario where many people may need to be moved with few options for transportation methods and destinations. This chapter addresses salient geographic characteristics that are relevant to the analysis of coastal hazard management scales in New Jersey.

Three distinct geographic factors are particularly important in assessing the constraints that nature and society impose on evacuation planning efforts for the Jersey Shore. These include, 1) the large variation in seasonal populations due to a robust tourism-based economy, 2) the differences between hazards experienced along the coast – the more frequent “nor-easters” are often assumed to be a benchmark for hurricanes by emergency managers and general population, and, 3) the political traditions of “home rule”, which have resulted in fragmented efforts in virtually all aspects of public management (including human-environment issues), and have dissuaded collaborative planning at regional levels. The combination of these three factors within the small size of New Jersey results in statewide impacts for coastal event planning. This underscores the broader impact for coastal planning in New Jersey – what is accomplished in coastal

communities individually and as a group will define the vulnerability of adjacent counties and the state as a whole.

### **A. The Physical Environment**

#### *The Natural Environment*

While some of the largest of New Jersey's 566 municipalities are found in the southern and coastal counties, many of the shore communities are small by any standard, measurable by blocks, in some instances. A common "string" for these fiercely independent "beads" is the environment – the occupation of coastal landforms that are dynamic sedimentary locations often with small inlets, estuaries and other water bodies indenting densely developed communities. All locations are situated on the unconsolidated sediments of the coastal plain that includes barrier islands and peninsular formations (Stansfield, 1998). These landforms are inherently dynamic, subject to seasonal storms, geomorphologic processes and relatively rapid transformations. Along the New Jersey coast, however, engineering design and development has been employed to control this dynamic state, particularly with the beaches and inlets used for tourism and commerce (Psuty and Ofiara, 2002; Mitchell, 2006). These engineering efforts have had limited success in controlling the coastal environment and protecting coastal areas from atmospheric and marine hazards (Platt et al. 1987, Beatley et al. 2002). A closer view of each county helps frame this dynamic setting.

Monmouth County is the northernmost of the four counties included in this research and includes 472 square miles of land area bordering the Atlantic Ocean and Raritan Bay (<http://quickfacts.census.gov/qfd/states/34/34025.html>, retrieved July 24, 2009) . Terrain includes low-lying coastal plain, to the county's highest elevation at the

Highlands (266'), in the northeastern portion of the county, adjacent to the Sandy Hook formation (<http://www.monmouthcountyparks.com/page.asp?agency=130&Id=2534>, retrieved 7/42/09). Despite the elevation of the Highlands at the apex of the Atlantic Coast and Raritan Bay, those elevations are not found further inland. Coastal areas include 27 miles of Atlantic beaches and 26 miles along the Raritan Bay (Monmouth County Planning Board, 2008a). Numerous rivers, lakes and ponds are present, including the Shrewsbury and Navesink Rivers, which are prone to flooding and storm surge.

Ocean County is situated to the south of Monmouth, and consists of 638 square miles in the coastal plain of New Jersey (Ocean County Department of Planning, 2009). A major characteristic of Ocean County is the extensive barrier island formations along the coastline. These produce not only desirable properties for summer tourism but also significant "back bay" areas where flooding can outlast several tide cycles before draining to the ocean. Frontage along the water is also extensive with the presence of the barrier islands, and dense development is prevalent as a result. There are approximately 44 miles of oceanfront and 198 miles of bay-front property in the county. This extensive waterfront area is most prevalent in Berkeley Township (36.61 miles), Toms River Township (33.82 miles), Long Beach Township (30.38), Brick Township (23.36 miles), and Little Egg Harbor Township (21.77 miles) (Ocean County Department of Planning, 2009).

Long Beach Island (LBI), Ocean County, is one of the most prominent inhabited barrier islands in New Jersey, stretching from Barnegat Inlet on the north to Little Egg Inlet on the south, for a total 18 miles of length (Psuty and Ofiara, 2002). The municipalities of Long Beach Township, Harvey Cedars, Barnegat Light, Ship Bottom,

Beach Haven and Surf City share the island, which is situated approximately six miles offshore (<http://hcpolice.org/>, retrieved 7/24/09). This island, renowned for tourism, is subject to severe erosion and seasonal effects of environmental processes. Psuty and Ofiara (2000) discuss the history of projects aimed at coastal stabilization in New Jersey, including the economically important LBI land area.

Ocean County also contains 638 square miles of Pinelands, a feature that is largely undeveloped in South Jersey (<http://www.ocean.nj.us/GovtDirPage.aspx?ID=172>, retrieved 07/24/09). Over 1 million acres of the Pinelands across seven southern NJ counties is in the Pinelands National Reserve as well, resulting in large tracts of land that have few roadways and little other development, through which east to west travel by ground transportation is inevitable for many Shore locations (<http://www.state.nj.us/pinelands/reserve/size/>, Retrieved 07/24/09).

Atlantic County consists of a mainland and barrier islands, all within the coastal plain of New Jersey. The county covers 561 square miles of land, including barrier islands, wetlands, six river systems, and back bays between barrier islands and the mainland (Atlantic County Department of Regional Planning and Economic Development, 2000). The majority of coastal lands are extensively developed, including the densely populated Absecon Island, which contains Atlantic City, Ventnor, Margate and Longport. Brigantine is an island municipality situated to the north of Absecon Island. Coastline from Little Egg Inlet to Egg Harbor Inlet spans approximately 14 miles (Psuty and Ofiara, 2002).

A large portion of Atlantic County, like other southern counties in New Jersey, contains undeveloped Pine Barrens, wetlands and river and stream systems. The three

major river systems in Atlantic County include the Great Egg River, Mullica River and Tuckahoe River (Atlantic County Department of Regional Planning and Economic Development, 2000).

Cape May County is a peninsular county with five prominent barrier islands, and extensive backbay wetlands, comprising 267 square miles (Cape May Planning Board, 2002a). The coastal wetlands west of the barrier islands are approximately 1.5 to 3.5 miles wide and elevations county-wide are generally below 20 feet above sea level (Cape May Planning Board, 2002). The Pinelands extend into the northwestern portion of the county, occupying 16% of the total land area (Cape May Planning Board, 2002b). Coastline extends approximately 43 miles from Great Egg Harbor Inlet to Cape May Point (Psuty and Ofiara, 2002).

The barrier island municipalities include Wildwood Crest, Wildwood, West Wildwood, North Wildwood, Stone Harbor, Avalon, Sea Isle City, Strathmere (Upper Township) and Ocean City. They host a large number of tourists during the summer season and are connected to the mainland by seven causeways spanning coastal wetlands approximately two miles wide. Dune landforms are most robust in Avalon due to municipal land use practices (Federal Emergency Management Agency, 1995), however, shore stabilization projects and natural processes provide substantial beaches along each coastal community.

Thus, there are a number of common physiologic features for these counties and their coastal municipalities. Each has characteristics of substantial river systems, low occurrence of agricultural productivity (due to sandy, nutrient-poor soils), prominent barrier island and backbay areas, and low elevations (Stansfield, 1998; Psuty and Ofiara,

2002). Detailed discussion of the additional characteristics of coastal geomorphology can be found in detail in Psuty and Ofiara (2002).

These features influence the nature of the built environment as well as populations, as discussed in the following sections. Ultimately, these features also impact the preparedness measures taken for moving populations across these islands, wetlands and bays, as discussed in subsequent sections and chapters.

### *The Built Environment*

Characteristics of the built environment for the four Atlantic coastal counties are similar in pattern resulting from the history of coastal settlement and tourism development in the region. Perhaps the most salient characteristic along the Jersey Shore are the densely-built communities catering to tourism, particularly in the form of individual homes and condominiums, with hotels present in lesser numbers. The exceptions to this pattern are in northern Monmouth County, where communities without extensive beach systems have moderate tourism rates, and in Atlantic City where casinos provide extensive lodging options in addition to home and condominium choices, and tourism is year-round with a summertime peak.

Transportation infrastructure throughout the four counties includes major thoroughfares such as the Garden State Parkway (GSP), Route 9, the Atlantic City Expressway (ACE), Route 195 and Route 72, as well as county and local roads that are commonly used by area residents. North-south traffic commonly uses the GSP, which provides access from North Jersey to Cape May County and Route 9, which runs through each of the four counties as well, closely parallel to the Garden State Parkway. East-west travel routes to and from coastal municipalities include I-195 in Monmouth and Ocean

County, State Routes 70 and 72 in Ocean County, the Atlantic City Expressway, State Routes 30, 322 in Atlantic County, and State Routes 47 and 50 in Cape May County. Despite the number of roadways, capacity for east-west travel is limited and roads cross through rural areas of the Pinelands, low-lying wetlands and other rural areas with few amenities for travelers. This lack of capacity for east-west movement is essential in considering evacuation planning and will be discussed further in subsequent chapters.

Equally as challenging for ground transportation as the limitations on roadway capacity are the numerous bridges that cars must cross for coastal access and egress. The nature of the offshore barrier islands, from six miles to less than 1 mile from the mainland, means that population movements are constricted by the capacity to cross bridges. In some cases this presents issues for traffic under normal conditions with congestion, under weather-related situations where rainfall closes roads and for events where bridge closures limit or prevent travel completely. Slow bridge traffic is experienced for all barrier islands during peak periods as there are few access and egress points along the Jersey Shore. Long Beach Island has a single access – Route 72 – which is prone to flooding and closure due to construction, rainfall and/or high tides (Weaver, 2009; U.S. Geological Survey, 2007).

The flooding issue for the Route 72 bridge as it enters Ship Bottom, LBI is such that DOT developed a project to attempt to alleviate flooding:

“Borough of Ship Bottom - Route 72 Improvements (\$15 million). This project will improve the drainage system along Route 72 in Ship Bottom in order to maintain access and egress for Long Beach Island during heavy rain falls and high tide events. The project will also improve traffic flow, as Route 72 is the only vehicle evacuation route from Long Beach Island. This project still needs design, right of way purchase, and construction.” (NJDOT, [http://adler.house.gov/index.php?option=com\\_content&view=article&id=176&catid=58&Itemid=89](http://adler.house.gov/index.php?option=com_content&view=article&id=176&catid=58&Itemid=89), retrieved 7/25/09).

When this area of Ship Bottom floods it prevents travelers from access or egress to the island, trapping people on LBI.

Shore traffic, both to and from coastal destinations, is notoriously slow, especially on Friday afternoons and evenings when tourists arrive for weekend vacations and on Saturday and Sunday afternoons when vacations end and people return home. An emergency management coordinator in Cape May County has stated that summertime traffic in and out of the county is their weekly practice for coastal evacuations, as roadway congestion is extreme with tourist departures (pers. comm., anon., 2004). Closures occur for construction purposes as in the summer of 2009 where paving resulted in periodic closures of the Route 72 bridge to LBI, and with the Beesley's Point Bridge from Cape May County to Atlantic County, which has been closed since 2004 due to poor roadway conditions (Weaver, 2009; <http://www.tollroadsnews.com/node/3912>, retrieved 7/27/09).

Automated coastal warning systems are relatively new along the Jersey Shore. The Stevens Institute of Technology operates the Coastal Monitoring Network, which provides near real-time oceanic and atmospheric data for one site in each of the four coastal counties: Ocean Grove, Monmouth County; Brant Beach (Long Beach Township), Ocean County; Atlantic City, Atlantic County, and Avalon, Cape May County (<http://cmn.dl.stevens-tech.edu/>, retrieved 7/27/09). The U.S. Geological Survey maintains the New Jersey Tide Telemetry System along the coast, with 14 tide gages, 4 tide and weather stations and 12 tide crest-stage gage sites along the Atlantic coast of the four counties (U.S. Geological Survey, 2007). One purpose of this system is specifically to monitor conditions for storm and other hazardous events so that responding agencies



can make decisions to protect lives and property, and it serves as the primary source of coastal data for emergency managers in the state (U.S. Geological Survey, 2007). The National Weather Service provides coastal weather warnings and rip current forecasts for the coast, but not in a manner specific to coastal evacuations. There also are monitoring systems that do not provide warnings, such as the New Jersey Mesonet system and private vendors that deliver information on weather conditions.

The impacts of the characteristics of the New Jersey coast on evacuation planning are better-understood in the context of the coastal hazards faced by these jurisdictions. The following section summarizes the demographics of the four counties, particularly with regard to those areas that may require evacuations of tourists and residents.

## **B. The Human Setting**

Coastal population trends in New Jersey exhibit a clear seasonal variation for most municipalities. Communities on the mainland west of barrier islands have less fluctuation than the barrier island populations, and there are fewer seasonal tourists in northern Monmouth County than other locations. Atlantic City experiences large numbers of visitors year round. Overall, however, the marked difference in “summer” and “winter” populations creates a challenge for coastal evacuation planners in that numbers of people and vehicles exceed local roadway capacities, and unfamiliarity with location presents difficulties in public messaging. A summary of the population variations demonstrates the extent of these variations.

Year-round populations for each county are presented in Table 4.1 Daily Population Estimates, and population densities are represented for winter and summer (to reflect seasonal population changes) in Figures 4.1 Population Density, Four Coastal

Counties, Winter, and Figure 4.2 Population Density, Four Coastal Counties, Winter. There is a notable increase in summer populations to New Jersey's most vulnerable coastal areas, to include barrier islands and low-lying coastal towns. Millions of tourists visit the Jersey Shore each summer, staying in extensive numbers of privately-owned rentals properties, hotels as well as campsites. Peak periods, such as holiday weekends, can result in significantly higher numbers.

**Table 4.1 Daily Population Estimates:**

**Monmouth, Ocean, Atlantic and Cape May Counties**

County	"Winter" Population	Summer Population Estimates (daily)	Difference	Size (sq. miles)	Density, "Winter"	Density, Summer
Monmouth <sup>1</sup>	439,331	762,000	322,669	472	930.8	1,614.4
Ocean	565,493	643,610	78,117 <sup>2</sup>	638	886.4	1008.8
Atlantic	270,644	377,000-600,000 <sup>3</sup>	106,356-329,356	561	482.4	672-1,069.5
Cape May	98,183	762,310	664,127	267	367.7	2,855.1

Data Sources: US Census ([www.census.gov](http://www.census.gov)); Monmouth County Planning Department, 2008; Ocean County Department of Planning, 2009; [www.capemaycountygov.net/Documents/Planning/summerpopulation\\_2007.pdf](http://www.capemaycountygov.net/Documents/Planning/summerpopulation_2007.pdf); Atlantic County Department of Regional Planning and Economic Development, 2000); Army Corps of Engineers, 2006.

Despite many similarities between the counties, there are differences as well. The seasonality of tourism is generally present in all shore locations, but the barrier island locations have a greater density of homes rented for tourism. That results in greater tourist-to-resident ratios for Long Beach Island, the barriers of Atlantic County and of

<sup>1</sup> Coastal municipalities only

<sup>2</sup> Estimate from Army Corps of Engineers 2008 New Jersey Hurricane Evacuation Re-Study data, Ocean County Occupancy Tables, represents overnight visitors only. Ocean County does not track or estimate visitor populations (Vicki Pecchioli, Ocean County Department of Planning, pers.comm, telephone 9/29/09).

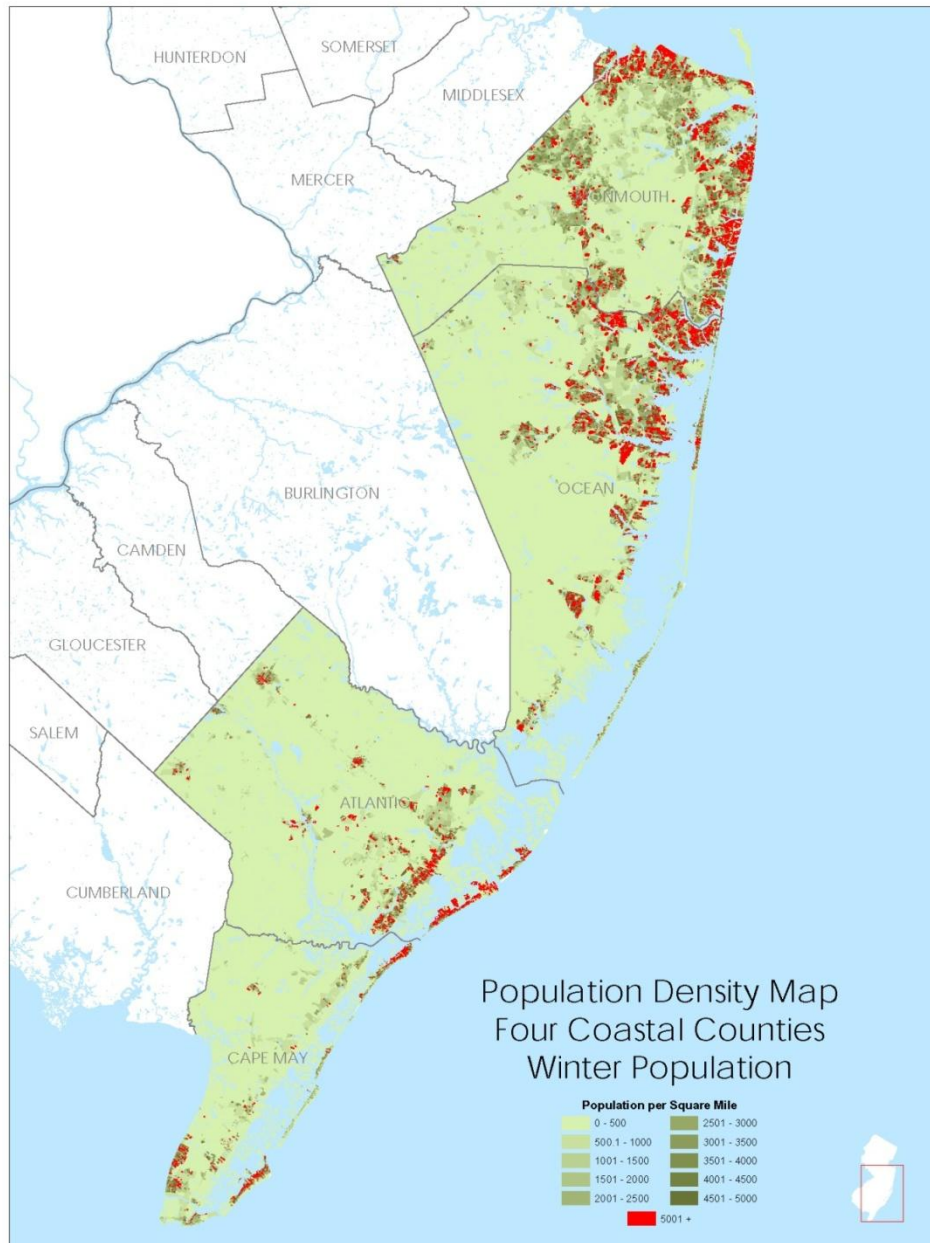
<sup>3</sup> As per Atlantic County Office of Emergency Management, pers. comm. 09/03/09.

Cape May County. Atlantic City has significant numbers of tourists all year long, with increases in the summer for beach-goers, and has a large number of tourists from destinations with limited English proficiency – a characteristic not seen in other shore locations, which cater more to regional tourist populations.

Roadway networks are denser in Monmouth County due to the intense development present. Coastal areas of Ocean and Atlantic Counties have significant infrastructure as well, however, the rural nature of the Pinelands creates inland areas with few transportation options. Cape May County does not have highways, apart from the Garden State Parkway, which is at-grade and open access for the majority of its length in Cape May County. All barrier islands are remote in that few bridges and causeways connect them to the New Jersey mainland. This is critical in evacuation planning as few options exist for closed, flooded or congested egress routes.

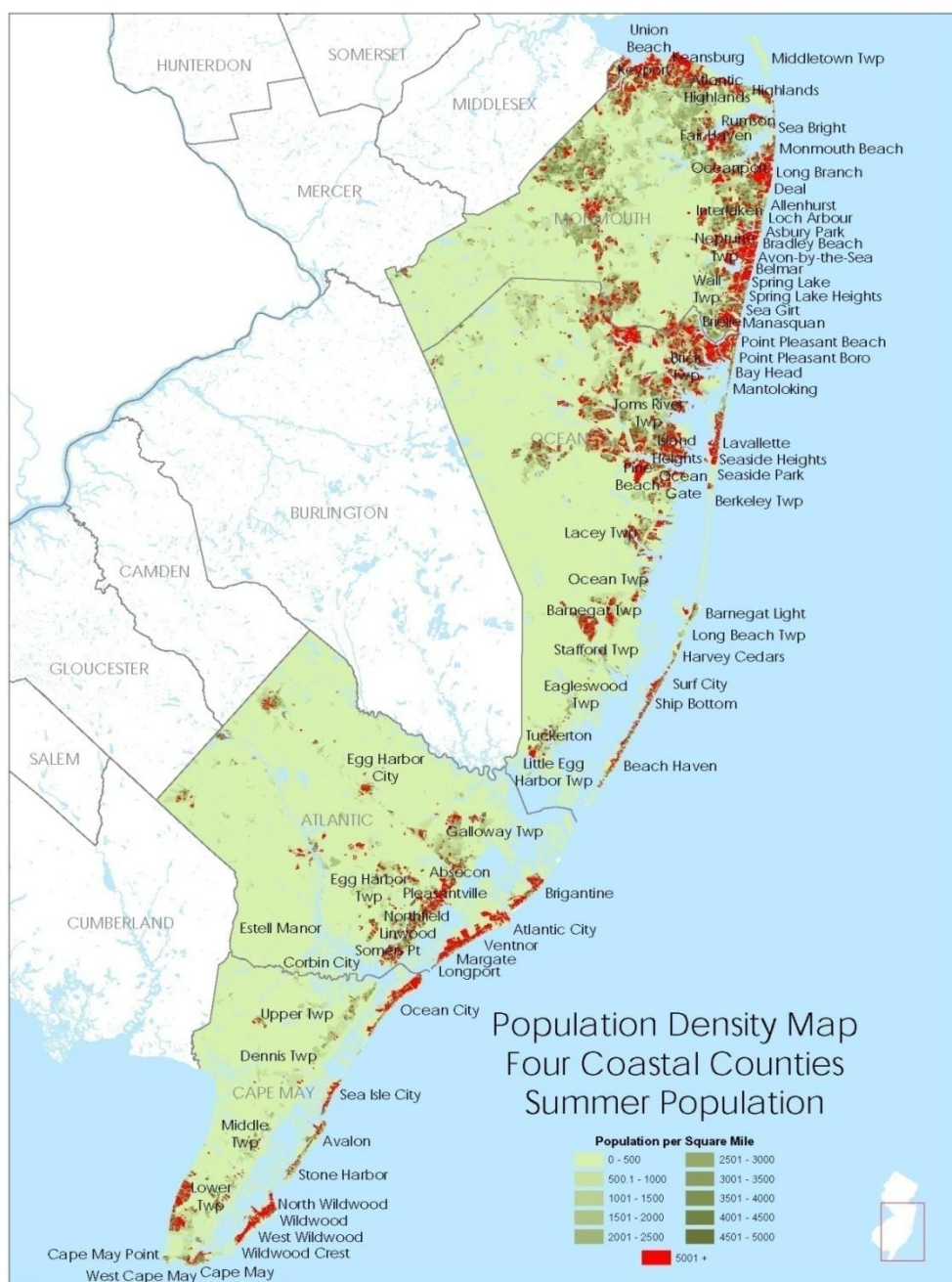
The end result of these differences is the greater variation in populations year-round in Cape May, Ocean and Monmouth Counties, as demonstrated in Figures 4.1 and 4.2. Atlantic County, conversely, has year-round demands and larger numbers of visitors, requiring additional considerations for evacuation planning. Finally, limited access and egress routes characterize Cape May, Atlantic and Ocean Counties to a greater degree than Monmouth, although congestion is commonplace for all shore communities.

**Figure 4.1 Population Density, Four Coastal Counties, Winter**



Data Sources: NJ Office of Information Technology, Office of Geographic Information Systems, "Municipal, County, and State Boundaries of New Jersey", 2004;  
 NJ Department of Environmental Protection, "Waters of New Jersey", 2008;  
 U.S. Army Corps of Engineers, Philadelphia District, "New Jersey Hurricane Evacuation Re-Study", 2006.

**Figure 4.2 Population Density, Four Coastal Counties, Summer**



Data Sources: NJ Office of Information Technology, Office of Geographic Information Systems, "Municipal, County, and State Boundaries of New Jersey", 2004;  
 NJ Department of Environmental Protection, "Waters of New Jersey", 2008;  
 U.S. Army Corps of Engineers, Philadelphia District, "New Jersey Hurricane Evacuation Re-Study", 2006.

### C. The Political Context

“Two of the most prominent New Jersey myths are the existence of the Jersey Devil and the existence of home rule. The difference between the two is that there have been more sightings of the Devil than there has been of home rule”.

- Alan J. Karcher, (1998) “New Jersey’s Multiple Municipal Madness”, p. 207.

Much has been made of the importance of a “home rule” tradition of government in New Jersey (Platt, et al. 1987; Platt, 1999; H. John Heinz III Center, 2000; Birkland, 2006; Beatley, 2009). New Jersey has a constitution that provides for a great deal of local autonomy in political action, but does not provide full powers of “home rule” as found in other states (Karcher, 1998). The vague delineation of boundaries for power between State and municipal entities has resulted in a longstanding and lively debate on “home rule” and its role in New Jersey’s political, economic and environmental path (Karcher, 1998; Trafford, 1995; Rusk, 2002; Tulloch, 2002; Bruck, 2008).

Former speaker of the New Jersey Assembly, Alan Karcher provides a concise timeline of milestones that have resulted in the widespread belief that New Jersey is a “home rule” state, when in fact municipal powers are limited to those granted by the state legislature (Karcher, 1998). This misunderstanding may lie in the various and unclear applications of the term “home rule” as well as the inconsistent application of State power over local jurisdictions in New Jersey. Karcher’s (1998) discussion frames “home rule” as the ability for local jurisdictions to be self-determinate and financially responsible for local legislation, ordinances and regulations. However, municipalities in New Jersey are given great latitude in decision-making and self-determination. The end result is that although not *constitutionally* a “home rule” state, New Jersey municipalities

have long functioned under a firmly set *tradition* of “home rule”, thus creating a misconception of roles, responsibilities and, therefore, of options for political action, including regional planning and emergency management collaboration.

Other sources define “home rule” simply as the ability for governments to make local decisions, with no reference to the role of State power as an oversight body ([www.bluejersey.com/njpolitics101/issues.html](http://www.bluejersey.com/njpolitics101/issues.html), retrieved 7/27/09; Trafford, 1995). This definition does not address that while local governments *can* make their own decisions, state government can *also* make local decisions. This is an important distinction, as claims that the state encroaches upon or undermines “home rule” may be misleading – the State is not overstepping legal boundaries in these cases, for example with regional management commissions or statewide building codes, rather it is exercising constitutional powers, albeit in rare (thus controversial) events.

Even critics of State involvement in local political autonomy praise State intervention in certain events – one New Jersey based-website lambasts the state as creating an “epidemic of initiatives designed to weaken local democracy” and misuses a quote from Karcher, but then praises state mandates for local governments in support of the Highlands Act, which creates a regulatory structure for water resources in northwest New Jersey as a “necessary mechanism to enhance local land use planning efforts” ([www.bluejersey.com/njpolitics101/issues.html](http://www.bluejersey.com/njpolitics101/issues.html), retrieved 7/27/09). These contradictions point to the acceptance of regional planning when interpreted as protective, but rejection if it is perceived as disempowering to local governments.

Tulloch (2002) reinforces Karcher’s interpretations in a discussion of the role of New Jersey’s “tradition of home rule”, as it impacts communities’ abilities to fund

database management programs. In this discussion, Tulloch notes the inefficiencies of land use, growth management and environmental issues resulting from the piecemeal strategies of disparate municipal goals and abilities to pay. However, technology is seen in this model as a possible tool to overcome the problems wrought by almost 150 years of “home rule” traditions, in that it allows for the consideration of non-traditional spatial delineations for various activities, such as environmental analysis. This suggestion has direct implications for potential regional evacuation planning collaboration because technology may serve to bridge municipal boundaries in routing and execution of plans.

The definition of New Jersey’s “home rule” used for this research is presented by Trafford (1995):

“Power granted either by the Constitution or Legislature or both to municipal governments to organize themselves to carry on a range of governmental activities under their own authority and to preserve health, safety and general welfare”.

Trafford supports this with quotes from the New Jersey Constitution, which do clearly indicate that the State government shall allow power to be “liberally construed” for municipalities and to provide the “most complete powers possible” for local determination. These constitutional statements, however, do *not* preclude the power of the state *over* municipalities rather they indicate the state’s acceptance of local determination within certain bounds. There is no implication that state government cannot or should not dictate local policy, rather the relationship is one of hierarchy where the state allows the municipality autonomy up to the point of determined intervention. In reality, the state can dictate to all jurisdictions within New Jersey and counties can dictate policy to jurisdictions in their borders. Thus, what we see is that while often unpopular for reasons of local autonomy, the grouping of communities into regional planning and



management entities offers a way to avoid disputes about local controls. The fact that such groupings are viable in New Jersey is demonstrated through the existence of the Pinelands Commission, Highlands Water Authority, and other regional planning commissions, all of which function effectively within agency scope and purpose.

Trafford (1995) concludes that “home rule” practices are functioning in New Jersey, but in a different context than previous decades. We can see that there are eras where the state/local balance on local decision-making favors the municipality and others favoring state intervention – these eras are characterized by prominent issues at the time that determine the need for fluctuation of powers granted. Municipal isolation in these efforts is a counter-productive result of misunderstandings of the foundations and purposes of New Jersey’s political structure.

Rusk (2002) clarifies any misinterpretations of New Jersey political power structures, identifying the “Home-Rule Cop-Out” as a reason why legislators fail to accept new initiatives from state levels of government – they incorrectly infer that the local governments may reject state initiatives based on local power of self-determination. Rusk continues his argument that inaction cannot be blamed on “home rule”, as both New Jersey and Federal authorities clearly place power in the state to both dictate and overrule local decisions and actions, and like Karcher, he advocates state mandate to coordinate the 566 municipalities for efficient action. While Rusk is referencing the control of sprawl, the same theme holds valid for emergency planning, which likewise is a multi-jurisdictional, statewide concern.

The tradition of home rule practices in New Jersey also has resulted in a wide variety of municipal priorities along the coast, all impacting emergency management and

evacuation planning in separate ways. Despite the state's ultimate authority, local governments hold a great deal of power in coastal and environmental planning and decision making in coastal zone areas. While this alone is not necessarily problematic, the result is that communities tend to plan with minimal inter-jurisdictional coordination.

The result is a reliance on higher nested levels of government to assist when local capacities are exceeded, but the system lacks sufficient coordination of regional planning and breadth of vision to ensure that it performs efficiently. Conversely, county and state levels of government turn the responsibility for such coordination back to local authorities due to the practice (and sometimes misunderstanding of) "home rule" traditions, in that they are not responsible for activities outside their jurisdictions, such as evacuations where populations cross political boundaries. In summary, regional coordination remains unaddressed and is an ad hoc process during actual emergencies.

Just as there are state, county and local political entities, there are three levels of emergency management offices as well, each with as unclear a role as home rule traditions have created for general governance. As a result, each jurisdiction looks to the other as the "lead" for coastal evacuation planning, but also staunchly defends its "right" to self-determination. The municipalities rely upon the emergency management offices at the county and state levels to assume the role of multi-jurisdictional planner for events that exceed the municipal jurisdiction, such as with coastal evacuations, which the counties push up to the state, and the state returns to county and local office under the premise of "home rule". It is a cycle that has forestalled progress in regional evacuation planning.

Recent emergency management activities supported by the state government have not set a precedent for requiring collaboration or specific action outside of formal

jurisdictional boundaries. This includes evacuation route planning for the Garden State Parkway, which remains a state project, and the “Register Ready” special needs registry, which is defined by County participation. This is not to say that New Jersey communities do not cooperate, but the multi-jurisdictional or regional approach to planning is not implicit in these cases. In fact, differences in municipal planning are noticeable even from the air, where contrasting spatial patterns of land use and development are easily discernable. Hasse and Lathrop (2003) likewise address the issue of urban sprawl in New Jersey, acknowledging that local power from “home rule” traditions has resulted in the widely variable land use practices we see today, and they specifically use municipal-level data to address these variations. Like examples of land use from the coast, patterns of erosion and deposition along the Atlantic coast reflect local land use variations, impacting dune structures necessary for coastal storm surge abatement. As in Hasse and Lathrop (2003), research for this dissertation was conducted at local levels to ensure inclusion of local desires as well as local practices.

Thus, traditions of “home rule” under any definition do not preclude regional collaboration, such as for coastal evacuation planning. As will be presented in the following chapters, the development of regional organizations can help to overcome the difficulties presented by “home rule”, seasonal population shifts, and insufficient infrastructure in planning for coastal evacuations. While an emphasis is placed on the hazards themselves, the risk, vulnerability and exposure are intrinsically tied to the physical, human and political settings of the Jersey Shore and state.

#### **D. Coastal Storm Hazards**

The history of coastal storm hazards in New Jersey has been amply documented

(Ludlum, 1983; Savadove and Buchholz, 1993; Coch, 1999; Psuty and Ofiara, 2002). New Jersey is subject to the hazards produced by “nor’easters” and hurricanes that constitute a year-round threat to life and property. The frequency of hazardous coastal events in New Jersey is enough to warrant the need for proactive planning and awareness, but is infrequent enough to result in failed institutional memories and lack of public understanding of hazards. Additionally, the differences between the physical impacts of “nor’easters” and hurricanes coupled with the prevalence of the former and not the latter results in effective preparedness for nor’easters and an underestimation of preparedness for hurricanes.

The “nor’easter” has become a barometer by which residents and planners of coastal New Jersey gage their risk and vulnerability to coastal storms. These mid-latitude cyclones may impact New Jersey year-round, but are most prevalent during the winter season. Windspeeds are less than hurricanes, although it is possible to experience gusts of hurricane strength in nor’easters. Rainfall may be substantial, but fall over a protracted period as the system develops, passes and/or dissipates. Onshore winds may elevate water levels significantly for several tidal cycles, resulting in flood damage, degradation of dune structures and creating the need for temporary evacuations although the strongest nor’easters generally have water heights comparable to or less than Category 1 hurricanes (U.S. Army Corps of Engineers, 1963; Psuty and Ofiara, 1992; Coch, 1999).

While nor’easters occur annually throughout the winter, several events have resulted in severe damage to the New Jersey shore, including December 1991, and March 6-8, 1962 – an event that is often mistaken for a hurricane in local recollection. The 1962 storm washed three channels across Long Beach Island, knocking out power, resulting in

evacuation and sheltering of residents, destroying houses, and causing significant inland, as well as coastal flooding (U.S. Army Corps of Engineers, 1963). Over \$100,000,000 dollars of damage was experienced in New Jersey, and the overwash of barrier islands clearly demonstrated the vulnerability of coastal, low-lying areas (U.S. Army Corps of Engineers, 1963). At the time, many of New Jersey's coastal barriers were already densely developed, but the event's timing in the winter ensured that tourism populations were not contributing to local vulnerability. Rather, multiple tidal cycles and storm intensity combined with low-lying, dense settlement and snowpack for inland areas creating severe inundation over several days (U.S. Army Corps of Engineers, 1963).

This event demonstrates the potential severity of nor'easters with sustained coastal flooding, inland flooding, structural damage and landform vulnerability. It also, however, provided a singular benchmark by which many people in coastal New Jersey measure all coastal events. This includes the assumption that if coastal areas survived the 1962 storm, they can certainly weather hurricanes. The misconceptions include not only the severity of hazards associated with hurricanes as compared to nor'easters, but also the increase in development since 1962 and the season for hurricanes, which includes the shore's peak tourism season. These views have been expressed to this researcher from emergency management professionals and the public during numerous outreach events and conversations with such persons in New Jersey.

Hurricanes are less frequent but remain a threat statewide (Ludlum, 1983, Coch, 1999, and Schwartz, 2007). The last hurricane to pass directly over the New Jersey shore is reported to be the hurricane of September 1821 (Ludlum, 1983). Indirect impacts have been experienced in 1936, 1938 ("Long Island Express"), September of 1944 (the "Great

Atlantic Hurricane), Hurricane Hazel (1954), Hurricane Gloria (1985), and Hurricane Isabel (2003). Numerous other hurricanes have produced heavy surf, erosion, winds and rainfall from passage further east and west of the state (Ludlum, 1983; Savadove and Buchholz, 1993; Coch, 1999).

An event such as the hurricane of 1944 could serve as an example of a potential “worst-case” scenario for New Jersey. The 1944 hurricane struck when New Jersey’s coast was still sparsely populated, but exacted enough damage that the badly damaged town of South Cape May, Cape May County, ceased to exist – what homes remained were moved and a nature preserve was created on the former site of the town (Schwartz, 2007). The hurricane of 1944 also destroyed boardwalks in all four Atlantic coast counties, breached barrier islands and damaged homes, businesses and infrastructure all along the coast (Schwartz, 2007). The equivalent event today would undoubtedly create the most costly disaster experienced in New Jersey, if not one of the costliest in our nation’s history. Any delays in evacuation orders, or timing of storm passage during the night could complicate evacuation further – people would need to leave their homes when weather may still be pleasant, in anticipation of worsening conditions in nighttime hours, perhaps 24 hours in advance or more to accommodate evacuation clearance times from coastal areas (US Army Corps of Engineers, 2006).

Tropical storms have had more direct strikes, including passage of a storm in 1903, Tropical Storm Floyd in 1999, and others that have impacted New Jersey from close passage. Many of these storms were downgraded from hurricane status as they traveled northward, producing rainfall, winds and coastal erosion. Extensive descriptions of events may be found in National Hurricane Center event reports ([www.nhc.noaa.gov](http://www.nhc.noaa.gov)),

journals (Monthly Weather Review), and books (Ludlum, 1983; Savadove and Buchholz, 1993; Schwartz, 2007), as well as hazards research (Coch, 1995; Coch, 1999; Psuty and Ofiara; 2002). Generalized characteristics are noted in Figure 4.3 Saffir-Simpson Hurricane Scale.

**Table 4.2 Saffir-Simpson Hurricane Scale**

Category	Windspeed range	Description (NJ)
One	74-95 mph	Damaging effects from wind, minor to severe flooding for coastal areas.
Two	96-110 mph	Widespread wind damage, moderate to severe flooding
Three	111-130 mph	Extensive wind damage, severe flooding
Four	131-155 mph	Devastating wind damage, severe flooding

Data source: <http://www.nhc.noaa.gov/aboutsshs.shtml>; U.S. Army Corps of Engineers Hurricane Evacuation Study, Sea Lake and Overland Surge from Hurricanes Maps (2006); <http://www.nap.usace.army.mil/HES/nj/index.html>).

There are no maps for coastal inundation due to nor'easters, but Sea, Lake and Overland Surge from Hurricanes (SLOSH) modeling from the U.S. Army Corps of Engineers has produced potential inundation maps for the state of New Jersey. These maps are produced from models that simulate “worst-case” scenarios for each shore point, resulting in a composite map, rather than a map representing a single scenario. The models do not include wave action on top of inundation, which can create underestimates of both damage and flood potential. Potential inundation for Category 1, 2, 3, and 4 are presented on a single map for New Jersey (Category 5 is not represented due to improbable occurrence at New Jersey latitudes. The SLOSH model can also be run to represent specific event parameters in animated and static formats.

The inundation depths presented on SLOSH maps demonstrate a need to evacuate large populations quickly, particularly in Cape May County, Atlantic County, Ocean County and Monmouth County. However, actual events as well as sophisticated modeling show that hurricanes approaching New Jersey may increase water levels 20 feet or more, and the rapid forward speed at New Jersey latitudes exacerbate difficulties in evacuating coastal populations (Figure 4.3 SLOSH Inundation Map, Four Coastal Counties, New Jersey). A critical element of this modeling is that it reveals inundation potential for coastal roadways, particularly those used as single access/egress for evacuating barrier islands and coastal communities. Potential damage to structures from storm surge and inland flooding, including bridges and critical facilities in densely populated coastal areas increases the urgent need for timely and successful evacuations. Wind hazards extend well inland, although they are not represented on SLOSH modeling. Rather, potential windspeeds for the various categories of storms at specific speeds of forward motion and mapping are provided by the National Hurricane Center (Inland Wind Model and Maximum Envelope of Winds.<sup>4</sup>

Figure 4.3 illustrates the variations in potential inundation between the four coastal counties. Higher elevations near the coast and smaller estuaries in Monmouth County contrast with the barrier islands, low-lying mainland areas and large back bays and river systems. When compared with the physical features of the coastal communities, infrastructure and populations, it is clear that risk variables increase from north to south in the four coastal counties, as well as along estuaries and barrier islands, particularly in summer months.

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<sup>4</sup> (<http://www.nhc.noaa.gov/aboutmeow.shtml>).



**Figure 4.3 SLOSH Inundation Map, Four Coastal Counties, New Jersey**



Data Sources: NJ Office of Information Technology, Office of Geographic Information Systems, "Municipal, County, and State Boundaries of New Jersey", 2004;  
 NJ Department of Environmental Protection, "Waters of New Jersey", 2008;  
 U.S. Army Corps of Engineers, Philadelphia District, "New Jersey Hurricane Evacuation Re-Study", 2006.

### **E. Coastal Evacuation Planning in New Jersey**

The basic structure of emergency management organization in New Jersey is well-defined in NJ Statutes Annotated (NJSA) Appendix A:9-77 et seq. (2001), New Jersey Domestic Security Preparedness Act). There exists a New Jersey Office of Emergency Management (NJOEM), an emergency management coordinator in each County, and an emergency management coordinator in each municipality. Also set forth in the statute is that each coordinator has responsibility for their jurisdiction, and as with emergency management traditions in the U.S., planning, preparedness, response and recovery regarding hazardous events begins at local jurisdictional levels. The County offices of emergency management serve to coordinate activities within their borders and to provide assistance to local jurisdictions, if requested. The state performs functions related to state plans, preparedness response and recovery; general oversight of activities New Jersey; and liaison with other State agencies for resources and response planning.

While this simplified structure should work in theory, it is the complications wrought by “home rule” traditions that create confusion. In my experience as an emergency management professional in the state, I observed a simple problem with no simple solution: when a jurisdiction fails to coordinate with a higher level or laterally (e.g. municipality to county, municipality to municipality, county to state), it is often based on the rationale that municipalities have the full responsibility for their own jurisdictions because of “home rule”, or because the county or state does not want to interfere precisely because of “home rule”. Municipalities, on the other hand, face confusion in this chasm between self-determination and inter-jurisdictional collaboration created by “home rule”.

In addition, there is a separate New Jersey Office of Homeland Security and Preparedness (NJOHSP), created in 2006 to address counter-terrorism efforts and homeland security preparedness. This Office also has responsibility for "emergency response efforts across all levels of government, law enforcement, emergency management, nonprofit organizations, other jurisdictions, and the private sector, to protect the people of New Jersey" (<http://www.njohsp.gov/about.html>). Emergency management initiatives come from both NJOEM and NJOHSP (emergency management performance grants from the former, for example, and special needs registry from the latter), creating an unclear view of lines of authority. There are not yet specific boundaries between the two state agencies (NJOEM and NJOHSP), and I am of the opinion that the balance of duties for all-hazards preparedness statewide are increasingly shifting from NJOEM to NJOHSP.

The way this situation impacts coastal evacuation planning is evident in the absence of over-arching coastal evacuation plans. The State Office of Emergency Management has oversight for the reverse lane strategies for Routes 195, the Atlantic City Expressway, Route 72, Routes 47/347 and the Garden State Parkway, but does not produce broader evacuation plans for the entire coast. Instead, it focuses on these state roads and the Garden State Parkway, leaving other evacuation planning to smaller jurisdictions (county and municipal). There is no single oversight in New Jersey for a coordinated plan to address evacuation from coastal storms. Decision-making is fragmented at three jurisdictional levels – state, county and municipal.

Each jurisdiction has their own power to call evacuations, issue public messages (e.g. preparedness information), close roads, and invoke emergency powers as needed to

suit the goals of that jurisdiction. There is a resulting gap in coordination between many jurisdictions. The distribution of power and unclear relationships between jurisdictional levels has resulted in the general lack of comprehensive evacuation planning, untested route management and absence of consistent public messaging that is desired at local levels.

Successful examples of collaboration in this area can be found with the communities of Long Beach Island and adjunct mainland Stafford Township, and they have a history of collaboration in areas of public administration such as schools, police activities, and land use management. This history of collaboration serves as an excellent example of the potential for regional collaboration. The New Jersey State Mitigation Plan, while not addressing evacuations, also serves as an example of interagency attention to hazards and emergency management

<http://www.nj.gov/njoem/programs/mitigation-plan08.html>).

Thus, while this research primarily focuses on the perspectives and problems of local emergency management personnel, other professionals, such as land use planners, insurance specialists, and others, may bring valuable perspectives to these issues. Coastal planning, including for evacuations, is a complex effort that requires integration of various disciplines.

## **F. Summary**

Hurricanes and nor'easters have similarities and differences that encompass both the physical and human settings. Both event types are accompanied by rain, wind and storm surge however they are manifested in different ways. Rains may be light to severe in both event types, but during hurricanes rain is usually heavier and falls within a shorter

duration – quantity per hour is greater, therefore, flood risk increases. Winds in hurricanes are greater than those of nor'easters and a further comparison shows that not only are windspeeds greater, but the potential for coastal and inland flooding is greater as well. A major difference is in the duration of each event, as nor'easters have higher potential for slow passage, whereas hurricanes may have forward speeds over 20 mph at New Jersey latitudes (Coch, 1999). The slower passage of nor'easters results in persistent onshore flow of wind, therefore water, through two or more tidal cycles, which can create lengthy coastal inundation. Hurricanes may create greater flood depths and stronger velocities due to the more rapid rise and fall of water, in contrast. This also creates differences in evacuations, as people depart areas that are flooded (more time to do so with nor'easters, less time for hurricanes).

These characteristics found in the New Jersey shore region combine to create management challenges for coastal emergency managers when planning for mass evacuations. The surveys and interviews conducted in this research illuminate specific concerns and the relationship of local needs and the impacts of superimposed “template planning” initiatives on the ability of local jurisdictions to address those needs. An approach to analysis and application of hazards assessment and planning that incorporates careful consideration of “scale” is developed to improve local results for planning and reduction of coastal storm vulnerability.

## CHAPTER 5 – SURVEY DATA AND ANALYSIS

### A. Introduction

This section on survey data and analysis reviews the results of the three research surveys. Of primary importance are the relationships between the survey questions, the scale of the subject matter and the institutional responses, as well as the synthesis of data and perspective into contextual analysis. Additional consideration is important for the practical application of findings to improving coastal evacuation planning at local levels – the integration of theory, research and actionable items.

Response rates for both surveys resulted in 49 municipalities from the 83 municipalities polled in total. Nine municipalities responded to both surveys, for 40 confirmed unique surveys received of the 166 total surveys disseminated in the two survey periods. The result is 48% of the municipalities responding in comparison to the total number of municipalities polled, with 29.5% of the surveys being returned of the total 166 submitted to municipalities over the two periods (Table 5.1).

**Table 5.1 Survey Response Rates**

Year	Surveys disseminated	Responses received	Response rate	Municipalities responding to both surveys (confirmed locations)
2004	83	27	32.5%	9
2006	83	22	26.5%	
Totals	166	49	29.5%	

Higher rates of response were from Monmouth and Ocean Counties, where this researcher worked closely with local and county emergency managers for six years and

less so for Atlantic and Cape May County municipalities, where close work during 2000-2007 was with only a few municipalities. This does leave a gap for the overview of barrier island communities, thus some data is extrapolated from the Ocean County respondents and responding municipalities from Atlantic and Cape May Counties to represent additional locations in Atlantic and Cape May Counties.

## **B. Discussion**

After indentifying the municipality of the respondent, initial questions sought information about: perceived authority to order evacuations; existence, age and updating of formal community and supra-community evacuation plans; changes in the level and types of evacuation planning; agents that influenced these changes; legislative mandates; histories of evacuations and evacuation exercises since 1994; numbers of mandatory and voluntary evacuations; types of evacuation notification; problems encountered; efforts to address these problems; remaining challenges; sources of assistance for evacuation planning; and related topics. Respondents were also given opportunities to add information about other matters not explicitly included in the surveys.

Surveys consisted of seventeen questions in total in 2004 and 2006, with some questions having multiple parts. Most respondents answered all questions and some added comments in the margins to clarify choices. This resulted in both qualitative and quantitative data and insightful comments. It appears in both the mailed surveys and the interviews that many respondents were enthusiastic about having the chance to voice opinions on the topics presented. Responses are summarized in the following sections with tabular format and commentary. Full data tables may be found in Appendix C, Survey Data.

*Question Summaries – 2004 and 2006 mailed surveys*

The mailed surveys provided data that would be expected following major events with national impact – 9/11 and Hurricane Katrina. The first question provided the optional identification of the community surveyed. Fifteen communities self-identified of the 27 total respondents in 2004. Communities in all four counties responded in the self-identified group, including barrier island communities in each county. The number of respondents dropped slightly between 2004 and 2006, differing by five communities. Only 10 communities in 2006 self-identified out of 22 respondents, including representatives from barrier islands for all four counties. This distribution may represent familiarity with the researcher as incentive to participate, however, not all self-identifying communities are personally known to this author.

The second question, asking for identification officials with authority to order evacuations, both aimed at discovery as well as commentary on local ordinances. More than one answer could be selected, as multiple individuals may hold such power locally. A total of 45 communities indicated the emergency management coordinator and 31 identified the mayor. This is evident throughout most communities in New Jersey where emergency managers work closely with mayors in decision-making. Public Safety (usually police) was identified by nine communities, which might be explained in that many communities have emergency management housed within police departments. One respondent identified their city council as having such powers as well.

Under New Jersey State Statute, power to order evacuations rest at State, County and local levels with equal authority (NJ Statutes Annotated [NJSA], Appendix A:9-77 et seq. [2001], New Jersey Domestic Security Preparedness Act). Local jurisdictions



determine exactly where that authority lies in their systems, and for the most part communities use a combination of offices to create complete coverage in any instance. This often translates into the Mayor, local emergency management coordinator, local deputy coordinator, chief of police, and fire chief. Additional personnel may be named depending on local political structures and practices.

It is this author's experience that some emergency managers are not fully aware of ordinances and rely on assumptions of where power is held, so this question may not reflect legal accuracy but may be correct in what occurs in actual operations. In fact, responses included mayors and emergency management coordinators in large part, whereas deputy coordinators were represented on only five of the 2004 surveys and four of the 2006 surveys. Normally the deputy coordinator has powers of the coordinator in the coordinator's absence, so the numbers should be identical between the two. In some locations there may not be a designated deputy coordinator, which could account for the difference in designations. Given that most indicated the mayor and OEM coordinator, it appears that knowledge of at least some local distribution of power is represented. It is likely that local ordinances do identify additional individuals, however.

Of interest is that the prevalence of "home rule" practices coupled with the widespread hesitation to initiate local action may be related to uncertainty in distribution of local power, particularly when power is shared. Each office may see the other as having more or less authority when in fact no specific hierarchy is determined. State statute, however, makes no distinction between levels of authority or various offices – each is equally encompassed by New Jersey emergency management statutes with evacuation decision-making. Unclear distinctions on authority may also translate into

authorities for other emergency management-related issues, such as planning and collaborative ventures.

Additionally, while this author has observed many jurisdictions that are unaware that both voluntary and mandatory evacuations exist in NJ and both may be called by state, county or local officials as legally designated. It is a common myth that there is no such thing as mandatory evacuations in New Jersey (NJ Office of Emergency Management Directive No. 79, enforceable under NJSA Appendix A:9-77, et seq., [http://www.state.nj.us/njoem/law\\_directives\\_79.html](http://www.state.nj.us/njoem/law_directives_79.html)). For those aware of this power there is an unspoken consensus that enforcement of such an order would not be employed for a variety of reasons related to the impractical nature of such enforcement (staffing, processing, etc.) as well as negative public opinion.

Question #3 requested information on when coastal evacuation plans were last updated by responding municipalities. A total of 43 respondents from both survey years stated their evacuation plans have been updated since 2004, with only 5 stating they have not been updated since that time. The most frequent year identified for plan updates was 2004, with 20 respondents. 2005 and 2006 both had 6 municipalities reporting plan updates, with 2001 third, with three updates.

Similar to the previous question, the answers to Question #3 are held in legislation wherein all municipalities are required to have an Emergency Operations Plan (EOP), updated every two years ([http://www.state.nj.us/njoem/law\\_appdx9.html](http://www.state.nj.us/njoem/law_appdx9.html)). In a complete EOP's hazard analysis for coastal communities, *it would be expected that hurricane hazards would be addressed as well as evacuations*. In practice, this varies. Most telling was one community that reported they have a plan but it had not been updated since the

1960's. There is no requirement specifically for coastal evacuation plans separate from the municipal EOP. Respondents that answered "yes" may have been specifically referring to the municipal EOP in general, assuming it contains coastal evacuation planning and coordination either in "Concept of Operations" or related annexes and/or appendices.

The dates of updating would correspond to the EOP review cycle as well – once every three years – if that state-mandated review cycle occurred in 2004. It would be anticipated that a similar question in 2007 would reveal another data peak. Review years do vary by location, but the 20 municipalities that indicated "2004" likely indicate a region-wide EOP review. The review is a general assessment to ensure that the plans exist and any procedural or policy changes are incorporated into local planning. There are no requirements for evacuation plans specifically in the review.

Question #4 polled respondents as to additional sources of plans outside of the municipal EOP or municipal evacuation plan that might be incorporated into overall coastal evacuation operations. In the survey completed after 9/11, there were four respondents who identified a specific evacuation annex to the municipal EOP, and one each identifying the local fire department, the County plan, the Army Corps of Engineers Hurricane Evacuation Study (source of SLOSH maps), and a Hazardous Weather Annex. The surveys from 2006 saw only mapping and prior experience as relevant to coastal evacuation planning sources outside local evacuation plans.

This question targeted intra-jurisdictional collaboration – mechanisms that incorporate collaboration already present within a jurisdiction that might translate to inter-jurisdictional planning as well. It is interesting to note that in 2006 there is a

decrease in referrals to other such plans, including creating of evacuation annexes for EOPs. The first survey was conducted after 9/11, an event from which much emphasis was placed on fire departments and police departments to incorporate planning for terrorism, weapons of mass destruction (WMD), and chemical, biological, radiological, nuclear and explosive attacks (CBRNE). Funding initiatives during this time from Federal sources were geared towards this type of planning, and local emergency managers reflect integration with these departments to a small degree.

In total, only ten additional planning sources were identified over the two survey periods, indicating little collaboration between municipal departments and from other tools, such as the New Jersey Army Corps of Engineers' Hurricane Evacuation Study (HES), which provides communities with SLOSH modeling and evacuation time estimates. The Hazardous Weather Annexes in New Jersey municipalities indicate probably participation in the National Weather Service's *StormReady*® program, where it is a required element for program participation. This Annex aims to create a common denominator for communications among the National Weather Service, local emergency management and the general public, thereby creating enhance situational awareness for storm conditions and atmospheric hazards. This indicates a lack of advantageous use of local and state resources in planning, but the tallies do not indicate *why* – this is addressed in discussions of interviews.

Question #5 sought increases, decreases or stability in efforts for evacuation planning. In the first survey set (2004) coastal evacuation planning was reported to have neither increased nor decreased by 22 respondents. In 2006, 12 respondents reported no change, but ten indicated efforts had increased, compared to 5 in 2004. Overall, 34

reported efforts did not change since 2001, and 15 reported an increase. Only one indicated a decrease in coastal evacuation planning efforts during that time.

This question was posed in order to see if respondents made a direct connection between the benchmark events driving Federal change and local action. There is anticipated to be a lag in such cause and effect, if it exists, due to time it takes to develop policy and produce local action, however, the number of respondents reporting an increase in coastal evacuation planning efforts doubled from 2004 to 2006. In fact, initiatives stemming from the experience of Hurricane Katrina were noted in the 2008 interviews, demonstrating this delay. Many of those changes may be related specifically to initiatives for special needs, pets and ICS training, all of which have increased in prevalence since 2005. Only one respondent reported a decrease in coastal planning after 9/11, almost certainly due to the post-event focus on terrorism, facility hardening, pandemic flu and other such hazards.

When asked from where initiatives increasing planning efforts were originating, Question #6, many respondents did not answer, and of those who did stated there was wide distribution across jurisdictional levels. Twenty respondents indicated no answer for both survey sets (2004 and 2006). Thirteen indicated that initiatives for coastal evacuation planning were originating at municipal levels, nine identified the county as a source, eight indicated the state level and 7 indicated the Federal level. Thus, local evacuation planning is seen by these respondents as locally-derived, but with external influence as well.

Blank responses may indicate that the respondent did not know from where initiatives were originating, possibly due to the hierarchical system of emergency

management in New Jersey. Federal, state and county initiatives would all be pushed to municipal levels via the county offices of emergency management. Most interesting in the responses is the increase in local initiatives after Hurricane Katrina. There were increases in initiatives identified from the local, county and State levels, with a decrease from the Federal level. This indicates the importance of coastal evacuations to these communities and the need to fill gaps not addressed at other levels. One community indicated that planning efforts for their jurisdiction resulted from public demand – a likely consequence of the impact of Katrina on both general and “special needs” populations publicized in mass media. The number of local initiatives post-Katrina was nine, compared with four in 2004. This element is important in that events occurring in other states are impacting local decision-making without the instigation of Federal, State and county initiatives – there is an awareness locally of “lessons learned” that is further investigated in the 2008 interviews.

Question #7 investigated the development of local legislative changes. Overwhelmingly no new legislation was noted – 48 respondents identify none as new, one indicated yes, for pre-disaster contracts. It was anticipated that few local ordinances would be drafted as most communities prefer flexible operations, as experienced by this researcher. As expected, only one community reported new requirements post-Katrina, which was to establish pre-disaster response contracts with private companies to expedite provision of contractor services for emergency response and recovery. The issue of pre-disaster response contracts is always problematic as multiple jurisdictions may plan with the same private provider in mind, thus creating a “planned shortage” of resources and a plan that provides false confidence. A contributing factor to this problem is the absence

of regional coordination of potentially shared resources. This is commonly seen in transportation sectors where ambulance companies, ambulettes and paratransit vehicles are in greater demand than supply can accommodate. Planning in this area was stressed in both political and public domains particularly for addressing the urgent characteristics of special needs populations as experienced by the deaths of nursing home and hospital residents and patients in New Orleans.

Questions #8, #9 and #10 addressed implementation of evacuation orders by local authorities. Many of New Jersey's coastal communities do employ evacuation orders regularly as a result of common low-level flooding. Some communities experience flooding more than others, and nor'easters – a familiar fixture in New Jersey weather – can bring minor to moderate flooding more commonly than any other cause. As such, localized evacuations may be called in and out of hurricane season, including during blizzards.

The response to whether or not a jurisdiction had ordered an evacuation since 1994 (a decade prior to the first survey), resulted in 12 “no” responses for 2004 and 11 for 2006. Conversely, 13 reported “yes” they had ordered evacuations since 1994 on the 2004 survey and 10 indicated they had in 2006. The surveys reveal this familiar activity at local levels and the responses may also reflect institutional memory loss: most 2006 respondents didn't identify the same post 1994 events as in the 2004 survey. Interestingly, respondents offered the 1992 nor'easter although it fell outside the specified date range. This event created significant flooding particularly in Monmouth and Ocean counties and is still a reference point for emergency managers in New Jersey – in the 1992 nor'easter tide gage measurements in some areas approximated or exceeded

those of the 1962 Ash Wednesday storm that devastated coastal areas along the state. Tropical Storm Floyd was identified nine times, with a number of other coastal storms having one, two, or three notations.

Mandatory evacuations also have been used in New Jersey's coastal communities, and the difference between the 2004 and 2006 numbers in Question #9 may reflect the inclusion of the 1992 storm by 2004 respondents. A far greater number of evacuations are identified in Question #10 as voluntary, however, both a reflection of the culture of reluctance in mandating evacuations as well as the low-level threat of the hazards from the majority of New Jersey's coastal storms.

Success in evacuations depends on efficient and effective communication with the public as well as with neighboring jurisdictions, mutual aid providers and relevant agencies and response partners. Question #11 addressed communications with the public only, to see what forms of notification are used at municipal levels. The most frequent methods employed for the combined survey years (responses for both years are similar) include the following, in order of frequency used:

- 1) Brochures
- 2) Signs
- 3) Emergency AM radio (often Highway Advisory Radio [HAR] or local station)
- 4) Television and radio announcements
- 5) Household mailings
- 6) Newspaper articles
- 7) Presentations and outreach



Used to a much lesser extent were reverse telephone calling systems, variable message signs, newsletters, fire sirens, telephone book information, E-mail, and route alerting (public address systems on emergency vehicles and door-to door notifications by officials, for example).

Contributing to the difficulties of coastal evacuation notification are the large numbers of tourists present during the summer and into fall – covering virtually all of “Hurricane Season”. Permanent residents might have a greater awareness of hazards and desired responses to warnings based on more regular and reliable outreach from local emergency managers. Tourists, however, may not be familiar with the location, the threats, or even the language spoken, especially in locations such as Atlantic City – a vulnerable jurisdiction on a barrier island that draws millions of visitors annually from around the world.

Even so, awareness and evacuation notifications differ little between residents and tourists, according to the surveys, with the exception of “resident-specific” strategies, such as mailings and exercises for preparedness and e-mail and route-alerting (notification via patrol vehicles, fire vehicles, etc. through neighborhoods) for evacuations. Despite the work of Drabek (1996) and others (see Mileti, et al., 2006) on tourist and general public evacuation behavior and notifications, the education of tourists regarding evacuation readiness and compliance continues to be a confounding process, particularly with frequent changes in tourist populations - often weekly - in coastal communities.

The opportunity to exercise plans is often limited for small jurisdictions such as those in coastal New Jersey, as reflected in Question #12, inquiring as to problems

experienced with events and exercises. Ten respondents indicated that there were no issues with events or exercises, which may be a result of no problems, or perhaps no events or exercises to report. Nine individuals reported financial constraints and eight noted the need for more accurate weather forecasting, technological constraints. Seven indicated difficulty with executing exercises, six noted adverse public reaction to events and exercises, and four stated that an issue is procedural constraints with emergency communications. In lesser numbers, three report that people do not follow official orders, two noted legal constraints on communications, and each of the following was indicated by one respondent: noise complaints from sirens, lack of agency cooperation, and an unspecified constraint.

A great deal of coordination is needed to exercise inter-jurisdictional responses as well as resources and staffing needs produce simulated responses. One respondent noted that the best evacuation route exercise they have had was when the circus came to their jurisdiction as they had to close major roads to accommodate the vehicles. At that point they practiced staged road closures to bring circus vehicles inbound on the outbound highway lanes; it was a “reverse” activation of the existing “reverse lane plan”, closing opposing traffic lanes to enter the city rather than exit it, but still with the best opportunity for exercising. The respondent reported that they deliberately addressed this operation as a drill for roadway management during evacuations, including EOC evacuation.

Within the survey series of this research, some communities reported no issues with exercises or events, however, issues were noted with communications, finances, weather information, public reaction, and logistical problems during exercises (staffing,

simulations). An important part of events and exercises is incorporating “lessons learned”: after-action reports, areas highlighted as deficient during events/exercises, mitigation measures based on damage, and adjustments to accommodate demographic changes.

Question #13 addressed the status of planning improvements stemming from prior experiences polled in Question #12. Twelve municipalities indicated “no answer”, corresponding with the previous question. Eleven stated they still have not overcome the problems experienced during events of Question #12. For those that indicated problems had been overcome, 12 indicated that local initiatives provided the solution, three identified state assistance and three attributed assistance to their county. One respondent identified Federal sources as providing solution to their issue. Overall, 22 stated problems had been resolved, 12 through local initiatives.

Unfortunately, many municipalities either did not respond or found that they still are faced with the same problematic issues. For those that have addressed improvements, many were resolved due to *local* efforts. This is important in proving the ability and need for local communities to determine corrective courses of action, and the lack of integration with regional actors or other jurisdictional levels. Of those that received resolution from higher jurisdictional levels in 2004, state assistance was noted in arranging National Guard resources, Federal assistance was cited for Coast Guard support, and county involvement came as support for drills. Local initiatives included mailings to residents, development of a “Hazardous Weather Annex” for the municipal EOP, collaboration with area businesses (to include local TV and radio, real estate offices), and the implementation of warning systems. Other assistance came from private

funding, amateur radio groups and schools. In 2006 the external assistance decreased, with the identification of coastal evacuation signs as the only item supplied. Local initiatives, in contrast, included education and outreach, communications equipment purchases, planning meetings, emergency radio purchases, and flood evacuation planning.

Question #14 polled respondents on “challenges” to each jurisdiction for creating successful evacuations, and these responses varied widely. To summarize, responses are placed into one of three categories: Respondents identified warning and notification as the greatest challenges 28 times between the two surveys, resource issues also garnered 28 notations, and items related to planning processes were cited 12 times. The most noted individual item was convincing people to evacuate, identified by 22 respondents as problematic. The second most common need identified was roadway infrastructure improvements and traffic management, with 14 municipalities stating such needs. Public education was identified by ten municipalities as an issue, and six municipalities identified having enough lead time for calling evacuations as a challenge for coastal evacuations.

This is notable in that greatest needs center on items that require public involvement – convincing people to leave, educating the public and managing the traffic once the public is convinced to evacuate. Externally-devised and template projects do not address these items, for example, NIMS, projects for registries, and mitigation planning, which were most salient during this study’s time frame for coastal New Jersey communities. Planning priorities at local levels indicate management needs, public outreach and infrastructure and facilities. The problem area on this question also involved

multi-jurisdictional issues: the need for improvements to roadway systems and in communicating the urgency to evacuate for both tourists and residents of coastal areas. Neither of these issues has been supported in significant detail for the Jersey Shore beyond local levels. Also important to note were the need for lead time for evacuations (closely tied to insufficient transportation infrastructure and convincing people to evacuate), as well as communications and sheltering.

Related to the issues of needs and challenges are sources of assistance. Question #15 posed the issue of how higher levels of government could provide assistance to resolve the problems noted in previous survey questions. Although some jurisdictions stated “nothing”, most had an opinion. The answer most frequently cited was “funding”, with 18 responses. The need for assistance with evacuation routing was second with 9 notations, and 8 indicated public outreach as a need for assistance. Additional items were indicated in lesser numbers – by one or two apiece – but the issues reflecting Question #14, and therefore, public involvement remained high, along with funding.

At the time of the 2004 surveys, there was significant funding for initiatives following 9/11, to include terrorism, WMD, hospital and other such planning efforts, but a minimization of emphasis on coastal projects. Thus, five jurisdictions still noted funding as a need. A greater emphasis was placed on evacuation routing in 2006, and for both surveys there were a variety of local needs not fitting a “template” initiative. Both funding and evacuation routing are multi-jurisdictional in nature, requiring effective inter-jurisdictional planning, collaboration and communication.

The final content question of the survey asked for general comments related to evacuation and planning, and the responses fell in line with the structured survey

questions. Public outreach was noted by 5 municipalities as an area for attention, the need for greater lead-time in calling evacuations, and interagency and inter-jurisdictional coordination. A wide variety of needs were represented due to local conditions, with funding, outreach and interagency coordination receiving multiple mentions. No specific trends were noted, however, other than a reinforcement of previous needs.

Although nine community representatives agreed to do follow-up interviews in 2004 and twelve in 2006, only eight agreed to follow-up interviews in 2008. Two counties were included in follow-up interviews as well, due to their expressed interest in participating. One community representative offered to do one in exchange for equipment only, demonstrating the need for assistance and creative methods to gain what is needed.

#### *Interview Question Summaries – 2008*

Ten follow-up interviews were conducted in 2008 to add dimension to information provided in the mailed surveys. Eight surveyed communities agreed to participate and two county emergency management offices volunteered due to their interest in the research. Ten questions were provided to each participant prior to the face-to-face interview and in some cases written responses were provided to the interviewer. The questions and summarized responses are presented here with some anecdotal comments from participants. All comments are anonymous as a condition of the survey, thus direct quotes are in quotation marks, but without revealing the speaker.

The first question addressed the greatest change in each jurisdiction's coastal evacuation planning process since 9/11/2001 and Hurricane Katrina (2005). Responses varied, and few participants differentiated between the two time frames. Not many changes were identified to have occurred locally, rather the focus of responses were on

the discovery of additional unmet planning needs as a result of these two benchmark events. One participant referred to the need for route signage, assessments identifying that there is insufficient capacity on evacuation routes, and the debate on making orders either mandatory or voluntary – voluntary orders were deemed ineffective. Another participant reflected on externally driven planning casting shadows on local initiatives, stating “Katrina has driven us to focus on the Special Needs population” rather than items determined as local priorities. Evacuation route planning was identified as a problem area particularly since certain critical local routes are in known surge and flood zones, yet Federal and State initiatives have not supported route mitigation.

Concern was expressed that the State Office of Emergency Management hasn’t addressed re-entry or debris management and those are real issues already experienced. Criticism was made that Federal and state mandates are made (ICS training and “special needs” registries were identified specifically) but exclude integration with local planning. The initiatives are perceived as existing in a vacuum, as something they must do locally as a directive, but that have little perceived value at local operational levels. Doubt was cast on the viability of reverse lane strategies for coastal evacuations and an over-reliance on those plans to prepare coastal areas due to existing capacity and quality of road networks. Security awareness was seen as spiking after 9/11 but off the planning radar since Hurricane Katrina.

It was noted that it has become somewhat easier to get the public to self-educate after Katrina. Changes since 2001 were described as mostly “attitudinal” rather than “physical”. One participant noted “We’re on the downward slope from Katrina” as psychological distance from the event is growing and institutional memories fail. Also

noted was that politicians need to be educated and re-educated to make sure decision-making is appropriate. Demands were observed to be increasing for local planners – e.g. special needs planning and pets – but resources were described as decreasing. Overall, there was a noted sense of additional top-down pressures and topics to address without the corresponding increase of resources and guidance to comply at local levels in a manner that would truly integrate programs into local action. Instead, planning gaps between local, county, State and Federal levels were a focal point of all ten interviews during this question.

The second question inquired about specific programs to impact these communities since 2001. Although the Disaster Mitigation Act of 2000 (DMA2000) pre-dates 9/11, implementation in New Jersey has been in the post-9/11 era, so is included here. This question targeted the roles of Federal programs in relation to local coastal evacuation planning needs. The Army Corps of Engineers Hurricane Evacuation Re-Study (2006, 2007) was noted as particularly useful as it provides the benchmark data for storm surge zones and vulnerable populations. One local respondent noted that the DMA 2000 mitigation plan requirements were useful in illuminating needs for priorities and capabilities as well.

There was criticism to be had in response to this question as well. In particular, the ICS requirements of NIMS were seen as fruitless by all but one respondent. Overall, ICS training requirements are being met on paper, but application to operations is rare, with the one exception as mentioned where ICS is applied to larger incidents (This respondent represented a large urban area where such procedures have been in place previously). For routine and smaller incidents, however, responses follow local procedures as in the past.



As one respondent noted “The expectations of NIMS are unrealistic at the local level for the way New Jersey operates.” The mitigation planning requirements of DMA 2000 were criticized for mishandling at the State level and respondents mostly did not find it useful overall, rather a “hoop” to jump through to ensure eligibility for Federal funds for other projects. A common critique was that the plans do not take into account evacuation needs or much-needed inter-jurisdictional coordination.

The third question focused on the same assessment for state initiatives. This included the four-county special needs registry project, funding through the FEMA Emergency Management Performance Grant (EMPG) program administered by the state OEM. This program exists to provide Federal funds to state and local programming and is distributed through state OEMs nationwide. The third question asked which state initiatives were of most help in coastal evacuation planning during the time from 2001 to 2008.

Only one community had received Emergency Management Performance Grant funding from the state OEM. “Register Ready” was a pilot project in all four counties in the survey, and while all responded it was of some help, implementation and sustainability were questioned. One respondent reported that the outreach isn’t sufficient and they don’t feel the people they need to reach are being reached. The electric company in their area had a more robust program (more registrants) as of the interview date. Also reported with the registry project are personnel shortages for managing the project. No funding exists to sustain the registry past the initial program development, so the benefits may be short-term. The complaint was made that there were no regional exercise opportunities from the state, although regional evacuations are of great concern

to the communities, and that such projects and planning rarely trickle to local level. Several participants in the survey mentioned that they don't know what opportunities are available from the state OEM or how to get to them, and that it would be beneficial to have a clearinghouse for state and Federal information.

A central issue of this research is that the Federal and state initiatives dominate planning activities at local levels and may not be the best application of local efforts, therefore interview participants were asked in Question #4, to prioritize between "special needs" planning, evacuation route management, professional training and education, public outreach, exercises, mitigation, or other needs for local planning improvements. Responses varied according to local priorities, as anticipated, demonstrating that the dominance of "template" planning initiatives does not address local needs. The three primary initiatives from Federal and state levels included ICS training, "special needs" registry and mitigation plans. No community identified ICS training or application as a planning priority. "Special needs" planning was ranked second by one person but more basic needs were identified overall. Mitigation planning did score first with one respondent, but only two respondents identified it as a priority overall.

Instead, planning priorities for these jurisdictions included more basic issues – half of all respondents placed public outreach as the top priority, with another three placing it second and third. Evacuation route management was the top priority for three jurisdictions and a fourth placed it third. Professional training made the list for four jurisdictions and was a common topic during most interviews as well. Interviewees noted that local OEMs are so small that it is not cost-effective to host training, nor are there

many opportunities at county levels so they look to the state OEM for regional training opportunities.

As a counterpart to priorities, the question was posed to interviewees to determine what planning initiatives may be given disproportionate emphasis over those desired priorities stated in the previous question. During interviews it was made very clear by all participants that all planning is essential, but that some items are more urgently needed than others from a holistic perspective. Those areas that are considered less important to local planning at this time yet are prioritized by higher jurisdictional levels include the items revealed in Question #5, a choice of “special needs” planning, evacuation route management, professional training and education, public outreach, exercises, mitigation, or other needs.

Four communities selected special needs planning, one qualified the comment in that the current program lacks follow-through and other items are more deficient. One priority each was given to evacuation route management and mitigation, and write-in’s with one “first place” listing for each of the following:

- 1) All planning is equally important;
- 2) All items listed are being done at the same time so none are getting proper attention;
- 3) Reverse lane strategies (because they are not believed to be sufficient for evacuation needs, and;
- 4) All programs are over-emphasized because there is not sustainable support for them.

As priorities and needs were identified, and opinions expressed on template planning initiatives, the interview discussions turned to perceived impediments to improving coastal evacuation planning efforts. Question #6 addressed the greatest impediment to improving coastal evacuation planning. Predictably, answers varied according to local priorities. Greater support from state OEM was a high priority for half of respondents, and six cited inter-jurisdictional collaboration. Shelter planning – also a major regional concern – was listed as a priority by two respondents. This demonstrates a clear need and desire for regional planning rather than piecemeal efforts.

Question #7 addressed political influence in planning. The intent was to see if local, state or Federal politics influenced evacuation planning at local levels. For the most part politics was not seen as a major factor except where Federal or state agendas were mandated locally. Local politics were a factor inasmuch as local mayors and other politicians are part of the decision-making processes, but not influencing the basic needs of emergency management. No significant findings emerged from this question except commentary that training politicians is needed to keep them aware of emergency management needs, activities and best practices.

Question #8 investigated local participation in Federal and state programs and initiatives that they would like to take advantage of but currently do not do so. Responses were similar from all participants in the interviews – they felt they were not aware of what opportunities might be available. Frustration was expressed at the lack of awareness for such programs, as stated by one: “‘aware’ is the operative word”, and echoed by another in that they find out what’s available by asking other coordinators who have items they need (e.g. equipment grants). Two people stated that local coordinators

educate each other as resources are discovered – an informal “regional” information network. Six respondents also stated that they don’t know what’s available as advertising of opportunities is poor.

For existing programs, one indicated a desire to participate in the Community Emergency Response Team (CERT) Program, two stated more EMPG funding would be favorable (EMPG funds local planning projects), one identified National Flood Insurance Program (NFIP) opportunities, and one participant stated that alert and warning grants would be important. One responded that the region should have Urban Area Security Initiative (UASI) designation as well.

The ninth question asked respondents to identify the greatest challenge for coastal evacuation planning for their jurisdictions over the next 5 and 10 years. The responses were varied, again according to local need and priority. The initiatives of ICS training, “special needs” registry and DMA2000-style mitigation planning (current “top-down”, “template-style” initiatives at the time of the interviews) were not suggested by any respondent. Instead, public outreach issues (information and compliance), infrastructure issues, and sheltering were most commonly discussed. One interviewee stated that experiencing a tropical storm would go far in showing the public how serious the hazards are so that compliance in a major event would be greater.

The final question asked for additional comments as the interviewee saw fit. There were a variety of suggestions offered of what would be beneficial to local enhancement of evacuation planning. Knowledge of state and Federal opportunities is desired, the extension of Route 55 was considered essential for the southern coastal areas. Reverse telephone notification systems were identified as necessary for public notifications.

Staffing was identified as an area to be addressed as current responders are “cross-pollinated” (fire/EMS/CERT are the same volunteers) so staffing will be short in an event. The desire to see definitive mandatory evacuations called from the state level was expressed by several interviewees, as was revisions to purchasing processes to make it easier to spend money on emergency management programs. Follow-up on programs and initiatives was seen as critical also. To quote one interviewee, the mandates and programs coming from higher levels of government are “one stupid program after another” with no follow-up or integration into large planning pictures. While not all expressed this issue with the same bluntness, most interviewees did express frustration with the fact that programs are not supported in the long term, reviewed, assessed or otherwise evaluated for effectiveness.

### **C. Summary**

Overall, interviewees were willing to share ideas, concerns and frustrations easily. Local needs generally centered on the basics of evacuation planning – route capacity, public information, and inter-jurisdictional collaboration. One theme common with all participants is the perception of separation from jurisdictional levels higher than the county, and in some cases, including the county. The more detailed planning considerations that should be layered on this basic planning include initiatives from Federal and state sources. This is not to say that such initiatives cannot be simultaneously integrated at local levels, but that any application of template planning initiatives must consider the gaps and needed elements for local levels.

Two salient points were revealed in this survey: the need for greater inter-jurisdictional coordination and the need for enhanced local decision-making in applying

external initiatives to localized conditions and needs. The former is noted in the responses that point to planning coordination, such as with sheltering, evacuation, awareness of grant opportunities, exercises, training, and clearly with infrastructure development. The latter is evidenced in that responses for priorities, concerns and applications of external initiatives vary widely between jurisdictions – the problems and immediate needs of one are not the same as another, even within the same county.

Salient findings also include (1) increases in planning activity at local levels in response to events and demands that relate to local conditions; (2) the relative promptness of updating of plans as local needs determine; (3) the importance of local/municipal initiatives in filling planning gaps rather than top-down initiatives; (4) the salience of direct experience in the 1992 nor'easter and Tropical Storm Floyd as stimulus events for improving local response planning; (5) the prevalence of voluntary evacuations as jurisdictions hesitate to employ mandatory evacuations; (6) the desire for two-part strategy of print and electronic media applications for public education; (7) an increase in the role of the State in regional evacuation planning; (8) an information outlet for local jurisdictions to learn of grant and other funding opportunities; (9) the need for support to continually educate political leaders about emergency management as officials change positions, and; (10) funding and technical support for Federal and state projects once “pilot” or first-year funding ends so that such initiatives do not fall into disrepair.

These findings reflect basic conditions and needs that individually or on the surface may not appear critical, but for Federal and state governmental levels to address them requires a change in the relationships between jurisdictions for emergency management and planning. In particular, attention should be paid to the need for regional-

scale planning and integration of efforts as well as the consideration of local initiatives in the development of regional, state and Federal evacuation planning programs.



## **CHAPTER 6 – CONCLUSIONS**

The purpose of this research has been to address gaps in both the research and analysis of institutional responses to disaster events and the bridge between academic research and applied research, through consideration of “scale” in emergency management planning. These efforts are part of a broader dialog about the role of scale in relation to policies and programs for the management and/or mitigation of global climate change. The writer has developed familiarity with these matters through fourteen years of involvement in the profession of emergency management, especially six years at the level of state government in New Jersey and through contact with peers engaged in similar work in other states as well as within U.S. government agencies like the Federal Emergency Management Agency. During this time I have formed certain opinions based on experience, that are critical of present approaches to formulating and executing coastal evacuation plans. But until carrying out the work describe herein, I have not been equipped with detailed objective evidence of a comparative nature with which to substantiate or challenge these views.

As shown in Chapter 5, coastal evacuating planning that is undertaken by municipal hazards managers does not take place in a vacuum. It is strongly influenced by what is done (or not done) in adjacent municipalities, in state agencies that have oversight and coordination responsibilities and in federal agencies that provide guidance, research support and funding as well as promoting broad strategy. It is also open to purely local influences from lay populations at risk and political leaders thereof, non-governmental agencies, academic researchers and representatives of public and private sectors. Although access to and interaction among these various actors helps to shape the

practical tasks of making evacuation plans “work”, fundamental processes of social learning, risk perception and communication also affect the outcomes that emerge. It is to these matters that I now turn.

### **A. Scale**

As we have seen in a review of literature, the importance of “scale” in geographic analysis is critical in hazard assessment. The synthesis of expert knowledge with scale considerations is precisely what is needed to present holistic views of hazard management that can be effectively applied to solving local and regional management problems. This is likewise reflected in action, not just theory. The surveys in this research clearly show a disparity between local needs and Federal initiatives (supported by the state, as well). Actions such as ICS training and “special needs” planning, while seen as important in overall emergency management strategies, is not seen as the local priorities, supported throughout the Atlantic Ocean coastal region of New Jersey. Rather, simpler, basic, and foundational priorities are identified as the preferred action for local and regional priorities – route improvements, public outreach and regional coordination for evacuation planning and execution. This sentiment is echoed elsewhere in the nation, such as with Senator Mary Landrieu (LA), who argues for a reform of FEMA to address regional issues of flood mitigation and response to augment local capacities with larger scale resource and institutional organization (Schleifstein, 2009). These same principles are equally relevant in other hazard-prone locations, and are evidenced to be desired at local levels as seen in this research’s surveys.

However, this comparison does not equate to similar action between locations, rather, similar approaches in consideration of scale and regional organization. For

example, the biogeophysical, economic and social conditions leading to overall social and institutional vulnerability in New Orleans during Hurricane Katrina are radically different than those variables creating vulnerability at wealthy tourist-based communities along the New Jersey coastline. The “lessons learned” from an event in one location should not be expected to produce desired results at a different geographic location. Rather, the intent of policies derived from “lessons learned” should be allowed to emerge from local adaptations of such policies.

While this suggestion may seem to imply omniscience at local levels, it would not do so in practice. Collaboration between jurisdictional levels, public/private/non-governmental sectors and academia is essential to derive appropriate local action, and collaboration requires a mutual understanding of priorities, needs and practical goals and strategies – local power would be represented in contributions to the regional direction, strategies and tactics to accomplish collaborative goals. What is necessary is a revision in the scales of assessment and planning to create regions for collaboration, decision-making and policy implementation. These “adaptive regions” can work to apply lessons locally rather than to simply superimpose template planning and policies that result in irrelevant or unproductive efforts.

For example, in this research we can see how although addressing “special needs” planning is an essential part of holistic disaster response planning, the lack of ready and planned evacuation routes and shelters is placing the “cart before the horse” – vulnerable populations maybe identified, but without functioning evacuation routes and locations to shelter such persons, their identification does not contribute to the reduction in their vulnerability. What is needed is an assessment of local perspectives for essential needs

and foundations in planning, with specific needs as overlays to address hazard-specific, population-specific, socio-political, economic, and biogeophysical considerations of that region. This is in its essence, a theoretical and practical approach to addressing hazards, vulnerability and policy as a function of “scale” – choosing appropriate regions for analysis and application of hazards theory.

The cycle of hazards analysis should include local perceptions in regional context, as evidenced by surveys in this dissertation, relevant to scale so as to produce the planning cycle:

Identify Hazard → Determine Adjustments → Determine differences in  
choices → develop policy → *Adjustment of policy to contextual scale* →  
*Change in “vulnerability”* → Identify Hazard

This revised cycle will allow for the assessment of needs at regional scales to better address local action in the context of integrative hazard planning and analysis.

## **B. Regionalism**

The question then becomes one of how to define such “adaptive regions” – formal and functional units that can effectively address and resolve top-down as well as bottom-up needs and approaches. Rather than delineating spurious boundaries based solely on political or biogeophysical areas, as we are prone to do, these regions should reflect a flexibility in definition to accommodate changing characteristics and needs as well as the reflect various roles in policy adaptation, implementation and response.

Implications for emergency management include the need for a greater state OEM role in inter-jurisdictional planning – providing training and exercises, producing public outreach materials and activities, creating a single-source location for emergency

managers to find grant, training, planning and other opportunities, and a larger role for advocating infrastructure needs, such as roadways, shelter development and communications networks.

Resolving disparities between local needs and hierarchical programming include bridging gaps between Federal initiatives, State initiatives and local needs. Matters of importance for one location mandated to matters of national importance and then transplanted nationally without contextual analysis to local applications place burdens on local emergency managers. This is particularly salient for smaller communities that may have small staffs and budgets as well as other issues that are of greater importance. It is easily observed that all topics in emergency planning, particularly in evacuations, are “important”, however, there are some linear relationships that are immutable – if roadways do not suffice to evacuate people in time or if shelters do not exist to handle fleeing populations, for example, all the pets and special needs planning initiatives will be for naught. Of primary concern are the basic needs for operational success, followed by additional initiatives to address complexities of communities, evacuations and human behavior.

There is no singular benchmark for a “basis” that a community needs for successful evacuations, rather, each community must assess variables impacting evacuations holistically to ensure the optimal combination of factors for their community. For some, such as the barrier island communities of New Jersey, that may involve focusing first on route safety, communication with tourists and coordination with mainland communities where evacuees will enter local, County and State roadway systems. For other communities, such as the growing number of retirement communities

of Ocean County, New Jersey, it may mean more attention to planning for the elderly, to include medical needs planning, pet planning and special sheltering considerations. Addressing the infrastructure issues would allow focus on the topical needs and initiatives presented by Federal and state agencies, however, without route capacity resolutions there will be no true solutions for other evacuation issues, including sheltering.

Collaboration through formal regional groupings should be explored as a vehicle to facilitate resolution of local needs with Federal and state planning goals. Regionalization can create a greater pool of resources, support training and exercise events, provide greater coordination for route management, create strength in collaborative planning and grant writing, and remove perceptions of distance between municipal, state and Federal agencies. The idea of “comprehensive vulnerability management” (McIntyre, 2002) provides a policy framework for analysis, combined with accommodation of scale of analysis and policy application.

Federal programs that require compliance as a consequence of eligibility for future funding regardless of the outcome of those efforts are potentially wasteful and counterproductive. Better efforts would be spent engaged in supporting activities to reduce vulnerabilities at local levels with appropriate assessments to gauge reduction progress. “Hazards theory” would then combine with local practice to produce measurable regional results. These results could be measured by quantified and qualified assessments showing increases in foundational planning, measurements of greater public awareness, regional transportation preparedness, after-action reports from exercises, and other such methods. Rather, local projects, such as dune stabilization programs in

Avalon, NJ have proven to be effective in reducing hazard and preventing future losses – policies derived or adapted locally rather than template down nationally.

The essential need is for regional planning tailored to address both Federal preparedness initiatives and the action for local planning priorities in order to resolve disparities between jurisdictional perceptions. This can be accomplished effectively through regional cooperation based on similar hazard geography and collective purpose. We have seen this collaboration effectively applied to other planning and management areas, to include the Pinelands Commission, Highlands Commission and Meadowlands Commission in New Jersey, despite the potential intrusion of outdated “home rule” arguments. Academic inquiry can support the development of these regional efforts through comparative research with other regional geographic applications to provide various models to adapt to local and regional contexts.

The importance of “scale” and “region” in this research is reflected in the proof of the research hypothesis: local emergency managers surveyed confirm that initiatives originating from catastrophic events outside of New Jersey have not resulted in efficient and effective local action. Rather, basic planning, response and mitigation needs such as public outreach and evacuation remain poorly addressed in lieu of more esoteric Federal mandates.

Major events elsewhere have draw attention to needs specific to other contexts and/or jurisdictional levels (e.g. poverty, Federal organization) but locally applied in coastal New Jersey they have ultimately pulled resources away from foundational emergency management planning. New Jersey’s lack of experience with extreme coastal events reinforces the de-emphasis on local planning needs despite the potentially

catastrophic nature of coastal evacuations. Regional planning efforts emphasizing local needs can be employed to combine efforts and resources to address the under-utilized strategy of regional collaborative planning and elevation of local and regional priorities to mandatory status. This application of “event + local need + institutional response = collaborative regional planning” may be applied as a systemic model elsewhere to enhance hazard planning success and analysis of local hazard geography.

### **C. Improving Local Evacuation Planning**

The challenge is modeling a system that can optimize the application of resources and improve capacities at local and regional levels for collaborative coastal evacuation planning. The goal of such a model is to minimize loss of life, reduce loss potential for response resources, and to facilitate community recovery efficiently. Such models are evident in New Jersey at present with collaborative evacuation planning efforts with Long Beach Island communities and Stafford Township (Ocean County), and with the proposal and development of an automated flood warning system in Monmouth County. Nine communities along the Shrewsbury and Navesink Rivers have worked together informally to plan, propose, and manage an automated flood warning system for these adjacent communities, and the County office of emergency management is serving as the liaison to funding agencies as well as collaborates with the communities in the planning and execution stages (M. Baldanza, pers. comm. E-mail, 9/24/09). This seemingly simple arrangement arose after approximately two years of lobbying municipal mayors and emergency managers, but the informal structure is held together by county-level formal agreements between participating municipalities. The planning efforts for Long Beach Island communities and Stafford Township arose from the Stafford emergency manager’s



initiative to coordinate evacuations, and since has become an engrained practice between mainland Stafford Township and the five Long Beach Island municipalities, as a voluntary and informal planning process. It is exactly these forms of collaboration that can serve as examples for other areas, not only coastal, but nationwide.

Collaborative efforts between municipalities would benefit from county involvement, as the counties are already posed to coordinate inter-jurisdictional issues within their borders, and currently serve as liaison to state agencies and funding sources. Municipal and county roles would not change, but would be applied to informal collaborations that may involve inter- and intra-county activities. Likewise, the New Jersey Office of Emergency Management would not need to adapt to changes in roles as they work directly with counties at present and serve as a funding vehicle for many Federal grants. They would continue in this role, providing advice and support to county representatives as needed for the county offices of emergency management to facilitate regional collaborations. All of these roles and activities – municipal, county and state – would remain intact and operate as permitted under state law, working within existing frameworks and protocols. This supports the existing three-fold division of responsibilities: 1) Federally-sponsored research, funding, broad policy direction 2) State allocation of resources to specific tasks, implement policies, 3) Local interactions with counties to apply funding and comply with mandates as well as develop and integrate local programming into regional visions.

Regional collaborations can also address deficiencies in technology, research and data collection. In an integration of municipal “have’s and “have not’s”, scarce resources may be shared and used to improve planning, response, recovery and mitigation. The

Monmouth County collaborative flood warning systems exemplifies this in that neither the county nor any single community could support such a system, but by joining as a flood warning system group they were able to provide sufficient proof of need as well as combine finances for annual operations and maintenance. Flood warnings will also be issued collaboratively to ensure equal application of the system's technologies to each community along the rivers. Resources such as geographic information systems are also scarce, even at county levels in some cases, and can be shared through specific project needs – mapping data, routing evacuations, producing public information pieces and creating regional evacuation maps, for example. This type of integration for resource sharing can improve data collection and application, and may increase efficiency of planning efforts, consistency of route and evacuation management, and effectiveness of public outreach messaging.

Opportunities for academic, public and private sector integration also increase with regional collaboration. The Office of the State Climatologist (New Jersey WxNet, mesoscale weather network) and Steven's Institute's Coastal Monitoring Network (CMN) operate through close collaboration with municipal and county governments for equipment location, operation and data collection. This integration occurs because there is a need for, and benefits to be derived from, the application of atmospheric and hydrologic data to prediction and warning systems. Opportunities are limited due to scarce local resources, but as we see with the Monmouth flood warning system project, collaboration produces new economic and operational levels where communities share project burdens. In this case, nine communities impacted by flooding have collaborated to support five flood gages and planning duties.

Structure for regional collaboration is best if kept simple. Although federal and state entities may help in the process, municipalities and/or counties are best equipped to determine local needs and to integrate the role of “scale” in the hazard assessment process. If that local level analysis (perhaps in collaboration with hazards researchers, social scientists and other academics) reveals a regional collaboration may make best use of resources and efforts, the project can then be further defined and refined to reflect the best geographic scale and management structure. This collaboration has been successful post 9/11 between Columbia University and New York City to address the emergency response to health needs in 9/11, from anthrax events, and lessons learned from those events. The collaboration has created a bridge between emergency planners and a research community with substantial expertise and relationships in the discipline (Morse, 2003).

What is critical is establishing those relationships *prior* to an event to mitigate losses – adding the collaboration into the planning process for best results. The Monmouth automated flood warning system project is a clear example of proactive collaboration utilizing county and municipal relationships with scale assessed as municipalities subject to flooding from the Shrewsbury and Navesink Rivers. The scale of the collaboration was determined by the geographic extent of the hazard and municipal boundaries. Not all municipalities along the rivers chose to participate, but a critical mass did, allowing for the project to move forth. This example serves as a clear model for other such efforts.

## Bibliography

- Adeola, Francis O. 1999. Natural disaster episode: Impacts, emergency response, and health effects of Hurricane Georges in the Gulf Coast. *Quick Response Report #122*. Natural Hazards Research and Applications Information Center. Boulder, CO: University of Colorado.
- Adeola, Francis O. 2003. Flood hazard vulnerability: A study of Tropical Storm Allison (TSA) flood impacts and adaptation modes in Louisiana. *Quick Response Report #162*. Natural Hazards Research and Applications Information Center. Boulder, CO: University of Colorado.
- Agarwal, Arun. 2008. The role of local institutions in adaptation to climate change. Paper prepared for the Social Dimensions of Climate Change, Social Development Department. Washington, D.C.: The World Bank, 5-6 March.
- Alexander, David. 1991. Natural disasters: A framework for research and teaching. *Disasters* 15(3): 209-226.
- \_\_\_\_\_. 1997. The study of natural disasters, 1977-1997: Some reflections on a changing field of knowledge. *Disasters* 21(4):284-304.
- \_\_\_\_\_. 2002. *Principles of emergency planning and management*. New York: Oxford University Press.
- \_\_\_\_\_. 2002 From civil defence to civil protection--and back again. *Disaster Prevention and Management* 11(3): 209-213.
- Amick, George. 2003. Rethink 19<sup>th</sup> century infrastructure. *The Times of Trenton* (NJ). *News Section*. 27 April.
- Anonymous. 1999. N.J. alert to possible damage from Floyd. *The Times of Trenton* (NJ). 15 September: A6.
- \_\_\_\_\_. 2003. Planning 566 ways can't work. *The Star-Ledger* (Newark, NJ). *Perspective*, 1 January: 2.
- \_\_\_\_\_. 2003. The mayor makes sense. *The Star-Ledger* (Newark, NJ). *Editorials*. 3 April: 20.
- Atlantic County Department of Regional Planning and Economic Development (ACDRPED). 2000. Atlantic County Master Plan. ([http://www.aclink.org/Planning/2000\\_mp/pdf/mp2000.pdf](http://www.aclink.org/Planning/2000_mp/pdf/mp2000.pdf) (last accessed 25 July 2009)).

- Baker, Earl J. 1991. Hurricane evacuation behavior. *International Journal of Mass Emergencies and Disasters* 9(2): 287-310.
- . 1995. Public response to hurricane probability forecasts. *Professional Geographer* 47(2):137-147.
- . 2003. Public response to Hurricane Lili. Manuscript prepared for U.S. Army Corps of Engineers, New Orleans District.
- Bailey, William E. 1999. *Andrew's legacy: Winds of change*. West Palm Beach, Florida: Telshare Publishing.
- Bashir, Zamaaz, Vincent Lafronza, Michael R. Frasier, Carol K. Brown and James R. Cope. 2003. Local and state collaboration for effective preparedness planning. *Journal of Public Health Management and Practice* 9(5):344-351.
- Batchelor, Julie W., Kelly E. Hutchinson, Theresa A. Wyatt, and James Don Goins. 2000. *Hurricane Floyd: Lessons learned*. Raleigh: North Carolina Department of Transportation.
- Bateman, Julie M. and Bob Edwards. 2002. Gender and evacuation: A closer look at why women are more likely to evacuate for hurricanes. *Natural Hazards Review* 3(3):107-117.
- Bea, Keith, Elaine Halchin, Henry Hogue, Frederick Kaiser, Natalie Love, Francis X. McCarthy, Shawn Reese, Barbara Schwemle. 2006. Federal Emergency Management Policy Changes after Hurricane Katrina: A Summary of Statutory Provisions. CRS Report for Congress. Washington D.C.: Congressional Research Service.
- Beatley, Timothy. 2009. *Planning for coastal resilience: Best practices for calamitous times*. Washington, D.C.; Island Press, Inc.
- Beatley, Timothy and David J. Brower. 1986. "Public perception of hurricane hazards: Examining the differential effects of Hurricane Diana. *Coastal Zone Management Journal* 14(3):241-269.
- Beatley, Timothy, David J. Brower, and Anna K. Schwab. 2002. *An introduction to coastal zone management, second edition*. Washington, D.C.: Island Press.
- Berke, Philip R. 1989. Hurricane vertical shelter: The experience of two states. *Coastal Management* 17:193-217.
- Berke, Philip R., Jack Kartez and Dennis Wenger. 1993. Recovery after disaster: achieving sustainable development, mitigation and equity. *Disasters* 17(2):93-109.

- Birkland, Thomas A. 1996. Natural disasters as focusing events: Policy communities and political response. *International Journal of Mass Emergencies and Disasters* 14(2):221-243.
- . 2006. *Lessons of disaster: Policy change after catastrophic events*. Washington, D.C.; Georgetown University Press.
- Blaikie, Piers, Terry Cannon, Ian Davis and Ben Wisner. 1994. *At risk: Natural hazards, people's vulnerability and disasters*. New York: Routledge.
- Bogard, William C. 1988. Bringing social theory to hazards research. *Sociological Perspectives* 31(2):147-168.
- Bolin, Robert and Lois Stanford. 1998. The Northridge earthquake: community-based approaches to unmet recovery needs. *Disasters* 22(1):21-38.
- Borondy, Kinga and Jeff May. 1997. Shore signs point the way out of danger. *The Star-Ledger* (Newark, NJ). *New Jersey* 7 November: 25.
- Bourque, Linda B., Kimberley I. Shoaf and Loc H. Nguyen. 2002. Survey Research, in Stallings, Robert A. *Methods of Disaster Research*. Xlibris.com. pp. 157-193.
- Brown, Bruce A. 1995. A model emergency response plan. *Professional Safety* 40(1):24-27.
- Bruck, Andrew. 2008. Overruled by home rule: Why the New Jersey legislature's latest attempt to end the waste, corruption, and inequality created by municipal fragmentation will fail. *Seton Hall Legislative Journal*, 32(2). <http://ssrn.com/abstract=1112816> (last accessed 25 July 2009).
- Buchholz, Margaret, ed. 1999. *Shore chronicles: Diaries and traveler's tales from the Jersey Shore 1764-1955*. Harvey Cedars, NJ: Down the Shore Publishing.
- Buckle, Philip. 2003. Some contemporary issues in disaster management. *International Journal of Mass Emergencies and Disasters* 21(1):109-122.
- Burby, Raymond J., ed. 1998. *Cooperating with nature: confronting land-use planning for sustainable communities*. Washington, D.C.: Joseph Henry Press.
- . 2006. Hurricane Katrina and the paradoxes of government disaster policy. *Annals of the American Academy of Political and Social Science* 604 (1):171-191.
- Burby, Raymond J. and Fritz Wagner. 1996. Protecting tourists from death and injury in Coastal Storms. *Disasters* 20(3):49-60.

- Burton, Lloyd. 2008. The constitutional roots of all-hazards policy, management, and law. *Journal of Homeland Security and Emergency Management* 5(1): Article 35.
- Burton, Ian, Robert W. Kates and Gilbert F. White. 1993. *The environment as hazard*. New York: The Guilford Press.
- Byrne, Brendan and Thomas Kean. 2003. The state of the state in 2003. *The Star-Ledger* (Newark, NJ). *Perspective*, 28 December: 3.
- Cairns, George, George Wright, Kees Van der Heijden, Ron Bradfield, George Burt. 2006. Enhancing foresight between multiple agencies: Issues in the use of scenario thinking to overcome fragmentation. *Futures* 38(8):1010-1025.
- Cape May County Planning Board (CMCPB). 2002a. Cape May County Comprehensive Plan. <http://www.capemaycountygov.net/FCpdf/COMPLAN2002.pdf> (last accessed 25 July 2009).
- \_\_\_\_\_. 2002b. Cape May County Data Book. <http://www.co.cape-may.nj.us/FCpdf/2000%20Census%20Data%20Book2.pdf> (last accessed 25 July 2009).
- Carter, R.W.G. 1988. *Coastal Environments*. New York: Academic Press.
- Chambers, Steve. 2004. "Home Rule still divides Jerseyans". *The Star-Ledger* (Newark, NJ). *New Jersey*, 25 January: 21.
- \_\_\_\_\_. 2004. Counties back highlands development restrictions. *The Star-Ledger* (Newark, NJ). *County News/State*. 11 February: 47.
- Chiu, Arthur N. L., Gregory L. F. Chiu, Charles H. Fletcher III, Hans-Jurgen Krock, J. Kenneth Mitchell and Thomas A. Schroeder. 1995. *Hurricane Iniki's impact on Kauai*. Springfield, VA: National Technical Information Service.
- Christoplos, Ian, John Mitchell & Anna Liljelund. 2002. Re-framing Risk: The Changing Context of Disaster Mitigation and Preparedness. *Disasters* 25(3):185-198.
- Clark, W. C. 1985. Scales of climate impacts. *Climatic Change* 7(1):5-27.
- Coch, Nicholas K. 1995. Hurricane hazards along the Northeastern Atlantic Coast of the United States. *Journal of Coastal Research Special Issue No. 12: Coastal Hazards*: 115-147.
- \_\_\_\_\_. 1999. Hurricane hazards in New Jersey. In *New Jersey Beaches and Coastal Processes from a Geologic and Environmental Perspective*, ed. J. Puffer, Geological Association of New Jersey Annual Proceedings 16: 65-98.

- Committee on Disaster Research in the Social Sciences: Future Challenges and Opportunities, National Research Council. 2006. *Facing Hazards and Disaster: Understanding Human Dimensions*. Washington D.C.: The Joseph Henry Press.
- Congressional Research Service. 2006. Federal emergency management policy changes after Hurricane Katrina: A summary of statutory provisions. Washington, D.C.; GAO.
- Creswell, John W. 2003. *Research design, second edition*. Thousand Oaks, CA; Sage Publications.
- Cuny, Frederick C. 1983. *Disasters and Development*. New York: Oxford University Press.
- Cutter, Susan L. 1991. Fleeing from harm: International trends in evacuations from Chemical accidents. *International Journal of Mass Emergencies and Disasters* 9(2):267-285.
- \_\_\_\_\_. 1993. *Living with Risk: the geography of technological hazards*. New York: Edward Arnold.
- \_\_\_\_\_, ed. 1994. *Environmental risks and hazards*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- \_\_\_\_\_. 2001. *American hazardscapes: the regionalization of hazards and disasters*. Washington, D.C.: Joseph Henry Press.
- Dalesio, Emery P. 2003. Isabel closes in on coast. *The Times of Trenton* (NJ). News. 18 September.
- Davidson, Rachel A. and Kelly B. Lambert. 2001. Comparing the hurricane disaster risk of U.S. coastal counties. *Natural Hazards Review* 2(3):132-142.
- Dawson, Gregg. 1993. A comparison of research and practice: A practitioner's view. *International Journal of Mass Emergencies and Disasters* 11(1):55-62.
- Dolan, Robert and Robert Davis. 1993 Nor'easters. *American Scientist* 81(5):428-439.
- Donner, William R. 2008. Decision-making as a community adaptation: A case study of emergency managers in Oklahoma. *Disasters* 292-302.
- Dow, Kirsten and Susan L. Cutter. 1997. Repeat response to hurricane evacuation orders. *Quick Response Report #101*. Natural Hazards Research and Applications Information Center. Boulder, CO.: University of Colorado.



- \_\_\_\_\_. 2000. South Carolina's response to Hurricane Floyd. Quick Response Report #128. Natural Hazards Research and Applications Information Center. Boulder, CO: University of Colorado.
- \_\_\_\_\_. 2002. Emerging hurricane evacuation issues: Hurricane Floyd and South Carolina. *Natural Hazards Review* 3(1):12-18.
- Downton, Mary W. and Roger A. Pielke, Jr. 2001. Discretion without accountability: Politics, flood, damage, and climate. *Natural Hazards Review* 2(4): 157-166.
- Doyle, John C. 1996. Improving performance in emergency management. *Disaster Prevention and Management* 5(3):32-46.
- Drabek, Thomas E. 1991. Anticipating organizational evacuations: Disaster planning by managers of tourist-oriented private firms. *International Journal of Mass Emergencies and Disasters* 9(2):219-245.
- \_\_\_\_\_. 1995. Disaster responses within the tourist industry. *International Journal of Mass Emergencies and Disasters* 13(1):7-23.
- \_\_\_\_\_. 1996. *Disaster evacuation behavior: tourists and other transients*. Program on Environment and Behavior, Monograph No. 58. Boulder, CO: University of Colorado.
- \_\_\_\_\_. 2000. Pattern differences in disaster-induced employee evacuations. *International Journal of Mass Emergencies and Disasters* 18(2):289-316.
- Drabek, Thomas E. and Gerard J. Hoetmer, eds. 1991. *Emergency management: principles and practice for local government*. Washington, D.C.: International City Management Association.
- Drabek, Thomas E. and David A. McEntire. 2002. Emergent phenomena and multiorganizational coordination in disasters: lessons from the research literature. *International Journal of Mass Emergencies and Disasters* 20(2): 197-224.
- Dynes, Russell R. 1994. Community emergency planning: False assumptions and inappropriate analogies. *International Journal of Mass Emergencies and Disasters* 12(2):141-158.
- Federal Emergency Management Agency (FEMA). 1995. *Partnerships in preparedness: A compendium of exemplary practices in emergency management*. Washington, D.C.: FEMA
- \_\_\_\_\_. 2000. *Economic impact assessment of Hurricane Floyd*. Washington, D.C.: FEMA.

- \_\_\_\_\_. 2003. "Lessons learned on Hurricane Lili anniversary". Press release #R6-03-129. 3 October.
- \_\_\_\_\_. 2003. *A nation prepared: Federal Emergency Management Agency strategic plan, fiscal years 2003-2008*. Washington D.C.: FEMA.
- Gaffney, Douglas A. and Wilden A. Kelly. 1996. Under the boardwalk: A shore protection plan emerges. *Geo Info Systems* October 1996:22-33.
- Gladwin, Christina H., Hugh Gladwin and Walter Gillis Peacock. 2001. Modelling hurricane evacuation decisions with ethnographic methods. *International Journal of Mass Emergencies and Disasters* 19(2):117-143.
- Gladwin, Hugh. 2003. Hurricane Floyd: timing of events. Florida International University, Institute for Public Opinion Research. [www.fiu.edu/orgs/ipor/floydevac/history.htm](http://www.fiu.edu/orgs/ipor/floydevac/history.htm) (last accessed 21 September 2009).
- Gladwin, Hugh. 2003. Hurricane Floyd evacuation. Florida International University, Institute for Public Opinion Research [www.fiu.edu/orgs/ipor/floydevac/](http://www.fiu.edu/orgs/ipor/floydevac/) (last accessed 21 September 2009).
- Glasser, Jeff. 2003. Improving emergency response. *U.S. News and World Report* 135(8): 29-30. 15 September.
- Glickman, Theodore S., Dominic Golding, and Emily Silverman. 1992. Acts of God and acts of man: Recent trends in natural disasters and major industrial accidents. Discussion paper CRM 92-02. Washington, D.C.: Center for Risk Management, Resources for the Future.
- Godschalk, David R., Timothy Beatley, Philip Berke, David J. Brower and Edward J. Kaiser. 1999. *Natural hazard mitigation: Recasting disaster policy and planning*. Washington, D.C.: Island Press.
- H. John Heinz III Center for Science, Economics and the Environment. 2000. *The Hidden Costs of Coastal Hazards: Implications for Risk Assessment and Mitigation*. Washington, D.C.; Island Press.
- Haddow, George D. and Jane A. Bullock. 2003. *Introduction to emergency management*. New York: Butterworth-Heinemann.
- Handmer, John and Stephen Dovers. 2007. *Handbook of disaster & emergency policies & institutions*. Sterling, VA: Earthscan.
- Hasse, John E. and Richard G. Lathrop. 2003. Land resource impact indicators of urban sprawl. *Applied Geography* 23:159-175.

- Hester, Jr., Tom. 2003. Isabel's bearing down. *The Times of Trenton* (NJ). *News*, 16 September: A1.
- \_\_\_\_\_. 2003. Firefighting home rule stirs a fuss. *The Star-Ledger* (Newark, NJ). *New Jersey*, 26 December: 33.
- Hewitt, Kenneth, ed. 1983. *Interpretations of calamity*. Boston: Allen & Unwin, Inc.
- \_\_\_\_\_. 1997. *Regions of risk: A geographical introduction to disasters*. Essex, England: Longman.
- Hogue, Henry B. and Keith Bea. 2006. Federal Emergency Management and Homeland Security Organization: Historical Developments and Legislative Options. CRS Report for Congress. Washington D.C.: Congressional Research Service.
- International Association of Chiefs of Police: State and Provincial Division. 2008. *The Role of State and Provincial Law Enforcement Agencies in a Post 9/11 Era*. Alexandria, VA: IACP.
- Johns Hopkins University. 2008. "Remarks by Homeland Security Secretary Michael Chertoff at Johns Hopkins University". (transcript) 3 December. <http://www.advanced.jhu.edu/calendar/index.cfm?print&ItemsID=1284>. (last accessed 06/05/2009.)
- Kapucu, Naim. 2009. Interorganizational Coordination in Complex Environments of Disasters: The Evolution of Intergovernmental Disaster Response Systems. *Journal of Homeland Security and Emergency Management* 6(1):Article 47.
- Karcher, Alan J. 1998. *New Jersey's Multiple Municipal Madness*. New Brunswick, NJ: Rutgers University Press.
- Kasperson, Roger E., Ortwin Renn, Paul Slovic, Halina S. Brown, Jacqu Emel, Robert Goble, Jeanne X. Kasperson, and Samuel Ratick. 1988. The social amplification of risk: A conceptual framework. In *Environmental risks and hazards* ed. S.L. Cutter, Susan L., 1994. Englewood Cliffs, NJ: Prentice-Hall, Inc. pp. 112-123.
- Kasperson, Jeanne X. and Roger Kasperson. 2005. *The Social Contours of Risk, Vol. 1: Publics, Risk Communication and the Social Amplification of Risk*. Sterling, VA: Earthscan.
- Kates, Robert W. 1971. Natural Hazard in Human Ecological Perspective: Hypotheses and Models. *Economic Geography* 47(3):438-51.
- Kirby, Andrew. 1990. *Nothing to fear: risks and hazards in American society*. Tucson: The University of Arizona Press.

- Landry, Craig E., Okmyung Bin, Paul Hindsley, John C. Whitehead and Kenneth Wilson. 2007. Going home: Evacuation-migration decisions of Hurricane Katrina survivors. *Southern Economic Journal* 74 (2): 326-343.
- Lebel, Louis. 2006. The Politics of Scale in Environmental Assessment. In *Bridging Scales and Knowledge Systems: Concepts and Applications in Ecosystem Assessment: A Contribution to the Millennium Ecosystem Assessment*. Ed. Wlter V. Reid, .Fikret Berkes, Thomas J. Wilbanks. 2006. Washington, D.C.: Island Press.
- Lewis, James. 1990. The Vulnerability of Small Island States to Sea Level Rise: The Need for Holistic Strategies. *Disasters* 14:241-249.
- Lewis, James. 1999. *Development in disaster-prone places*. London: Intermediate Technology Publications Ltd.
- Lindell, Michael K., ed. 1997. Part one: An assessment of existing research. *International Journal of Mass Emergencies and Disasters* 15(3):327-388.
- Lindell, Michael K. and Ronald W. Perry. 2004. *Communicating risk in multiethnic communities*. Thousand Oaks, CA: Sage Publications.
- Lindell, Michael K., David J. Whitney, Christine J. Futch and Catherine S. Clause. 1996. Multi-method assessment of organizational effectiveness in a local emergency planning committee. *International Journal of Mass Emergencies and Disasters* 14(2):195-220.
- Liverman, Diana M. 1986. The vulnerability of urban areas to technological risks. *Cities*:142-147.
- \_\_\_\_\_. 1990. "Vulnerability to Global Environmental Change". In *Understanding global environmental change: The contributions of risk analysis and management*. eds. R. Kasperson, K. Dow, D. Golding, and J. Kasperson. Worcester, MA: Clark University.
- Lloyd, John Bailey. 1994. *Eighteen Miles of History on Long Beach Island*. Harvey Cedars, NJ: Down the Shore Publishing.
- Ludlum, David M. 1983. *The New Jersey Weather Book*. New Brunswick, NJ: Rutgers University Press
- May, Peter J. 1994. Analyzing mandate design: State mandates governing hazard-prone areas. *Publius: The Journal of Federalism* 24:1-16.

- McEntire, David A., C. Fuller, C. W. Johnston, R. Weber. 2002. A Comparison of Disaster Paradigms: The Search for a Holistic Policy Guide. *Public Administration Review* 62(3):267-281.
- McEntire, David A. 2004. The Status of Emergency Management Theory: Issues, Barriers, and Recommendations for Improved Scholarship. Paper Presented at the FEMA Higher Education Conference, Emmitsburg, MD. 8 June. <http://www.training.fema.gov/emiweb/downloads/David%20McEntire%20-%20%20Status%20of%20Emergency%20Management%20Theory.pdf> (last accessed 7 April 2009)
- MilebyMile.com. 2005. New Jersey Road Map and Travel Guide. [http://www.milebymile.com/maps/New\\_Jersey\\_road\\_map.pdf](http://www.milebymile.com/maps/New_Jersey_road_map.pdf) (last accessed 25 July 2009).
- Mileti, Dennis S. 1980. Human adjustment to the risk of environmental extremes. In *Environmental risks and hazards*. Ed. Cutter, Susan L. 1994. Englewood Cliffs, NJ: Prentice-Hall, Inc. pp. 178-194.
- Mileti, Dennis S., Jens H. Sorensen, Paul W. O'Brien. 1992. Toward an explanation of mass care shelter use in evacuations. *International Journal of Mass Emergencies and Disasters* 10(1):25-42.
- Mileti, Dennis S., Rachel Bandy, Linda B. Bourque, Aaron Johnson, Megumi Kano, Lori Peek, Jeannette Sutton, Michele Wood. 2006. *Bibliography for public risk communication on warnings for public protective actions response and public education* (Revision 4). Natural Hazards Research Center, University of Colorado, Boulder. <http://www.colorado.edu/hazards/publications/informer/infrmr2/pubhazbib.pdf> (last accessed 20 March 2009).
- Mitchell, James K. 1976. Adjustment to new physical environments beyond the metropolitan fringe. *Geographical Review* 66(1):18-31.
- \_\_\_\_\_. 1984. *Hurricane evacuation in coastal New Jersey*. Discussion Paper No 21, Graduate Program in Geography. New Brunswick: Rutgers University.
- \_\_\_\_\_, ed. 1999a. *Crucibles of hazard: mega-cities and disasters in transition*. New York: United Nations University Press.
- \_\_\_\_\_. 1999b. Mega-cities and disasters: A comparative analysis. *GeoJournal* 49: 137-142.
- \_\_\_\_\_. 2003a. The fox and the hedgehog: Myopia about homeland vulnerability in US policies on terrorism. *Terrorism and Disaster: New Threats, New Ideas - Research in Social Problems and Public Policy* 11: 53-72.

- \_\_\_\_\_. 2003b. Urban vulnerability to terrorism as hazard. In *The Geographical Dimensions of Terrorism*, ed. Susan L. Cutter, Douglas Richardson and Thomas J. Wilbanks. New York: Routledge. 17-25.
- \_\_\_\_\_. 2005. Urban disasters as indicators of global environmental change: Assessing functional varieties of urban vulnerability. *Earth System Science in the Anthropocene*. Berlin: Springer-Verlag 135-152.
- \_\_\_\_\_. 2006. A century of natural disasters in a state of changing vulnerability, *New Jersey's Environments: Past, Present, and Future*. Neil Maher, Ed. New Brunswick: Rutgers University Press 164-198.
- \_\_\_\_\_. 2007. Review of *The Social Contours of Risk, Vol. I – Publics, Risk Communication and the Social Amplification of Risk* by Jeanne X. Kasperson and Roger E. Kasperson in *Annals of the Association of American Geographers* 97(2): 445-447.
- \_\_\_\_\_. 2009. American disasters during the Twentieth Century: The case of New Jersey”, *Natural Disasters, Cultural Responses: Case Studies toward a Global Environmental History*. Lanham and Washington, D.C.: Lexington Books and the German Historical Institute. pp. 327-354.
- Mitchell, James K., Neal Devine and Kathleen Jagger. 1989. A contextual model of natural hazard. *Geographical Review* 79(4):391-409.
- Mittler, Elliot. 1997. A case study of Florida's emergency management since Hurricane Andrew. Working Paper #98. Natural Hazards Research and Applications Information Center. Boulder, CO: University of Colorado.
- Monmouth County Planning Board (MCPB). 2008a. Monmouth County Profile. <http://co.monmouth.nj.us/documents/24%5C2008%20Monmouth%20County%20Profile.pdf> (last accessed 24 July 2009).
- \_\_\_\_\_. 2008b. Summer Coastal Population Study. <http://co.monmouth.nj.us/documents/24%5C2008%20Coastal%20Pop%20Study%20Report.pdf> (last accessed 25 July 2009).
- Montello, Daniel R. and Paul C. Sutton. 2006. *An introduction to scientific research methods in geography*. Thousand Oaks, CA; Sage Publications.
- Morren, Jr. George E.B. 1983. A general approach to the identification of hazards and responses. In *Interpretations of calamity*, ed. Kenneth Hewitt. 1983. Boston: Allen & Unwin, Inc.

- Morse, Stephen S. 2003. Building academic-practice partnerships: The Center for Public Health Preparedness at the Columbia University Mailman School of Public Health, before and after 9/11. *Journal of Public Health Management* 9(5):427-432.
- Mossler, Mariana. 1996. Environmental hazard analysis and small island states. *Geographische Zeitschrift* 84(2):86-93.
- \_\_\_\_\_. 2003. Get out of town: A primer on New Jersey coastal evacuations. *The New Jersey Shoreline* 22: 2.
- Mustafa, Daanish. 2003. Reinforcing vulnerability? Disaster relief, recovery and response to the 2001 flood in Rawalpindi, Pakistan. *Environmental Hazards* 5:71-82.
- New Jersey Domestic Security Preparedness Act (NJSA App. A:9-77 et seq.). 2001. <http://www.state.nj.us/njoem/documents/appdx9.doc> (last accessed 21 September 2009).
- New Jersey Department of State. 2003. Press Release: CERT training helps prepare State employees to make a difference in times of disaster. 27 October.
- New Jersey Legislature. 2004. "Historical Information". [www.njleg.state.nj.us/legislativepub/history.asp](http://www.njleg.state.nj.us/legislativepub/history.asp) (last accessed 21 September 2009).
- New Jersey Register Ready. <https://www13.state.nj.us/SpecialNeeds/> (last accessed 21 September 2009).
- New Jersey Pinelands Commission. <http://www.state.nj.us/pinelands/reserve/> (last accessed 21 March 2009).
- New Jersey State Constitution 1947 (and amendments). 2004. [www.njleg.state.nj.us/lawsconstitution.constitution.asp](http://www.njleg.state.nj.us/lawsconstitution.constitution.asp) (last accessed 25 July 2009).
- Norris, Darrell A. 1987. Disaster Demographics. *American Demographics* 9(8):38-41.
- Ocean County Department of Planning (OCDP). 2009. Ocean County Databook (online reference). <http://www.planning.co.ocean.nj.us/databooktoc.htm>, (last accessed 25 September 2009).
- O'Keefe, Phil, Ken Westgate and Ben Wisner. 1976. Taking the "Naturalness" out of Natural Disasters. *Nature* 260:566-67.
- Oliver-Smith, Anthony and Susanna M. Hoffman. 1999. *The angry earth: Disaster in anthropological perspective*. New York: Routledge Press.

- Parker, S.G. and S.J. Byrne. 2000. Functional siloing: Towards a practical understanding of operational boundaries using critical systems heuristics. Proceedings: 1<sup>st</sup> International Conference on Systems Thinking in Management, Philadelphia, PA. pp. 503-507. <http://ftp.informatik.rwth-aachen.de/Publications/CEUR-WS/Vol-72/080%20Parker%20Siloing.pdf> (last accessed 5 June 2009).
- Peacock, Walter Gillis. 1997. Cross-national and comparative disaster research. *International Journal of Mass Emergencies and Disasters* 15(1): 117-133.
- Peacock, Walter Gillis, Samuel David Brody and Wes Highfield. 2005. Hurricane risk perception among Florida's single family homeowners. *Landscape and Urban Planning* 73:120-135.
- Pelling, Mark, ed. 2003. *Natural disasters and development in a globalizing world*. New York: Routledge Press.
- Perry, Ronald W. 1979. Evacuation decision-making in natural disasters. *Mass Emergencies* 4:25-38.
- \_\_\_\_\_. 1985. *Comprehensive emergency management: evacuating threatened populations*. Greenwich, Connecticut: JAI Press Inc.
- Petterson, Jeanine. 1999. A review of the literature and programs on local recovery from disaster. *Natural Hazards Research Working Paper #102*. Natural Hazards Research and Applications Information Center. Boulder, CO: University of Colorado.
- Phillips, Brenda D. 1993. Cultural diversity in disasters: sheltering, housing and long-term recovery. *International Journal of Mass Emergencies and Disasters* 11(1):99-110.
- \_\_\_\_\_. 1997. Qualitative methods and disaster research. *International Journal of Mass Emergencies and Disasters* 15(1):179-195.
- Pine, John C. 1997. Geographic Information Systems (GIS) in small communities: Application of GIS in emergency management. *Quick Response Report #99*. Natural Hazards Research and Applications Information Center. Boulder, CO: University of Colorado.
- Pisauro, Jr., Girard A. 2002. End home rule. *The Times of Trenton* (NJ). Editorial Section. 23 December.



- Platt, Rutherford H., Sheila G. Pelczarski, and Barbara K. R. Burbank, eds. 1987. *Cities on the beach: management issues of developed coastal barriers*. Chicago: The University of Chicago.
- Platt, Rutherford H. 1999. *Disasters and democracy: The politics of extreme natural events*. Washington D.C.: Island Press.
- Plowman, Terry. 2001. Danger! Coastal states get ready for a really rainy day—by cranking up their evacuation plans. Reprinted from *Planning*, December 2001. [www.intercom.net/~terrypl/evacuation-Planning.html](http://www.intercom.net/~terrypl/evacuation-Planning.html) (last accessed 21 September 2009).
- Psuty, Norb and Douglas D. Ofiara. 2002. *Coastal hazard management: Lessons and future directions from New Jersey*. New Brunswick: Rutgers University Press.
- Quarentelli, E. L. 1994. Draft of a sociological disaster research agenda for the future: Theoretical, methodological and empirical issues. Preliminary Paper #228. Newark, DE; University of Delaware Disaster Research Center.
- Quarentelli, E. L. 1997. Ten criteria for evaluating the management of community disasters. *Disasters* 21(1):39-56.
- Ragonese, Lawrence. 2003. Highlands protection a leading '04 issue. *The Star-Ledger* (NJ). *Morris*, 28 December: 31.
- . 2004. "Most at Mahwah hearing back a super-agency for Highlands". *The Star-Ledger* (Newark, NJ). *County News*, 21 January: 21.
- Reddick, Christopher G. 2008. Collaboration and homeland security preparedness: A survey of U.S. city managers. *Journal of Homeland Security and Emergency Management* 5(1): Article 22.
- Riad, Jasmine. 2000. Hurricane threat and evacuation intentions: An analysis of risk perception, preparedness, social influence, and resources. Manuscript.
- Reid, Walter V. Fikret Berkes, Thomas J. Wilbanks (Eds). 2006. *Bridging scales and knowledge systems: Concepts and applications in ecosystem assessment: A contribution to the millennium ecosystem assessment*. Washington, D.C.: Island Press.
- Rosenkoetter, Marlene M., Eleanor Krassen Coven, Brenda K. Cobb, Sheila Bunting, Martin Weinrich. 2007. Perceptions of older adults regarding evacuation in the event of natural disaster. *Public Health Nursing* 24(2): 160-168.

- Rubadiri, Lindiwe, Divine T. Ndumu and John P. Roberts. 1997. Predicting the evacuation capability of mobility-impaired occupants. *Fire Technology* 33(1):32-53.
- Rubin, Claire B. 1998. What hazards and disasters are likely in the 21<sup>st</sup> century – or sooner? *Natural Hazards Research Working Paper #99*. Natural Hazards Research and Applications Information Center. Boulder, CO: University of Colorado.
- Rusk, David. 2002. Sprawl and fair housing: New Jersey's unfinished agenda (presentation). The Annual Isadore Caneub Memorial Lecture in Planning. New Brunswick, NJ. 31 October. <http://www.gamaliel.org/DavidRusk/Rutgers%20talk%2010-31-02.pdf> (last accessed 27 July 2009).
- Savadove, Larry, and Margaret Thomas Buchholz. 1993. *Great storms of the Jersey Shore*. West Creek, NJ: Down the Shore Publishing.
- Schafer, Wendy A., John M. Carroll, Steven R. Haynes and Stephen Abrams. 2008. Emergency management planning as community collaborative work. *Journal of Homeland Security and Emergency Management* 5(1): Article 10.
- Schleifstein, Mark. 2009. U.S. Sen. Mary Landrieu: U.S. should adopt Netherlands-like policies for flood control. The Times-Picayune (New Orleans). 5 June. [http://www.nola.com/news/index.ssf/2009/06/us\\_sen\\_mary\\_landrieu\\_us\\_should.html](http://www.nola.com/news/index.ssf/2009/06/us_sen_mary_landrieu_us_should.html) (last accessed 3 September 2009).
- Schwartz, Rick. 2007. *Hurricanes and the Middle Atlantic States*. Springfield, VA: Blue Diamond Books.
- Simpson, Robert H. and Herbert Riehl. 1981. *The hurricane and its impact*. Baton Rouge: Louisiana State University Press.
- Smith, Stanley K. and Christopher McCarty. 1996. Demographic effects of natural disasters: A case study of Hurricane Andrew. *Demography* 33(2):265-275.
- Stallings, Robert A. 1997. Methods of disaster research: unique or not? *International Journal of Mass Emergencies and Disasters* 15(1): 7-19.
- \_\_\_\_\_, ed. 2002. *Methods of disaster research*. USA: Xlibris.
- Stansfield, Jr., Charles A. 1998. *A geography of New Jersey: The city in the garden, second edition*. New Brunswick, NJ: Rutgers University Press.
- Suro, Thomas P. Water-Supply Paper 2499 U.S. Department of the Interior U.S. Geological Survey Summary of Floods of 1992 December 11-12, 1992, in

- New Jersey. <http://ks.water.usgs.gov/pubs/reports/wsp.2499.sumnj1292.html> (last accessed 21 March 2009).
- Sylves, Richard T. 2004. A précis on political theory and emergency management. *Journal of Emergency Management*. 2(3): 27-32.
- The H. John Heinz III Center for Science, Economics and the Environment. 2000. *The hidden costs of coastal hazards: Implications for risk assessment and mitigation*. Washington, D.C.: Island Press.
- Tierney, Kathleen J., Michael K. Lindell, and Ronald W. Perry. 2001. *Facing the unexpected: disaster preparedness and response in the United States*. Washington, D.C.: Joseph Henry Press.
- Titus, James G. 1990. Greenhouse effect, sea level rise, and barrier islands: case study of Long Beach Island, New Jersey. *Coastal Management* 18:65-90.
- Tobin, Graham A. and Burrell E. Montz. 1997. *Natural hazards: Explanation and integration*. The Guilford Press: New York.
- Trafford, John E. 1995. Home rule in the '90's: Is it dead or alive. [www.njlom.org/homerule.html](http://www.njlom.org/homerule.html) (last accessed 27 September 2009).
- Tulloch, David. 2002. Environmental NGO's and community access to technology as a force for change. In *Community Participation and Geographic Information Systems*. Eds. William J. Craig, Trevor M. Harris and David Weiner. 2002. New York: Taylor and Francis.
- Turner, B.L. 1989. The specialist-synthesis approach to the revival of Geography: The case of cultural ecology. *Annals of the Association of American Geographers* 79 (1):88-100.
- Turner, B. L., et al. 1990. Two types of global environmental change: definitional and spatial-scale issues in their human dimensions. *Global Environmental Change* 1(1):14-22.
- Urbina, Elba and Brian Wolshon. 2003. National review of hurricane evacuation plans and policies: A comparison and contrast of state policies. *Transportation Research Part A* 37:257-275.
- U.S. Army Corps of Engineers (USACOE). 1963. Report on Operation High-Five: March 1962 Storm. Manuscript.
- \_\_\_\_\_. 2006. New Jersey Hurricane Evacuation Re-Study. Draft Manuscript.

- U.S. Department of Homeland Security (DHS). 2006. *Nationwide Plan Review: Phase 2 Report*. Washington, D.C.: U.S. DHS.
- U.S. Department of Transportation (USDOT) Federal Highway Administration (FHWA). 2002. Summary of the regional hurricane traffic operations workshops (held January – February 2002). Washington, D.C.: FHWA, U.S. DOT. [www.itsdocs.fhwa.dot.gov/JPDOCS/REPTS\\_TE/13788.html](http://www.itsdocs.fhwa.dot.gov/JPDOCS/REPTS_TE/13788.html) (last accessed 25 July 2009).
- U.S. Geological Survey. 2007. New Jersey tide telemetry system. <http://cmn.dl.stevens-tech.edu/> (last accessed 27 July 2009).
- U.S. Government Accountability Office (USGAO). 2008. Past experiences offer insights for recovering from Hurricane Ike and Gustav and other recent natural disasters. Report to the Committee on Homeland Security and Governmental Affairs, U.S. Senate. Washington, D.C.: USGAO.
- Watts, Michael. 1983. On the poverty of theory: natural hazards research in context. In *Interpretations of calamity*, ed. Hewitt, Kenneth. 1983. Boston: Allen & Unwin, Inc.
- Waugh, Jr., William L. 2000. *Living with hazards, dealing with disaster: an introduction to emergency management*. Armonk, NY: M.E. Sharpe.
- \_\_\_\_\_. 2006. Preface. *Annals of the American Academy of Political and Social Science*, 604(1): 6-9.
- Weaver, Donna. 2009. Many furious DOT to start Route 72 work in July. Atlantic City Press. 19 June.
- White, Gilbert F. 1973. Natural hazards research, In *Environmental risks and hazards*, Susan Cutter, ed. 1994. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Whitehead, John C., Bob Edwards, Marieke Van Willigen, John Maiolo and Kenneth Wilson. May 2000. Hurricane evacuation behavior: A preliminary comparison of Bonnie, Dennis and Floyd. Manuscript.
- Wilbanks, T.J., and D. Capistrano, et al. 2003. Dealing with scale, conceptual framework, Millennium Ecosystem Assessment, Kuala Lumpur. Washington, D.C.: Island Press, pp. 107-126.
- Wolshon, Brian. 2001. “One-Way-Out”: Contraflow freeway operation for hurricane evacuation. *Natural Hazards Review* 2(3): 105-112.
- \_\_\_\_\_. 2002. Planning for the evacuation of New Orleans. *ITE Journal* 72(2):44-49.

- Wolshon, Brian, Elba Urbina, and Marc Levitan. 2001. National review of hurricane evacuation plans and policies. LSU Hurricane Center, Louisiana State University: Baton Rouge, Louisiana.
- Wu, S., Najjar, R., & Siewert, J. 2009. Potential impacts of sea-level rise on the Mid- and Upper-Atlantic region of the United States. *Climatic Change* 95(1-2):121-138.
- Young, Oran R. 2002. *The institutional dimensions of environmental change: Fit, interplay and scale*. Cambridge, MA: MIT Press.

**APPENDIX A: MUNICIPAL SURVEY**

1. Jurisdiction\_\_\_\_\_ (on a separate sheet of paper).
2. What position(s) are authorized to order an evacuation in your jurisdiction? (e.g. mayor, chief of police, municipal OEM coordinator, etc.)  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. Does your jurisdiction have written plans specifically for coastal evacuations?\_\_\_\_\_
 

If so, what year were they first developed? \_\_\_\_\_

When were they last updated? \_\_\_\_\_

When were they last exercised? \_\_\_\_\_
4. If your jurisdiction does not have written plans specifically for coastal evacuations, what other methods are used to plan and prepare for evacuations in your jurisdiction?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
5. Since September 11, 2001, have your efforts for large-scale coastal evacuations
 

a. increased                      b. decreased                      c. stayed the same
6. If these efforts have increased, where are the initiatives or mandates originating (circle all that apply)?
 

a. Federal level

b. State level

c. County level

d. Municipal level

e. Other(pleasespecify)\_\_\_\_\_
7. Has your jurisdiction passed any new legislation since September 11, 2001 that impact coastal evacuation planning or execution? \_\_\_\_\_.
 

If so, please list:

- 
- 
- 
8. Since 1990, has your jurisdiction executed evacuations due to impending or actual coastal storms? If so, please list below.

Date Event (specify Tropical, Nor'easter, etc.)

- a.  
b.  
c.  
d.  
e.  
f.  
g.
9. How many of the evacuations listed in #8 were mandatory? \_\_\_\_\_ How many citations or arrests have been made by your jurisdiction for non-compliance? \_\_\_\_\_
10. How many of the evacuations listed in #8 were voluntary? \_\_\_\_\_
11. What does your jurisdiction employ to inform tourists and residents of evacuation procedures and/or evacuation orders?

<b><i>Method</i></b>	<b><i>Tourists</i></b>	<b><i>Residents</i></b>
<i>Presentations/talks</i>		
<i>Mailings</i>		
<i>Emergency AM radio</i>		
<i>Brochures</i>		
<i>Signs</i>		
<i>Exercises</i>		
<i>TV/radio announcements</i>		
<i>Newspaper articles</i>		
<i>Other (please specify)</i>		

12. Please summarize your opinion of the greatest challenges for your jurisdiction in preparing for or executing evacuations from coastal storms.

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13. Please summarize your opinion of how Federal, State and/or County governmental institutions may enhance your coastal evacuation planning or assist your jurisdiction in reaching your coastal evacuation planning and execution goals.

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14. Please provide any other comments you have regarding the planning for and execution of coastal evacuations in your jurisdiction or New Jersey.

15. If you are willing to do an “on the record” interview, please email me at [mariana2984@hotmail.com](mailto:mariana2984@hotmail.com).

**Thank you for your participation in this survey.**



## APPENDIX B: INTERVIEW QUESTIONS

1. In your opinion, what has been the greatest change in your jurisdiction's coastal evacuation planning process since 2001 (9/11)? Since Hurricane Katrina (2005)?
2. Which Federal programs/initiatives/actions have best helped your evacuation planning process since 2001 (list specifics activities and years)? DMA2000? NIMS? NRP?
3. Which State programs/initiatives/actions have best helped since 2001? EMPG? Special Needs Project? Any training or exercises? (list specifics)
4. Of the following, which would you enhance in your community as a priority? A) Special Needs Planning, b) evacuation route management (e.g. signs), c) professional training and education? d) public outreach, e) exercises, f)mitigation, g) other (specify \_\_\_\_\_).
5. What area of coastal evacuation planning do you feel may be disproportionately emphasized over other more urgent issues? A) Special Needs Planning, b) evacuation route management (e.g. signs), c) professional training and education? d) public outreach, e) exercises, f)mitigation, g) other (specify \_\_\_\_\_)
6. What do you see as the greatest impediment to enhancing coastal evacuation planning? A) need for increased Federal support/guidance , b) need for increased state support/guidance, c) need for increased inter-jurisdictional collaboration, d)increased funding (any source), e) better science/engineering/forecasts and warnings, f) other (specify \_\_\_\_\_).
7. Describe how great a factor politics is in your coastal evacuation planning process: Federal, State, local (scale of 1-5, 1 being none, 5 being driving force, 3 being neutral). Comments?
8. Are there any Federal/State initiatives of which you are aware that your jurisdiction does not qualify for or participate in that you would like to take advantage of?
9. What is the greatest challenge for coastal evacuation planning for your jurisdiction over the next 5 years, the next 10 years?
10. Do you have any other comments or questions?

## APPENDIX C: SURVEY DATA

### **PART I: 2004 and 2006 mailed surveys**

#### **Question #1: Identification of municipality**

	2004	2006	Total
Municipality (#of responses)	27	22	49

#### **Question #2: Authority to order evacuations**

Office	2004	2006	Totals by Response
OEM Coordinator	23	22	45
OEM Deputies	5	4	9
Mayor	16	15	31
Public Safety	6	8	14
City Council	0	1	1
Totals by Survey Year	50	50	

**Question #3: Have specific coastal evacuation plans/last update**

Responses	2004	2006	Totals by Response	Comments
Yes	23	20	43	<p>From the first survey, 19 updated post-9/11 (2002-2005), 8 exercised post-9/11 (2002-2005).</p> <p>From the second survey, 6 updated post-Katrina (2005-2006), 4 exercised post-Katrina (2005-2006)</p>
No	4	1	5	
Last Update 2006	N/A	6	6	
Last Update 2005	N/A	6	6	
Last Update 2004	15	5	20	
Last Update 2003	1	0	1	
Last Update 2002	1	1	2	
Last Update 2001	3	0	3	
Last Update 2000	1	0	1	
Last Update 1996	1	0	1	
Totals by Survey Year	49	39	88	

**Question #4: Other evacuation planning sources**

Responses	2004	2006
Local Fire Dept.	1	0
County Plan	1	0
Hazardous Weather Annex	1	0
NJ Hurricane Evacuation Study	1	0
Local EOP Evacuation Annex	4	0
Prior Experience	0	1
Mapping	0	1
Totals by Survey Year	8	2

**Question #5: Change in coastal evacuation planning efforts**

Responses	2004 Survey	2006 Survey	Totals by Response
Increased	5	10	15
Decreased	1	0	1
Stayed the same	22	12	34
Totals by Survey Year	28	22	

**Question #6: From where are initiatives originating?**

Responses	2004	2006	Totals by Response
No Answer	12	8	20
Federal Level	4	3	7
State Level	3	5	8
County Level	3	6	9
Municipal Level	4	9	13
Other	1 (warning systems)	1 (public demand)	2
No initiatives	0	1	1
Totals by Survey Year	27	33	

**Question #7: Additional legislation for coastal evacuations?**

Responses	2004	2006	Totals by Response
Yes	0	1 (pre-disaster response contracts)	1
No	27	21	48
Totals by Survey Year	27	22	

**Question #8: Jurisdiction-ordered evacuations since 1994? If yes, when?**

Responses	2004	2006	Totals by Response
No (# of Jurisdictions)	12	11	23
Yes (# of Jurisdictions)	13	10	23
1992 Nor'easter (before '94, but noted on 10 responses)	10	1	11
1993 Nor'easter	2	0	2
1995 Nor'easter	2	0	2
1996 Blizzard	2	0	2
1997 Unspecified	1	0	1
1999 TS Floyd	6	3	9
2000 Unspecified	1	0	1
2003 Blizzard	1	1	2
2003 Hurricane Isabel	1	2	3
2005 Nor'easter	N/A	2	2
2006 TD Ernesto	N/A	1	1
2006 Nor'easter	N/A	1	1
Totals by Survey Year	51	32	

**Question #9: How many of the evacuations in Question #8 were mandatory?**

	2004	2006
Mandatory evacuations	5	1

**Question #10: How many of the evacuations in Question #8 were voluntary?**

	2004	2006
Voluntary	21	13

**Question 11: What forms of notification are used?**

Responses	2004 For Tourists	2006 For Tourists	2004 For Residents	2006 For Residents	Totals by Response
Reverse telephone systems	2	1	2	2	7
Variable Message Signs	1	0	1	0	2
Presentations/Talks	3	4	12	13	32
Mailings	7	5	20	14	46
Emergency AM Radio	12	15	15	15	57
Brochures	15	18	19	20	72
Signs	17	16	18	17	68
Exercises	2	2	10	6	20
TV/Radio announcements	16	9	18	11	54
Newspaper Articles	8	10	13	11	42
Newsletters	1	0	1	0	2
Fire Sirens	2	1	2	3	8
Telephone Book information	1	0	1	0	2
e-mail	0	2	0	2	4
Route alerting	0	3	0	3	6
Totals by Survey Year	87	81	132	117	

**Question #12: Which were most problematic in events or exercises?**

Responses	2004	2006	Totals by Response
None	7	3	10
Reliable weather information	5	3	8
Communications: noise complaints from sirens	1	0	1
Communications: technological constraints	5	3	8
Communications: procedural constraints	1	3	4
Communications: legal constraints	1	1	2
Difficulties executing exercises	5	2	7
Financial constraints	6	3	9
Adverse public reaction	3	3	6
People didn't follow orders	0	3	3
Lack of agency cooperation	0	1	1
Unspecified	0	1	1
Totals by Survey Year	34	26	



**Question #13: How have you overcome problems with evacuations/exercises?**

Responses	2004	2006	Totals: Negative Outcome	Totals: Positive Outcome
No Answer	7	5	12	
Have not overcome them	4	7	11	
State Assistance	2	1		3
County Assistance	2	1		3
Federal Assistance	1	0		1
Local Initiative	6	6		12
Other	3	0		3
Totals by year and outcome	25	20	33	22

**Question #14: Greatest challenges in coastal evacuations.**

Responses	2004	2006	Warning and Notification	Planning Process	Resources
Convincing people to evacuate	14	8	22		
Finances	1	1			2
Preparedness Efforts	1	0		1	
Public Education	3	7		10	
Quality weather information	1	0			1
Lead time/calling evacuation	3	3	6		
Good information (general)	1	0			1
Sufficient staffing	1	0			1
Communications during an event	2	0			2
Involving political officials	1	0		1	
Roadway Infrastructure and traffic	7	7			14
Sheltering	0	2			2
Inter-jurisdictional collaboration	0	1		1	
Pet/Animal planning	0	1		1	
Total by Survey Year and General Category	35	30	28	14	23

**Question #15: Needs from Federal, State and County Government to assist locally.**

Responses	2004	2006	Totals by Response
Nothing	2	1	3
Assistance with evacuation routing	2	7	9
Exercise support	2	2	4
Promote interagency/jurisdictional cooperation	1	1	2
Grants/funding	13	5	18
Assist with LEPC development	1	0	1
Education for responders	1	0	1
Public outreach	7	1	8
Provide need-based aid	0	1	1
Technical support for alert and warning	0	2	2
Regional shelter planning	0	2	2
Animal Planning	0	1	1
Continuity in State staff	0	1	1
Need UASI designation	0	1	1
Increase local staffing	0	1	1
Increase signage	0	2	2
Totals by Survey Year	29	28	

**Question #16: Additional comments?**

Responses	2004	2006	Totals by Response
None	1	1	2
More lead time for decision-making	4	0	4
More exercises	1	2	3
Responder training	1	0	1
Evacuation routing	1	1	2
Interagency cooperation	3	0	3
Timely weather information	2	0	2
State coordination for planning efforts	1	2	3
Dune replenishment	1	0	1
Ability to reach trapped people	1	0	1
Public outreach	2	3	5
Overall feasibility	1	1	2
Continuity of staff at State level	0	1	1
Funding	0	2	2
Re-entry planning	0	1	1
Totals by Survey Year	19	14	

**Question #17: Willing to do an interview**

Responses	2004	2006
Yes	9	12
No	18	10

**PART II: Interview Question Summaries – 2008 (Tallied answers only)**

**Question #4: Planning priorities – Interviewee responses**

Item	First	Second	Third	Fourth	Fifth	Sixth	Total
Special Needs Planning		1					1
Evacuation Route Management	3		1				4
Professional Training		1	2			1	4
Public Outreach	5	2	1				8
Exercises		1			1		2
Mitigation	1			1			2
Other		1*	1**	1***			3

\*shelters

\*\*communications tests

\*\*\*shelter planning

**Question #5: Planning initiatives identified as disproportionately emphasized.**

Item	First	Second	Third	Fourth	Fifth	Sixth	Total
Special Needs Planning	4						4
Evacuation Route Management	1						1
Professional Training							
Public Outreach							
Exercises							
Mitigation	1						1
Other	4						4

**Question #6: Greatest impediment to enhancing planning**

Item	First	Second	Third	Fourth	Fifth	Totals
Federal Support	2				1	3
State Support	1	4				5
Inter-Jurisdictional Collaboration	2	2	2			6
Increased Funding	1		1	2		4
Science		2	1		1	4
Other	1* 2** 1***		1****			5

\*Public Outreach

\*\* Shelter planning

\*\*\* Infrastructure

\*\*\*\* Money needs to be spent in appropriate areas

**Question #7: Political influence in planning**

Item/ Rank	1	2	3	4	5
Federal	3		2		1
State	2		2	1	1
Local	2	1	2	1	1

**Question #9: Greatest challenges in upcoming years.**

Item	Total
Sheltering	2
Professional education	1
Compliance with evacuation orders	3
Realistic evacuation timing	2
Lack of experience	1
Infrastructure improvements/road capacity	3
Increasing population	1
Public Outreach	2
Debris management	1
Re-entry planning	1

**APPENDIX D: INSTITUTIONAL REVIEW BOARD APPROVAL**

**RUTGERS UNIVERSITY**  
**Office of Research and Sponsored Programs**  
**ASB III, 3 Rutgers Plaza, Cook Campus**  
**New Brunswick, NJ 08901**

June 17, 2004

**P.I. Name:** Mossler  
**Protocol #**E04-437

Mariana Mossler  
161 Church Street  
Richlandtown PA 18955

Dear Mariana Mossler:

**Notice of Exemption from IRB Review**

**Protocol #** E04-437

**Protocol Title:** "Evacuation of Storm-Threatened Coastal Populations in New Jersey: An Assessment of Institutional Mechanisms"

The project identified above has been declared exempt from review by the IRB under the provisions of Federal Regulations 45 CFR 46.

**Exemption Date:** 6/16/2004

**Exempt Category:** 2, 3

This exemption is based on the following assumptions:

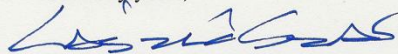
1. that the materials you submitted to the Office of Research and Sponsored Programs (ORSP) provide a complete and accurate account of how human subjects are involved in your project.
2. that you will carry on your research according to the procedures described in those materials.
3. that you will report to ORSP any changes in your procedures that would remove the project from the exempt category and make it subject to IRB review.
4. that if such changes are made, you will submit the project for IRB review.
5. that you will immediately report to the ORSP any problems that you encounter while using human subjects.

**Additional Conditions:** None

**Failure to comply with these conditions will result in withdrawal of this approval.**

The Federal-wide Assurance (FWA) number for the Rutgers University IRB is FWA00003913; this number may be requested on funding applications or by collaborators.

Sincerely yours,



Laszlo Szabo, CIP  
Sponsored Programs Administrator  
szabo@orsp.rutgers.edu

cc: Ken Mitchell

## CURRICULUM VITA

**Mariana Leckner**

### **Colleges Attended:**

1991-2009	Rutgers University, Ph.D. Geography
1982-1986	University of Virginia B.A. International Relations
1988-1990	University of Virginia M.A. Marine Affairs

### **Occupation:**

2003 – present	Assistant Professor, Program Director (Science). American Military University, Charles Town, West Virginia.
2006 – present	President, Leckner Consulting LLC.

### **Publications:**

Mossler, Mariana I. 2004. "Get out of town: A primer for New Jersey coastal evacuations". *The Jersey Shoreline* Vol. 23, No. 1, Winter 2004.

Mossler, Mariana I. 1999. "Hurricane simulation efficacy for increased event preparedness: U.S. Virgin Islands". *Middle States Geographer* Vol. 32.

Mossler, Mariana I. 1996. "Environmental hazards analysis and small island states: Rethinking academic approaches". *Geographische Zeitschrift* 84(2):86-93.

Smith, David E. and Mariana I. Mossler. 1989. "Blue crab recruitment dynamics in Chesapeake Bay: A review of current knowledge". Virginia Sea Grant College Program Publication no. VSG-89-01.