APPLYING THE INDIVIDUAL UNDERSTANDING AND RESPONSE FRAMEWORK TO SEA-LEVEL RISE SOUTH OF DELAWARE'S INDIAN RIVER INLET

by

Anne Goodman

A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Master of Science in Disaster Science and Management

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Anne Goodman

Approved:

___________________________________________________________________________
Joanne M. Nigg, Ph.D.
Professor in charge of thesis on behalf of the Advisory Committee

Approved:

___________________________________________________________________________
Maria Aristigueta, D.P.A.
Director, School of Public Policy and Administration

Approved:

___________________________________________________________________________
George H. Watson, Ph.D.
Dean of the College of Arts and Sciences

Approved:

___________________________________________________________________________
James G. Richards, Ph.D.
Vice Provost for Graduate and Professional Education
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LIST OF ABBREVIATIONS

SLR - Sea Level Rise
DCP – Delaware Coastal Programs
DEMA – Delaware Emergency Management Agency
DSLRAC – Delaware Sea Level Rise Advisory Committee
NOAA – National Oceanic and Atmospheric Association
SGD – Sea-Grant Delaware
DNREC – Delaware Department of Natural Resources and Environmental Control
FEMA – Federal Emergency Management Agency
PDE – Partnership for the Delaware Estuary
ASBPA – American Shore and Beach Preservation Association
CIB – Center for the Inland Bays
ABSTRACT

This project explored residents' perceptions, opinions and attitudes towards Sea-Level Rise (SLR) in communities located less than 10 miles from the Delaware's Atlantic coast south of the Indian River Inlet. Data analysis used in-depth, individual, in-person interviews to identify factors that influenced area residents’ understandings, opinions and responses to the threat of SLR and how these factors did so. Interviews discussed people's coastal land-use involvement, coastal concerns and opinions with a focus on SLR issues, Hurricane Sandy and evacuation decisions. Data consisted of four preliminary interviews conducted in April 2013 and 20 interviews additional interviews in September and October 2013. The Individual Understanding and Response Framework (IURF) was used to guide analysis, and includes factors such as direct experience, communications effectiveness, local social networks, wider concerns and values, perceived responsibility and capacity. The framework further identifies which factors attenuate the risk understanding versus amplify it, and which factors drive or constrain individual responses. Data analysis concluded that though the IURF generally applied to the data accurately, it seemed that previously-held beliefs/values, direct hazard experience, prior interest, source-exposure and personal relevance had the greatest impact on people's perceptions, awareness and engagement with SLR issues. These categories also influenced each other in the same manner that the IURF suggested. The findings overall imply that because people do not feel they have access to unbiased, understandable and reliable information, they ultimately turn to their own personal experiences to formulate
their opinions and points of views on SLR.
Chapter 1

INTRODUCTION

Sea-level rise (SLR) is defined as the global mean increase in ocean-levels due to melting glaciers, ice-caps and polar ice-sheets as well as thermal expansion, all of which are linked to climate change (Valencik 2010; Haddow 2009). According to Delaware Coastal Programs (DCP), research suggests that SLR has the potential to affect multiple coastal areas around the world, with some places already seeing major impacts. By 2100, the global mean sea-level is projected to rise between .18 and .59 meters above the 1980-1999 average, affecting populations around the globe (Montgomery 2013a). Within the United States, multiple communities as well as entire states have begun to address the phenomenon with mitigation and adaptation planning. One of these states is the State of Delaware, which is particularly vulnerable to SLR effects because it is one of the lowest-lying coastal states in the country and is already undergoing very high rates of coastal erosion. Climate changes are projected to produce a range of consequences in the Mid-Atlantic region of the US where Delaware is located. These symptoms range from a SLR of 3.5 to 5 feet, extreme storms, drought and ocean acidification; all are expected to accelerate after the year 2050 (Montgomery 2013a). Additionally, the state is sinking, meaning the rate of SLR is double (.13 in/yr) that of the global mean (.06 in/yr) (DSLRAC 2012; DEMA et al. 2012; DCP 2011).

In 2009, scientists from the Delaware Coastal Programs used Light Detection and Ranging (LiDAR) data elevation data to create interactive, SLR inundation zone maps.
LiDAR is a remote sensing method that uses pulsed laser light to measure ranges (variable distances) to the Earth. These light pulses, combined with other data recorded by the airborne system, generate precise, three-dimensional information about Earth's shape and surface characteristics. (NOAA 2010; DSLRAC 2012; DCP 2012; Valencik 2010). They used a bathtub model to project Delaware’s potential future sea-level rise inundation zones at .5-meter SLR increments. According to projections, a .5-meter rise would inundate 8% of the state, while a 1-meter rise would inundate 11%. This includes parts of all three Delaware counties (DSLRAC 2012; DCP 2012; Valencik 2010). There are limits to the model, however – the bathtub model only considers elevation. This model ignores soil-type, vegetation, tidal forcing, downstream flow, or other factors that could possibly change water levels. Even with these limitations, the maps provide invaluable information that aims to inform future planning (DCP 2012).

The Bethany-Fenwick area of Delaware (Figure 1.1) lies at the southeast corner of bordered by the Atlantic Ocean and the Indian River Inlet bay. Figure 1.1 shows both the area and the SLR scenarios for that area. Approximately 5,966 people live in this proposed area of study (this number includes the populations of towns and their subdivisions located within a 10-mile radius of Bethany Beach) year-round. Nevertheless, approximately three quarters of the houses along the coast are seasonal vacation homes, which means that in the summertime the population increases dramatically (U.S. Census 2010). the state of Delaware, The beach communities along the Atlantic Ocean are developed with a dense local street network with most access being from the north. There is also limited access to the west, and to the south via the Chesapeake Bay Bridge and Tunnel. Because of this geography, here is limited access to the beach communities.
During severe weather, this may be compounded by closures at the bridges across the canal and the Indian River Inlet (McNeil and Archibald 2012).

The area is just south of the Indian River Inlet Bridge/State Route 1, a main transportation artery that connects the northern and southern parts of the state. The bridge floods during major storms, including during Superstorm Sandy when waves buried the road under 6 feet of sand (Montgomery and Murray 2013). This flooding cuts off the main routes for area residents as well as tourists, and makes it harder for emergency responders to access the area from the north during hazardous situations. During interviews, there were many concerns over being isolated during rain events because other major routes into the area (routes 54 and 26) also tended to flood (these concerns
are discussed more fully in the results section). Ultimately, these communities become especially vulnerable to SLR, especially because of their low-lying locations adjacent to the Atlantic Ocean, the Delaware Bay and multiple rivers and tributaries. Since Sandy, the Army Corps of Engineers has widened the north beach along Rt. 1 in order to protect the highway from future flooding (Montgomery and Murray 2013).

DCP's assessment model predicts that SLR will significantly impact the Bethany-Fenwick area in the coming years; however, there is much uncertainty regarding exactly when this will happen (DSLRA 2012; DCP 2012). Currently, a large dune system protects the Bethany-Fenwick area from the Atlantic Ocean, but water from the Indian River Inlet Bay often floods parts of the area during heavy-rain events (Montgomery and Murray 2013a). Because of these projections, policy-makers and agencies are in the process of discussing appropriate policies to address potential SLR issues in the future. Fortunately, in order to address the state’s vulnerabilities many people have documented much of coastal managers’ recent efforts regarding Delaware's coasts, both pre-Sandy and post-Sandy. Multiple state and local-level organizations and government agencies have collaborated with each other to protect Delaware’s lands and empower coastal communities in the protecting themselves and their shorelines.

There has been conflict between these different groups and residents, however, regarding the best way to handle coastal-management in the face of vulnerability. For example, some real-estate agencies and pro-development groups have vehemently protested any regulations restricting shoreline development, while other groups argue that those regulations are necessary to reduce vulnerability and improve shoreline sustainability in the face of SLR (Montgomery and Murray 2012a). One of the questions
this project tries to address is whether public outreach and engagement efforts have been effective in informing residents of the various SLR coastal management issues and risks in the Bethany-Fenwick area of Delaware. The findings will have important implications for future planning approaches, especially because so much of the area's cultural heritage and economy is intrinsically linked to being close to the shore. Additionally, a recent Sea Grant study estimated that Delaware's ocean coastline generates nearly $7 billion annually and provides a tenth of the state's total employment (SGD 2013).

Community awareness and involvement in adaptation/mitigation planning is integral to successful implementation (Beatley 2009). In order to effective engage community residents in this planning, it is important that policy-makers and community outreach officials understand how their target population comprehends and responds to the threat of SLR. Thus, this explanatory case study analyzed data collected from first-person interviews with Bethany-Fenwick area residents using the Individual Understanding and Response Framework (IURF) in order to explain how interviewees form their understandings and decide to respond to SLR. The findings can then inform future communication and community engagement techniques in the Bethany area and other SLR-threatened areas. Specifically, this project asked area residents what and how they think about associated risks and approaches to sea-level rise in their communities, including whether the damage from Superstorm Sandy affected their outlooks. Thus, the findings will provide relevant information for coastal-management policies and practices in the Bethany-Fenwick areas and elsewhere.
1.1 Research Objectives

1. To identify factors that influence Bethany-Fenwick area residents’ understandings, opinions and responses to the threat of SLR

2. To explain how these factors influence Bethany-Fenwick area residents’ understandings, opinions and responses to the threat of SLR

1.2 Outline of Thesis Document

The document will first discuss a review of the literature on SLR and the Bethany area, including background of the area’s history and current efforts to deal with SLR; past studies on SLR and community engagement conducted prior to the proposed; models of understanding used to explain understanding and response; and the importance of communication and stakeholder engagement in SLR planning. The next chapter will cover the methodological details behind explanatory case-studies, first-person interviewing, sampling and analysis. Lastly, the discussion chapter presents the findings and their implications on SLR policy and outreach in the Bethany-Fenwick area and elsewhere. A final chapter will summarize the contributions and present conclusions.
Chapter 2
A REVIEW OF THE LITERATURE

This literature review’s background section first covers the history of the Bethany area with respect to flooding and severe weather. It also discusses current efforts throughout the State of Delaware to mitigate the effects of SLR and involve Delaware citizens, communities and policy-makers with the issue. The past surveys section discusses studies conducted previously and the implications their findings have on the proposed study. The models of understanding section introduces the Protective Action Decision Model, the Social Amplification of Risk model and the Individual Understanding and Response Framework and discusses their limitations and contributions to explaining human understanding and behavioral responses. Lastly, the communication and stakeholder engagement section discusses issues with climate change/SLR and community engagement as well as why this engagement is important to successful adaptation/mitigation planning.

2.1 Background

Historically, the Bethany-Fenwick area (like much of the Delaware coast) has been exposed to hurricanes and nor’ easters as well as their resultant flooding (Meehan 2008; Montgomery and Murray 2012b; Montgomery and Murray 2012a). The most destructive event, prior to Hurricane/Superstorm Sandy in 2012, was known as the ”Storm of '62”, which stalled off the coast of Delaware for five high-tides, causing
massive flooding, beach erosion and building/boardwalk devastation (Meehan 2008; George 2007; Oates 2006). After the storm, people in the Bethany-area were much more aware of coastal hazards and began undertaking preparedness activities; however, as the years went on without another major storm, people felt that the danger had passed and discontinued their actions (George 2007; Oates 2006). This has generally been the case throughout the area's history. However, most residents take nor'easters in stride and do not evacuate their homes (Meehan 2008; George 2007). This was also the case in Sandy.

This map of my study area (Figure 2.1) illustrates FEMA's previously established flood zones (in blue hatching). Repetitive Flood Loss properties and Severe Repetitive Flood Loss

Figure 2.1: Study Area and Flood Risk
properties are marked on the map as well to illustrate the area's previous flood history. FEMA's definition of a Repetitive Loss property is any property that:

...is covered under a contract for flood insurance made available under the National Flood Insurance Program (NFIP) and has incurred flood related damage on 2 occasions, in which the cost of the repair, on the average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event; and (c) At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage (Carlson 2014).

Severe Repetitive Loss properties have the same definition, except:

...4 or more separate claims payments [had to] have been made under flood insurance coverage with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or... for which at least 2 separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure (Carlson 2014).

The lists of these properties on the map are from the National Flood Insurance Program (On the map legend, these are referred to as “Bureau-Net”) and FEMA, which is considered to have a more accurate listing according to the definitions available (Carlson 2014).

Regardless of these flood hazards, the Bethany-Fenwick area relies mainly on tourism and recreation for revenue and livelihood, which means the state considers the area a good investment and has priority when it comes to state-aid (Montgomery and Murray 2012; Oates 2006; George 2007; DSLRAC 2012). Because of this, the area usually recovers quickly from storm events (Montgomery and Murray 2012; Oates 2006; George 2007; DSLRAC 2012). But, the future projections indicating that these storm-surges and tidal flooding could worsen and then engulf specific portions of the land have major implications for the tourism and recreation economies in both the Bethany-area and for the entire state of Delaware. Figure 2.2 (p. 10) indicates current levels of storm
surge associated with different levels of storms according to the Army Corps of Engineers – SLR could potentially increase these levels of storm surge. The Delaware Department of Natural Resources and Environmental Control (DNREC) has made it clear that real preparations for the effects of SLR have to happen at the local level using customized, small-scale mitigation and adaptation projects and programs (Valencik 2010). Delaware towns and counties will therefore be largely responsible for dealing with SLR, making the findings of this project very important (Valencik 2010).

Since the Storm of '62, there has been a much more interdisciplinary effort by
state agencies to help Delaware's beach communities prepare for coastal hazards. Currently, Sea Grant Delaware (SGD), DNREC, NOAA, the Army Corps of Engineers, the Federal Emergency Management Agency (FEMA), the Coastal Zone Management Program and state and local officials/politicians all play a role in what happens along the coasts. Specifically, DNREC has made efforts to include future issues of saltwater intrusion, coastal storm-damage and coastal inundation into their planning as well as developed grants for local governments to start building up their cities and towns to prepare for flooding (Hill 2013; Valencik 2010). They have also made some controversial proposals, one requiring anyone selling a property to warn buyers the home could be victim of future SLR (Hill 2013).

Additionally, Governor Jack Markell participates in the Task Force on Climate Preparedness and Resilience, a group of eight governors and 18 local government or tribal leaders from across the US. The group was formed in order to draw up recommendations for modernizing federal programs to improve federal, state and local readiness for weather extremes and climate-shift adaptation. In early December 2013, Gov. Markell sent task force leaders a list of steps Delaware has already taken in regards to climate-change preparations, which included the sea-level rise vulnerability assessment conducted by DNREC’s SLRAC (Montgomery 2013c; DSLRAC 2012). Additionally, the list included recommendations such as a modernization of Army Corps of Engineers channel dredging policies to support regional, coastal and habitat protection projects; giving a priority to cleanups of contaminated sites in flood-prone areas; assuring that federally subsidized transportation projects include changing assumptions in design decisions; and including sea level rise in National Flood Insurance Program models and
maps (Montgomery 2013b).

Additionally, SGD has done quite a bit of recent work doing both community outreach and SLR/climate change research. In addition to their annual reports on the state of Delaware's coastline, one of their publications is a report on the coastal communities' economic contributions to the state that will serve as a baseline to monitor coastal development over time as economic conditions change (Latham and Lewis 2012). Another is a strategic plan for 2014-2017, designed to provide detailed outcomes and targets for tracking their progress and measuring results in serving Delaware's coasts through scientific contributions (SGD 2012). In addition, the Partnership for the Delaware Estuary (PDE) has provided multiple workshops and research on Living Shorelines, which are natural alternatives to shoreline-stabilizing structures, like bulkheads. They are designed to manage shoreline erosion while also providing fish and wildlife habitats (PDE 2012). The towns of Bowers Beach and Lewes, DE among multiple other communities in other states, have implemented similar measures using a variety of different localized engagement techniques (Vaughan 2012; Coastal Services 2012; Moser and Ekstrom 2011; Coastal Services 2011; NOAA 2010; Valencik 2010; Coastal Services 2010: Florida; Coastal Services 2010: Oregon and Maine; Coastal Services 2009; NOAA 2009; Center for Science in the Earth System 2007).

In 2010, DNREC secretary Collin O'Mara formed Delaware's Sea Level Rise Committee (DSLRAC), charged with formulating a comprehensive SLR adaptation plan for the state, which is still in development. The committee consists of representatives from state agencies, business groups, environmental groups and elected officials, and is responsible for drafting and implementing recommendations that will help to minimize
SLR risks in Delaware. They have since provided workshops, research compendiums, and a vulnerability assessment of Delaware's coasts to SLR (DSLRAC 2012; DCP 2013). These publications are all aimed at community outreach and providing detailed, informative data to professionals, practitioners, politicians and residents regarding the threat to Delaware's coasts. Just before Superstorm Sandy hit the Delaware coasts, there had also been two major series of articles published in Delaware's main newspaper – The News Journal – focusing on the dangers the coast faced from SLR and climate change. Much of the reporting detailed the current challenges facing coastal managers, policymakers and coastal residents as they faced rising tides and increasing frequency of flooding in Delaware (Montgomery and Murray 2012; Montgomery and Murray 2012a).

The most recent developments in SLR coastal management stem from the destruction caused by Superstorm Sandy. The Army Corps of Engineers recently constructed a 25 ft-wide, 16 ft-high dune stretching 3,500 ft along the north shore of the Indian River inlet. The project is designed to provide this part of the inlet with more protection from erosion and flooding, since ocean erosion naturally depletes the dune. This depletion then allows ocean water and sand to flood Route 1 during major storms – during Superstorm Sandy, the bridge was closed for 5 days from flooding water and sand build-up. The dune-construction project has been under construction throughout 2013 and has recently been completed (Murray 2013; Montgomery and Murray 2013). Since Sandy, there has been a series of beach repair and extension projects along the ocean resort coast involving 1.85 billion cubic yards of sand (Montgomery and Murray 2013a). Fenwick Island is also currently seeking FEMA funding to elevate 3 bungalows near the Assawoman Bay, though only a small fraction of FEMA hazard mitigation funding from
Sandy will come to Delaware. Additionally, only a fraction of applicable projects will be selected for this funding (Montgomery and Murray 2013a).

Additionally, FEMA has slated $30 million in Sandy relief aid for three separate areas in the state, one of which includes the inlet dune project. Another includes sand-replenishment projects for selected beaches for Lewes to Fenwick (Murray 2013a). Sand-replenishment, however, has also come under criticism because it is funded by federal taxpayer dollars and has been since the 1980s. Some, including Delaware governor Jack Markell, have questioned the public benefit and future sustainability of continuous nourishment for some of Delaware's beaches, particularly private ones (Montgomery 2013b; Montgomery and Murray 2013b). Overall, many agencies and organizations in Delaware (and other states) have been very active in SLR community engagement and public policy, but short-term development interests have conflicted with environmental and long-term sustainability. Even in the most threatened areas on Delaware's coast, a retreat strategy has not been given much focus – rather, an adaptive approach has been given more attention (Montgomery and Murray 2013b).

Despite these efforts and actions, however, Delaware’s county governments have continued to approve ever greater amounts of development in vulnerable areas to raise revenue. According to the News Journal, DNREC has continually urged counties to discourage development in these threatened areas. However, Sussex County in particular has seen significant amounts of development along the coasts (Montgomery and Murray 2012; Montgomery and Murray 2012b). Both local and statewide real estate and tourism economies have benefited from this development, making the SLR inundation zone projections unpopular in some sectors. But while this development has benefited the
economy, increasing structural building development combined with SLR and increasing storm frequency and magnitude has worsened the state's already high rate of coastal erosion (Montgomery and Murray 2012b; Montgomery and Murray 2012; George 2007; Oates 2006).

Currently, there seems to be some contention between the majority of Sussex County's Government and many of the coastal municipality governments/citizens. The general impression from my interviews (as well as unofficial conversations with people who have been involved with Sussex County government) is that within-government there is a great emphasis on economic values (specifically money) and property-rights. Additionally, Sussex County council reportedly does not consider SLR to be a threat, let alone an existing phenomenon. Therefore, many coastal municipal government agencies who do believe that they are under threat from SLR are trying to take this into their future plans ultimately without county-level support. Also, Sussex County has been developed as a patchwork of small municipalities, which often means that individual towns have trouble completely addressing some flood issues that arise in their area because of inter-municipality drainage problems – sometimes, part of the reason municipalities have flood issues is because of something being done over in the next town. Without county support, coordination between municipalities to address flooding (especially SLR threats) is more difficult.

As a result of Sussex County's significant amounts of area development over the past few decades (especially as a coastal retirement/tourist destination – see Figure 2.3 and Table 2.2), many developers have filled in surrounding marshlands in order to build more homes in places like Fenwick Island and South Bethany. Additionally, lax county
regulations have made it easier to build along the coasts, leading to excessive structuring along the beaches. For example, all 65 homes in South Bethany were built on the ocean side of the established building-line (since the 1984 Beach Preservation Act) rather than the inland side, and lawmakers and coastal residents have resisted efforts to tighten regulations preventing further construction. Many residents have leveled-out the natural protective dunes that normally serve as a buffer between the rough ocean waves and coastal development, and in their efforts to thwart flooding on their own property they often fill in/build up their own yards to prevent water from puddling/pooling on

Figure 2.3: Delaware Wetland Loss
their own property. Unfortunately, this pushes water onto their neighbor’s property and adds to pre-existing flooding issues. Fortunately, some municipalities have made efforts/regulations to manage these issues and increase pervious/porous surfaces to help with drainage and flooding (Montgomery and Murray 2013b; Montgomery and Murray 2012; Montgomery and Murray 2012a; Valencik 2010; Oates 2006).

Table 2.1: Sussex County Area Development Statistics 2000-2010 (U.S. Census 2010)

<table>
<thead>
<tr>
<th>Location</th>
<th>% Population Increase</th>
<th>% Increase in # of Housing Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of Delaware</td>
<td>14.60%</td>
<td>18.30%</td>
</tr>
<tr>
<td>Sussex County</td>
<td>57.20%</td>
<td>35.00%</td>
</tr>
</tbody>
</table>

SLRAC has also attempted to add to land sale contracts property-owner warnings about permanent flooding – the attempt collapsed in 2013 after facing opposition from business and conservative groups. The influx of people and development has increased the risk in coastal areas, including the Bethany-Fenwick area, due to the fact that so many people are concentrated in an already vulnerable place (Montgomery and Murray 2013b; Montgomery and Murray 2012; Montgomery and Murray 2012a; Valencik 2010; Oates 2006). Additionally, Sussex County regulations currently only require new homes to be built at FEMA-designated Base-Flood-Elevation (BFE) rather than being built with freeboard. New Castle and Kent Counties require homes be built with 1.5 feet above BFE. That being said, individual communities can adopt their own BFE standards – for example, Henlopen Acres (an oceanfront community outside Rehoboth, DE in eastern Sussex County) requires 3 feet above BFE (Carlson 2014). This provides some free-
board for homes to prevent damage from flooding should water-levels go above this level. Because Sussex County does not require free-board, SLR may put homes at risk in the future as flood-levels rise.

Another issue in the area is that FEMA has updated its flood-maps since Superstorm Sandy. These maps indicate which properties are located within the boundaries of FEMA-designated floodplains throughout the United States – these indications are then used to set the National Flood Insurance Program rates for the properties in addition to minimum building elevation requirements. FEMA's recent changes to the maps in the state of Delaware threaten to increase flood insurance rates for approximately 46,000 properties, 30,000 of which are located in Sussex County (Montgomery and Murray 2013c). Many of these properties are located in the study-region south of the Indian River Inlet. These changes, which the Natural Resources Defense Council consider to more accurately illustrate the true flood-risk of US properties, take effect in 2014. Additional changes that are currently underway or planned include a phased elimination of subsidies for non-primary residence homes built before the community's first flood-insurance rate maps take effect, along with those for businesses and repeatedly damaged properties (other properties with federally subsidized rates will lose the discounted insurance premium if sold); rates for new policies that are based on actual risk of flooding and damage; an increase in the cap on annual premium increase to 20%, up from the previous 10% limit; provisions for monthly payments for policy-holders without an annual escrow payment requirement from leaders. These changes could potentially threaten the future economic viability of Sussex County beach communities, especially because of how many second-homes there are in the area as well
as retirees who live there year-round (Montgomery and Murray 2013c).

2.2 Past Surveys

Others researchers in the past have also conducted surveys and interviews to gain information on people’s attitudes and concerns on climate change and SLR. The surveys listed below are the most directly relevant to the subject under study and are illustrative of some of the previous findings/study methods related to climate change, sea-level rise, opinion and understanding.

In the early 1990s the University of New Orleans conducted a survey with local residents for the state’s Department of Natural Resources to assess people’s risk awareness and engagement with SLR issues in their community (Emmer et al 1992). Maine and Oregon conducted interdisciplinary and mixed-methods studies assessing people’s engagement and awareness of climate change and SLR (Coastal Services 2009). Then in 2009, DCP, the National Oceanic and Atmospheric Administration (NOAA) and Responsive Management supported DNREC by funding telephone surveys throughout the state of Delaware to gauge residents' opinions on SLR and climate-change (Responsive Management 2010). Most recently, the Yale Project on Climate Change to look at how people see their local climate and how that matches climate conditions that have been recorded over time (Murray 2013b; Leiserowitz et al. 2012). Table 2.2 summarizes the methodologies from each of these surveys. And Table 2.3 summarizes their findings.

The findings of the Delaware survey are particularly important to this proposed research because in the three years since the study took place, there has been increased
attention and outreach to the public about these issues in the state. There have also been increasingly frequent damaging storms and many instances of flooding throughout the state, especially along the coasts. The relevancy and direct experience portions of the IURF in this case could reveal more detail on residents’ attitudes toward SLR. The survey revealed that coastal residents were more concerned about SLR effects than non-coastal, and the proposed research aims to provide insight into exactly why this was.

Table 2.2: Past Survey Methodology

<table>
<thead>
<tr>
<th>Survey</th>
<th>Reference</th>
<th>Means</th>
<th>Targeted Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>U of New Orleans</td>
<td>Emmer et. al 1992</td>
<td>Administered 50-item telephone questionnaires to New Orleans registered voters in the Barataria Basin first, and then to public officials (elected and appointed – state representatives, parish council, town aldermen, levee and port commissioners) in the same area. The same questionnaire was administered to both samples but with 10 additional questions for public officials.</td>
<td>Local coastal property owners and elected/appointed municipal officials</td>
</tr>
<tr>
<td>Oregon</td>
<td>Coastal Services 2010: Oregon and Maine; Coastal Services 2009: Oregon</td>
<td>Worked with teams of scientists, faculty, educators, coastal managers and committees of stakeholders to design surveys, focus groups and interviews for their targeted populations to determine their attitudes, knowledge and concerns related to climate change</td>
<td>Coastal Decision-makers (city-managers, county planners, state agency personnel, private developers, bankers and realtors)</td>
</tr>
<tr>
<td>Maine</td>
<td>Coastal Services 2010: Oregon and Maine</td>
<td>Worked with teams of scientists, faculty, educators, coastal managers and committees of stakeholders to design surveys, focus groups and interviews for their targeted populations to determine their attitudes, knowledge and concerns related to climate change</td>
<td>Coastal property owners and elected/appointed municipal officials</td>
</tr>
<tr>
<td>Delaware</td>
<td>Responsive Management 2010</td>
<td>Structured telephone surveys designed by DNREC, NOAA, DPC and Responsive Management (survey-administering company)</td>
<td>State residents</td>
</tr>
<tr>
<td>Yale</td>
<td>Murray 2013a; Leiserowitz et al. 2012</td>
<td>Used national survey data collected in 2011</td>
<td>US Residents</td>
</tr>
</tbody>
</table>
Table 2.3: Past Survey Findings

<table>
<thead>
<tr>
<th>Survey</th>
<th>Findings</th>
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</table>
| **New Orleans Survey** | • High awareness of coastal erosion and sea-level rise  
• Community residents more in favor of controlling area development than community officials  
• Officials concerned that SLR would affect their communities, but were more confident than residents that something could be done to reduce the threat |
| **Oregon and Maine Surveys** | • People should use terms other than “climate change” to communicate with constituents due to politicized connotation  
• Respondents noted that they had seen effects of climate-variability, (stronger storms and more frequent flooding etc.) but did not necessarily identify them with climate change;  
• Persuading coastal property owners and managers that climate change is happening is not necessary – respondents thought that both individuals and governments must take action to deal with the effects  
• Lack of knowledge about risks and resources were barriers to SLR action |
| **Delaware Surveys** | • Women and those with higher education more likely to be concerned about SLR and climate change issues (but men claim to know more about these issues)  
• People in 34-64 year old age bracket tend to care more about SLR issues than younger or older brackets  
• Coastal residents more likely than non-coastal residents to worry about SLR  
• People living in coastal areas more likely to consider SLR rise a threat to them personally  
• Those in non-coastal areas more likely to consider SLR a threat to Delaware in general  
• Coastal residents more likely to think that SLR is having an impact on Delaware now  
• Non-coastal residents more likely to think that SLR impacts will be in years to come  
• SLR concern-levels ranked low compared to immediate economic/environmental issues  
• Coastal residents more likely to think governmental and non-government agencies should do more to reduce SLR impacts than non-coastal residents |
| **Yale Study** | • In groups that have strong beliefs that global warming is occurring or is not, people tend to “cherry-pick” what backs up what they already believe  
• Perceptions about weather in the short-term coincided with collected weather data; but among people who believe that global warming is not happening, there was less of a tendency to recall normal summer temperatures even if the weather was hotter than normal  
• For global-warming alarmists, extreme weather events can be calls to action even if they have no known connection to climate-change (for example, tornadoes in the Midwest)  
• Among global-warming deniers, the global-warming conversation triggers deeply-held political fears, namely that actions on climate change will signal huge expansions in government, raised taxes and more interaction of the U.S. Government with the United Nations.  
• 8 out of 10 people across America have had a personal experience with a weather disaster event. 1/3 of these were harmed in some way by the event.  
• The above evidence suggests that the subjective experience of local climate change is dependent not only on external climate conditions but also on individual beliefs. Perceptions are apparently biased by prior beliefs about global warming |
2.3 Models of Understanding

According to some researchers, no single theory completely explains the variation of human experience of climate change and action in response to it. But, the culture of the community plays an integral role in residents’ and officials’ attitudes and opinions, and small variations between communities – like differences in the political atmosphere – can mean a significant difference between residents’ outlooks on many issues. Overall, what matters are individuals’ cognitive and emotional engagement levels and how those levels affect behavioral changes and civic/political activities (Wolf and Moser 2011). However, there are models that at least attempt to explain human response to threat/risk.

The Protective Action Decision Model (PADM) (Figure 2.4) is one model that attempts to explain people’s responsive behavior to environmental risks. It identifies three critical pre-decision processes that precede all further processing: reception, attention, and comprehension of warnings or exposure, attention, and interpretation of environmental/social cues. The revised model then identifies three core perceptions—threat perceptions, protective action perceptions, and stakeholder perceptions—that form the basis for decisions about how to respond to an imminent or long-term threat. The outcome of the protective action decision-making process, together with situational facilitators and impediments, then produces a behavioral response (Lindell and Perry 2011). However, part of what this research will look at is whether people support other residential, organizational and/or governmental action in response to SLR. The PADM applies more specifically to resulting behavioral decisions and actions rather than understanding and opinions/attitudes, while the proposed research aims to look at both. For example, if someone understands very little about SLR risk or has not formed a
decisive opinion on it, the PADM would not be able to accurately account for this indecision. Therefore, for the purposes of this study, the PADM is limited.

Figure 2.4: The Protective Action Decision Model

Another conceptual framework used to explain human responses to a risk like sea-level rise is the Social Amplification of Risk Framework (SARF) (Figure 2.5)(Kasperson et al 1988). This framework recognizes that amplification occurs in both the response mechanisms of society and in the transfer of information about risk. Therefore, ‘risk events’ like flooding will be largely irrelevant to people unless they directly observe the risk events and then communicate them to others. However, other scholars agree that a weakness in this framework has always been that it can downplay the importance of meaning, social interaction, context and setting (spatial/physical, experiential, and social). These factors all shape people’s sense making and co-construction of specific risk issues (Harvatt et al. 2011). The SARF, instead, is more focused on risk’s impact on corporations and business and therefore focuses more on political and economic power.
in attenuation and amplification. Because of this, reliance on the SARF for a study more focused on individual-perceptions within a community is not appropriate. Another limitation of SARF is its focus on centers of political and economic power, which amplification processes tend to devalue in terms of their expertise, knowledge and attempts to manage risk. Thus, Harvatt, Petts and Chilvers (2011) created the Individual Understanding and Response Framework (IURF) designed to take into account the various factors and complexities that went into people’s opinion formulation and action-responses to the threat of SLR (Harvatt et al. 2011).

In 2011, Harvatt, Petts and Chilvers conducted a study comparing human responses to individual flooding events versus responses to the concept of sea-level rise.
In their article, they developed the IURF (Figure 2.6) from the SARF in order to explain differing responses to sea-level rise versus flooding. Their findings presented IURFs for flooding and sea-level rise as a

“simple but potentially valuable means of comparing hazards and expressing the dynamic processes that appear to heighten or attenuate understanding and drive or constrain responses to specific natural hazards” (Harvatt et al. 2011: 63). Their framework takes into account multiple factors that affect individuals’ understanding and response to sea-level rise, including direct experience, communications effectiveness, local social networks, wider concerns and values, perceived responsibility and capacity among others. The framework further identifies which factors attenuate the risk understanding versus
amplify it, and which factors drive or constrain individual responses. Since this proposed study also looks at attitudes, understandings and response actions to the SLR threat, the IURF is the best-suited framework with which to analyze the data.

2.4 Climate-change Communication and Stakeholder Engagement in Adaptation and Mitigation Planning

Collaboration with decision-makers and community members is key to future climate-change policy success (Moser et al. 2012). However, there is still much more research needed on this topic to adequately inform policy and practical approaches (Nigg 1993). Particularly, there is a distinct lack in research regarding climate-change communications and improved understanding of climate-change policy consequences and evaluation (Moser 2012; Wolf and Moser 2011; Moser 2010a; Dilling and Moser 2010). Specifically, more research is needed in terms of key communication processes; technologies and modes; communicating mitigation and adaptation; long-term and deep engagement; mass mobilization; and dialogic forms of communication (Moser 2010a). There is also a need for small-scale, in-depth studies focused on understanding, learning, and people's beliefs and emotions; why the people who do make changes in their lives make them versus why other do not; understandings, perceptions, barriers and motivations of elites, policy-makers, business leaders and other influential people; and civic/political engagement (Wolf and Moser 2011).

In their study, Harvatt, Petts and Chilvers noted that compared to flooding, people’s responses to sea-level rise are generally unknown. However, they noted that “attributions of cause and effect, responsibility for action and levels of trust are important
in perceptions of, and responses to, rapid climate change, with responses varying from concern to skepticism, and from action to apprehension” (Harvatt et al 2011: 66). Additionally, even when people consider that they may be vulnerable to climate change effects it is difficult for them to relate the consequences to their everyday experience of their local area. While it a serious flood may heighten their concern for SLR and their motivation to act, flood victims and non-victims are both skeptical about whether climate change is a primary cause of flooding. Additionally, “response may be limited if people continue to believe that personal action is of little use unless there is also strong national and international action. Diffused responsibility for the problem could be a form of denial “that creates the bystander effect,” which refers to a psychological phenomenon where the more people there are present, the less likely anyone is to offer their support or help in a given situation (Harvatt et al 2011: 66).

Until recently, climate-change communication has only been able to provide people with a limited, superficial understanding of the real issues due to the ways in which the problem has been framed and presented (Wolf and Moser 2011; Dilling and Moser 2010). Even if it improves, however, climate-change communication can only be effective in leading to active engagement if policy, economic and infrastructural changes take place that allow good intentions and concerns to be realized (Dilling and Moser 2010). Generally, there are also knowledge and communication gaps between academics, practitioners and community-members regarding climate change and its implications. This is due to a number of reasons, including jargon and differential access to information and avenues of communication (Klein et al. 2011; Moser 2010b; CRED 2009). As a result, the public does not adequately comprehend overly technical graphs and analytical
information related to climate-change.

For example, some climate-change information has indeed left audiences with an increased awareness of climate changes; but people then lack the motivation to take action on it because the data were presented in a way that suggested it was a future issue and not a current problem (CRED 2009). Despite the pitfalls of relying on analytical data to communicate the issue, using emotional appeals unfortunately has its dangers as well. At first, emotional appeals do manage to engage people in the process; but the engagement only lasts for a short time period if no one provides them with good, concrete reasons to remain engaged. Especially in our modern culture, overexposure to emotional appeals can leave many people numb and desensitized to climate-change issues. Thus, purely emotional and purely analytical appeals do not work well (CRED 2009).

When confronted with direct challenges (like natural disasters) to their existence, communities generally take adaptive measures by coming together to resolve problems with collective approaches and adopting policies that enable them to rebound from the damage and build resilience for the future (Nigg 1993). But due to the complexity, uncertainty and gradual nature of climate change, sometimes its effects are almost invisible and/or too distant to automatically connect with direct causes/effects (Moser 2010a). Because people have a finite number of issues they can really worry about and focus attention on at a given time, near-future worries that individuals believe will affect them personally take priority over distant-ones that affect other people (CRED 2009). Part of the reason many people do not think climate change will affect them or is currently affecting them is that most modern and urban people are rather insulated from
the their environments – most work, live and play in climate-controlled indoor environments and spend little time observing natural processes around them. These factors, combined with the inadequacy of change-inducing social signals and people's generally self-interested actions/thought processes, have been found to hinder much community engagement and communication (Moser 2010a).

Further complicating the engagement issue is the way in which individuals think and process information. People's perceptions of climate change are highly contextualized and very much depend on their pre-existing mental models, which enable people to interpret and form conclusions about new information (Wolf and Moser 2011; CRED 2009). This can include confirmation bias, which makes people look for information that they already agree with and forget information that they do not. This, then, generally leads to people's misinterpretations of climate-change data and the perpetuation of climate-change myths (CRED 2009). People's perceptions also encompass other issues as well, and denial/distancing and an active disconnect between recognizing causes and assigning responsibility for action both mitigate the cognitive dissonance climate change can cause in individuals. Thus, one of the most important aspects of communication is to understand the audience/target population. Since much climate-change communication has not been tailored to different audiences (or, at least, communicators have not acknowledged that different audiences require different frames and stories about climate change in order to take appropriate actions), it has not been that effective (CRED 2009).

Scholars agree that future communication techniques must play a larger role than simply conveying information and persuading a passive receiver – in democratic societies
especially, people are best served by active engagement, making their values and voices
heard, and contributing to the formulation of societal responses (Dilling and Moser 2010;
CRED 2009; Beatley 2009). Community buy-in is necessary for any sort of long-term
plan for sustainability; so, mechanisms for citizen participation are necessary for
deepening a sense of caring for place, bonding and trust between residents (Beatley 2009;
Haddow 2009). To do this, there must be improved two-way communication rather than
simple dissemination of scientific jargon-laden technocratic solutions without public
discussion and awareness of the risks and choices involved in combating climate change
effects. Thus, by better understanding the audience/target population, creatively
combining information with engagement in forums or direct dialogue, communicators
can take advantage of persuasive power, economies of scale and social capital to
effectively reach out to the public (Dilling and Moser 2010; CRED 2009; Beatley 2009).

Additionally, some scholars suggest that due to the nature and the scale of the
increasing stresses on the world's coasts, communities need to deal with many climate
change issues creatively and on a small-scale, local-level basis. Many of these problems
cannot be indefinitely solved, especially with a one-size-fits-all approach, due to the
changing nature of coasts, contested understandings of causes and preferences for
solutions – this is why tailoring communications and approaches to different audiences is
so important (Moser et al. 2012). In fact, many communities have already taken the lead
in terms of community-based approaches to adaptation planning to SLR and other
climate change effects. In San Luis Obispo and Fresno, California, Moser and Ekstrom
studied pilot climate change adaptation projects that ultimately succeeded in opening
conversation about climate change issues among the two counties’ residents (Moser and
Ekstrom 2011). Multiple other communities such as Worcester County, MD; Maui County, Hawaii; and Noisette, NC have had many successes with a localized approach to hazard mitigation and adaptation, including SLR (Beatley 2009).

The extent of personal engagement in participation in a community is an integral component of resilience to hazards. In addition, widespread, diverse participation in hazard mitigation planning increases successful implementation and effectiveness of the plans (Beatley 2009; Haddow 2009; George 2007). When citizens understand the concepts and engage themselves, they can also influence how officials and politicians embrace issues like sustainability and long-term resiliency (Haddow 2009). In terms of sea-level rise, ideal coastal planning for hazards requires a local, grassroots approach with a long-term vision (Haddow 2009; Beatley 2009; Daniel 2001). Community-based initiatives also often come with benefits that transcend the original goals of the approach. Some of these benefits include fostering good governance so that at-risk communities can reduce their exposure to disasters and develop local capacity awareness; promoting local confidence and skills to take ownership of risk-reduction and development activities; and bridge-building between different local actors and with government (Pelling and Smith 2008).

Despite our understandings of the former process, it is much harder to activate and engage citizens and stakeholders in actions and activities that focus on long-term sustainability and resilience rather than short-term solutions with immediate benefits (Beatley 2009). Additionally, communities generally plan for future hazard events using their experiences from the past – this can be beneficial, and does allow for some hazard-protection, but climate change has the potential to bring about events that are entirely
different, and perhaps larger and more catastrophic, from the events of the past (CRED 2009; Nigg 1993). SLR is just one example of these future catastrophic events, and awareness and engagement are linked to effective climate-change communication. At the same time, many challenges exist even though residents are willing to take action in their communities. Some of these challenges include: learning how to translate theory into practice; dealing with limited long-term financial support for capacity-building and implementation; potential abuse of power by local actors/leaders, leading to community fragmentation; resistance from local elites when they perceive community-based approaches as threats to the status quo; large-scale implementation difficulties, especially in unstable communities; segregation from broader/longer-term development practices; and socio-economic inequality (Pelling and Smith 2008).
Chapter 3

METHODS

This study inductively analyzes data from face-to-face interviews conducted in the Bethany area in order to explain how residents form understandings, attitudes and responses to the threat of SLR. Categories are organized around the main concepts in the IURF: direct experience, communications effectiveness, local social networks, wider concerns and values, perceived responsibility and capacity to respond. I then use the findings to discuss implications for future communication, outreach and engagement techniques in the State of Delaware. The sections below outline and discuss each facet of the methodology in detail, including why these approaches are the most relevant and effective for the purposes of the research questions. The explanatory case-study section addresses the methodology of the surveys mentioned in Table 2.3, as well as Harvatt et al.’s 2011 IURF study. The research-to-date section describes the preliminary pilot interviews completed this past spring and how they led to further the proposed research. The interview guide and data collection section covers the structure and development of the guide itself as well as describing the sampling and interviewing techniques. Lastly, the analysis section discusses how the project analyzes and draws conclusions from collected data.
3.1 Explanatory Case Study Methodology

This project is an explanatory case study aimed at gaining an in-depth understanding of the perceptions and actions of Bethany-area residents. A case-study approach takes into account the context within which residents have formed their opinions and taken or not taken action regarding SLR (Flyvbjerg 2011; Neumann 2006). Understanding this context is crucial to applying the IURF because of it focuses on other factors besides informational sources. The framework includes direct experience, social networks, prior beliefs and values and other factors in addition to effectiveness of government communications and media reporting (Harvatt et al. 2011). This is also why the project will rely on local newspaper articles and other publications whenever possible to ensure a fuller picture of the area’s issues and understandings of SLR.

As previously mentioned, the surveys by Louisiana, Oregon, Maine and Delaware have all attempted to assess people’s attitudes and opinions on climate change and SLR. But, they targeted different people and used a variety of different methods (See Tables 2.2 and 2.3). The research takes a similar approach to that used in Maine which targeted coastal property owners only, due to the fact that they presumably have a greater stake in the state of the area projected to be affected by SLR. However, this project was conducted on a much smaller scale than these studies. This was partially due to lack of sufficient resources and time to do a larger study, but it also enabled me to employ a more in-depth, qualitative focus on how people came to understand SLR in the first place. This research focuses on residents in one specific area of the coast rather than the entire state, county or coastal area. For example, Delaware’s survey separated the results by county and by coastal vs. non-coastal residential area, but not by municipality or community.
However, the areas along Delaware's coast are not all identical, especially since only some cater to tourism and others consist of private, residential areas. In addition, because the proposed study will consist of semi-structured face-to-face interviews rather than telephone questionnaires, there is an increased opportunity for probing and gathering more detail on people's thought processes.

The closest study found to mine (which generated the IURF) was conducted by Harvatt et. al (2011). They focused on three contrasting locations in England that had experienced extreme flooding events and have the potential in the future to experience more due to SLR. The study considered the local context and shared natural hazard experiences in the analysis, which is what the proposed study also aims to include. Their study focused on gathering data from multiple sites, but this proposed study will instead focus on one area. Even though the proposed study is only drawing from one site, however, the point of a case study is to expand and generalize theory, not to enumerate frequencies. Therefore, reliance on a single-site rather than multiple sites does not drastically limit the findings (Yin 2009). The Harvatt et al. study also used both face-to-face interviews and structured questionnaires, but instead of snowball sampling the study gathered data from telephone directories and electoral registers with addresses within high-risk flood areas. The study also employed purposive sampling parameters to ensure a diverse and representative sample of the three areas using age, property tenure, length of time lived in residential area, current type of housing unit and gender (Harvatt et. al 2011). If my study had a large enough sample, I would have also employed these parameters – but it would have been impossible with only 20 people. Perhaps this approach will provide an opportunity for further research in the area.
The interview protocol also includes questions about evacuation behavior. These questions were included to take advantage of the data collection effort. Although not the primary focus of the study, the responses are reported for purposes of completion and comprehension.

3.2 Preliminary Interviews

Building on background literature, an interview guide was developed to conduct preliminary pilot interviews in April 2013. The interview guide was developed to ask study-area residents about their attitudes and responses regarding SLR threats in their communities, and interviewees were identified through personal contacts. The primary 3 contacts consisted of 2 extended family members and one acquaintance, all of whom aided me in contacting the first interviewees. Four separate interviews were conducted in Clarksville, DE with area residents – three interviews were conducted with an individual informant at a public park, and one was conducted in a group with three family members in their home. These interviewees were selected because they were willing to participate and lived in my area of study. Interviews were set up through the acquaintance-contact. During these pilot interviews, a flexible, exploratory approach was used to gain a sense of what specific issues and views actually existed in the Bethany area about SLR.

Additionally, this approach enabled the development of preliminary ideas about the specific issues that emerged following Superstorm Sandy. The pilot interviews allowed for the refinement and development of more specific the research questions (Neumann 2006; Rubin and Rubin 2005; Marshall and Rossman 1989). The pilot interviews were used to formulate the current interview guide questions, including probes
and follow-up inquiries (Appendix A).

3.3 Interview Guide and Data Collection

For this study, I conducted semi-structured interviews with residents living in Delaware municipalities within 10 miles of the Atlantic Coast south of the Indian River inlet bridge. This includes the towns of Bethany Beach, South Bethany, Ocean View, Dagsboro, Frankford, Millville, and Fenwick Island and their subdivisions (Roxana and Clarksville). Figure 3.1 illustrates where interviewees identified as living/working in relation to current FEMA-designated floodplains. Figure 3.1 and 3.2 illustrate where they

![Interviewee Locations Relative to SLR Scenarios](image)

Dagsboro, Frankford, Millville, and Fenwick Island and their subdivisions (Roxana and Clarksville). Figure 3.1 illustrates where interviewees identified as living/working in relation to current FEMA-designated floodplains. Figure 3.1 and 3.2 illustrate where they
were located (using black dots) in relation to the SLR scenarios, FEMA-designated floodplains and Repetitive Loss Properties/Severe Repetitive Loss Properties. I conducted individual interviews with 20 people (all over 18) interviewed individually. Notes were taken during 2 of the interviews; the rest were recorded. My sample consisted of 11 men and 9 women, the vast majority of whom were married and Caucasian with at least some college education (mostly Bachelor's degrees). The average age of participants was 58 and the median age was 59. Highest-obtained education ranged from high-school diploma to Ph.D. Half were involved in public office, half were not. Most

Figure 3.2: Interviewee Locations Relative to the Current FEMA Floodplain and Repetitive Loss Properties
people identified themselves as retired, though some of these retirees were involved in public office. Four people were heavily involved in SLR issues and another four were not involved at all, but most people identified as being peripherally involved in these issues through their employment/volunteer positions (for example: realtors, home-owners association presidents dealing with flood/drainage issues, non-coastal-management public officials). Most interviewees did not have children living at home with them, but the vast majority had pets. Minus the three who chose not to answer the question about household income, nearly half of interviewees reported earning over $105,000 annually; additionally, almost as many reported earning between $40,000 and $74,999 annually.

To identify interviewees, I used a snowball sampling approach that relied on 5 main in-area contacts. These contacts consisted of extended family, friends and former colleagues. If the interviewee and interviewer have mutual friends, or someone introduces the interviewer ahead of time and confirms their legitimacy, it gives the researcher “quasi-membership status” in the community (Hoffman 1980). This increases the trust-level between parties and increases the likelihood that interviewees will be willing to provide the interviewer with good data (Rubin and Rubin 2005; Hoffman 1980). This approach worked well for pilot phase of the project interviewing, as well as the final phase, though at some points I did have to contact public officials from municipality websites in order to identify further interviewees.

There was enough unfamiliarity with the area that I was able to avoid using residents within my own social circles, but I still kept a record of contact-interviewee relationships to ensure a representative sample of the population (Warren and Karner 2010; Davis 1982). I employed pseudonyms when keeping records of my interviewees to
protect confidentiality, and made every effort to obtain as many interviews as possible using a diverse set of contacts. In the end, for the area I was researching, my sample seemed representative of the population. Overwhelmingly, all (except one, who identified as a skeptic) believed SLR was at least somewhat of a threat, and that it was an existing phenomenon. Most believed it was a major threat, and were at least somewhat involved in the issue.

3.4 Analysis

The analysis procedure for this project followed an inductive approach. Rather than starting out with preconceived categories and codes, I attempted to discover them via my collected data. At the same time, my familiarity with the literature on qualitative analysis and the IURF did give me some ideas of what to look for, which aided me in the coding process but did not strictly dictate which categories to use (Neuman 2006; Rubin and Rubin 2005; Strauss and Corbin 1998; Strauss 1987). Some categories in the IURF did not apply as much as others, which I noted and discussed in the following section. My analysis followed a procedure recommended by much of the literature of qualitative interviewing (Warren and Karner 2010; Neuman 2006; Rubin and Rubin 2005; Strauss and Corbin 1998; Strauss 1987; Whyte 1984). The first review of the collected interview data involved an open-coding procedure, by which core codes/categories were established according to identifiable factors that seemed to influence residents' SLR perceptions and opinions. After the first pass-through, my categories were as follows: Personal Relevance, Prior Interest, Direct/Indirect Experience, Source Exposure (of information) and Beliefs/Values. Again, these categories were generated from the data
itself, with some influence from relative literature and the IURF.

For each interview analysis, I first listened to the recording (starting with my preliminary interviews and continuing on from there). As I listened, I created analytic memos that noted down important points, ideas, quotes and other statements interviewees made throughout. In addition, I created a master list of core codes that I generated throughout this process – I modified this list accordingly with each interview. Then, I color-coded statements in the transcript according to the relative theme/category. As I was color-coding I noted down any relationships between codes that I noticed, as well as any obvious subcategories that I wanted to remember for my next data pass-through. Lastly, I wrote a short summary of the transcript to clarify the overall sentiments of the interviewee and which factors seemed to influence his/her opinions. Categories/codes were developed throughout this process rather than solely at the beginning. After developing categories/codes, I created separate documents for each of them and put the relevant information gleaned from each interview into these respective documents.

The second review of the data involved further development of the original categorical codes through the axial coding process. I went through each code-summary document and developed subcategories I noticed that explained the “how” and “why” behind the core codes. I then wrote summaries of the categories stemming from what I found in the data. Lastly, during the third pass-through, I compared the categories and summaries I had written with the conclusions of the IURF. Results are discussed in the following section.
Chapter 4

RESULTS AND DISCUSSION

Generally, the IURF was applicable to the results of my study. All categories seemed to be accounted for and also seemed to influence each-other in the way the framework suggested – but some of the IURF categories seemed very peripheral in the conversations that I had with people. The results of my interviews implied that these aspects did not have equal amounts of influence, and some of the separate core categories in the IURF were better combined as either separate subcategories or general explanations under a broader umbrella category. The resulting core categories, in order of their respective amounts of influence, were: Personal Experiences, Prior Interest, Personal Relevance, Personal Beliefs and Values and Sources. These categories, like those in the IURF, all influence each-other. The following sections explain the rationalizations and subcategories behind the core categories. For reasons of clarity, I would like to note that all quotes in the following section are reserved for actual direct statements from interviewees – in the previous sections, there were instances that I made use of “air-quotes,” which should be distinguished from the quotes used in this section.

Overall, I concluded that above all else, people turned to their own personal experiences when explaining their viewpoints, and whether people grew up interested in/affected by these issues had a lot of influence over how people viewed the problem. Participants overwhelmingly believed that SLR was, in fact, happening and that it would likely impact their area, though the scale ranged from alarmist to cautiously skeptical.
Only one interviewee believed it to be a hoax. Judging from the map-locations they provided me, interviewees had an accurate sense of whether they would be affected by SLR or not. Those who thought they would definitely not be personally affected by SLR provided approximated map locations that did not appear to be in a .5, 1 or 1.5 meter SLR scenario. Or, they gave locations that appeared to be in a 1 or 1.5 meter SLR scenario, but they recognized that they were old enough that they would very likely be deceased by the time this amount of SLR occurs. Those who were very concerned about SLR affecting them personally pointed out locations that appeared to be in either a .5 or 1 meter SLR scenario. These conclusions, however, are preliminary and require further research using more detailed data (ideally, using actual GPS addresses rather than approximating eye-balled locations on a printed map).

4.1 Personal Experience

Many of the conclusions people had during my interviews seemed to come down ultimately to personal experiences. More than anything else, people cited what they had seen and what they had experienced personally when I asked them about their opinions. For instance, participants had very conflicting views as to how engaged in-area residents actually are. Some thought people did not get involved, some thought they were very involved, but it seemed to come down to what people have personally experienced. If they had never experienced it personally, they relied on word of mouth, news media and indirect stories.

The greatest influencing factor in participants' risk perception and engagement level was their own personal experience with flooding and SLR issues. This personal
experience was either direct or indirect, through either their work/employment experiences or their living experiences. Direct experiences consisted of participants' own homes/workplaces flooding, personal involvement in SLR/flooding issues through their employment, or personal sightings of flooding whether or not it affected their home. Indirect experiences consisted of hearing second-hand stories of neighbors/friends flooding or hearing stories of flooding and SLR in the news/elsewhere. Participants who had seen the area flood or had experienced flooding themselves expressed a greater SLR risk perception than people who had never seen flooding. One public official who had stayed in the area during Irene and Sandy for Emergency Management stated that as far as he could tell:

People were talking more about Sandy immediately after storm, but with every day that passes they forget. Unfortunately that storm didn't ever affect us. Every time, there is a hype, but then [the storm] doesn't impact us, and there's no real damage. Every time that happens, peoples' concerns are diminished. I don't understand it. I see [the near miss] as “we got lucky” - they see it as “see? It's not a problem.” If you go up to New Jersey and New York, they get it now. They felt it first hand. We don't get it. We haven't felt [the impact] since the '62 storm and barely any of those who went through it are alive. It sounds crazy, but we need to get impacted by a storm for people to wake up and realize how dangerous this could actually be.

This statement was echoed by quite a few interviewees. On the other hand, there were a few participants (mostly those who had lived in the area for multiple generations/many years) who basically said that flooding is part of life in the area. It's something that just happens, so it does not faze them much – they are “used to it,” and not as concerned. This could be due to a few reasons – because these residents had been in the area so long, they seemed to know it well enough to know where it does flood so that they could avoid living in those areas. These participants lived further inland away from the worst flooding either because that was where they grew up or they knew it had
historically been considered higher ground in the area. These residents also seemed to be more comfortable with knowing what specific protective actions to take in the event of a flood/storm event to lessen their risk to any damage. One of these residents, who had lived in Ocean View for 5 generations on the same land, expressed that he was a “skeptic” about SLR. His main reason for having this opinion was that he had grown up on the water in the area for so long without having personally seen any overall differences in water-levels.

Direct experience had a major impact on “bringing the flooding/SLR issue home” for people, as multiple participants phrased it. But, many other participants mentioned that hearing about the damage New Jersey and New York experienced had made them realize that they “were lucky – that could have been [them].” Multiple people said that they had seen the area flood so often, especially the Rt. 1 bridge, that they felt that eventually the communities would have to cease attempting to “fight nature” because nature would eventually “win.” When asked why they thought SLR was as threatening/nonthreatening to the area as they thought it was, interviewees mostly said that they formed their opinions based on what they had personally seen. Some said they had not realized that it was possible for the water to come up as high as it did until they saw it, and others said that after seeing pictures from previous storms near their newly acquired property, they decided to look into elevating their houses. One resident mentioned that what had the greatest impact on her concern-level was:

...seeing the lighthouse at Cape Henlopen State Park with a sign that says [the lighthouse] used to be a mile away [from the water, but it is now much closer], something with a historical perspective to it where you can go 'oh wow, look at that'... It gives you time perspective – you can see a bigger impact.

When it came to assertions about others' behavior, multiple people said that those
who had experienced flooding finally had “really understood” the risk when they had personally experienced it themselves. Many participants said they knew of people who were now taking steps to reduce flooding (mainly elevation) after they went through a flood themselves. On the other hand, participants said that some of those who the flooding had “just missed,” particularly during Sandy, interpreted the storm as another hoax/false alarm, and therefore continue to think future SLR to be a non-issue.

Additionally, one especially interesting observation I had was that people who had flooded tended to become more involved in their own personal preparation and/or community awareness. This often led to greater exposure to sources which contributed to their understanding/perception of SLR and its effects/preparation options.

With respect to opinions on community engagement, almost all public-officials and people with personal experience in coastal issues and/or land-use agreed that generally people were very engaged in these kinds of issues (especially beach nourishment) and that their ideas and concerns were taken into account and listened to as much as possible. Usually the more authority they held in their position, the greater the tendency was to assert this sentiment. It was interesting to note, though, that people with less personal experience with land-use policy and/or coastal management projects thought the opposite – that, overall, people were ignorant of SLR and that their opinions did not matter in the long run. I noted, too, that most of the people with the latter mindset were located further inland. Those who lived/worked in the most coastal areas (Bethany, South Bethany and Fenwick) expressed a perception of greater team-work between public officials and citizens compared with people in the more inland areas, like Ocean View and Frankford. The common sentiment was, though, that regardless of where one
lived, it was much more feasible to try to change a local decision than a state-federal level one because the state and federal decisions were “basically already planned out.”

Interviewees' experiences during evacuation were very interesting. In my interviews I also explored the issue of evacuation concerns and actions taken during both Irene and Sandy. The summary of responses related to the mandatory evacuation prior to Hurricane Irene are shown in Table 4.1. The summary of Hurricane Sandy appears in Table 4.2.

During Sandy, past experiences seemed to be a major factor in whether interviewees evacuated or not. If their home did not have a history of flooding, people tended to be more comfortable remaining home. Additionally, during Irene a few people had ended up evacuating

Table 4.1: Evacuation: Hurricane Irene 2011

<table>
<thead>
<tr>
<th>Evacuation Behavior</th>
<th># Participants</th>
<th>Reasons Given (# Responses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did Evacuate</td>
<td>6</td>
<td>- I wanted to set a good example as a public official (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- It was mandatory, and I was caring for a sick spouse (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- My area was predicted to be badly affected, as illustrated by the “red” area on the storm/flood warning map Sussex County emailed to me (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I had never lived in a coastal hazard area before, so I decided to heed the governor's warning (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- No specific Reason (2)</td>
</tr>
<tr>
<td>Did Not Evacuate</td>
<td>10</td>
<td>- I did not think I was in any real danger or that it would affect me enough to warrant evacuation (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I was considered “Essential Personnel” (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I did not want to leave my pets/property (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I have stayed at home during storms/rain events in the past and did not think it would have been any different (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I was not in a flood zone/at-risk area (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I did not think I had anywhere else to go (1)</td>
</tr>
<tr>
<td>Did Not Remember</td>
<td>1</td>
<td>N/a</td>
</tr>
<tr>
<td>Not in Area</td>
<td>3</td>
<td>N/a</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>16</td>
</tr>
</tbody>
</table>
Table 4.2: Evacuation: Superstorm Sandy 2012

<table>
<thead>
<tr>
<th>Evacuation Behavior</th>
<th># Participants</th>
<th>Reasons Given (# Responses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did Evacuate</td>
<td>5</td>
<td>- Was concerned about wind damage (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- My area was predicted to be badly affected, as illustrated by the “red” area on the storm/flood warning map Sussex County emailed to me. Just because nothing happened during Irene does not mean it is not possible (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- It was mandatory, our house was low-lying and we had family to go to (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Had higher ground to go to in Fenwick (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Did not want to risk being trapped in the area due to having to work out of state (1)</td>
</tr>
<tr>
<td>Did not Evacuate</td>
<td>12</td>
<td>- I was considered “Essential Personnel (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I have ridden out storms in the past so I did not think it would have been any different (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I did not think I was in any real danger (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- When I evacuated during Irene, it was worse where I went. I figured I may as well stay home during Sandy because I would have had problems wherever I would have gone (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I did not want to leave my pets/property (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I did not know where else to go (1)</td>
</tr>
<tr>
<td>Not in Area</td>
<td>3</td>
<td>N/a</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>17</td>
</tr>
</tbody>
</table>

to a place that was more adversely affected by the storm than their home was. This made them not want to evacuate during Sandy because they figured they would have problems wherever they went anyway. Rather than leave their home behind and risk inconveniencing themselves or others, they thought staying home would be better.

Another sentiment that came up was that the news media “overblows” the storm's ferocity during its coverage and sensationalizes it to the point where people do not take the warnings seriously. Some interviewees expressed that the news always says that the incoming storm will be bad, but it never affected them how they said it would – as a result, people have begun to distrust the news and go with what they have experienced personally. Additionally (and very importantly) rather than evacuate, people seemed to prefer taking more protective action so that they feel more comfortable remaining home – for example, one participant said after Irene he bought a generator so he would be able to
have power should a future storm cause an outage. He had evacuated during Irene but
had decided to stay home during Sandy because where he had gone to ride-out Irene
ended up having more problems than his home had. Other participants said they had
hurricane-preparedness kits and had established procedures of what precautionary actions
they take under threat of a storm/hurricane.

One of the most common concerns was over being isolated/trapped in or out of
the area because of flooding. Almost half of participants (8 out of 20) expressed much
concern over the available evacuation routes in their area, citing being “cut off” and
“isolated” both from escape and resource-aid in the event of a hazardous event. This is
due to to a few key reasons. Firstly, in low-lying areas along routes 1 and 26 (the area's
main roads/evacuation routes) flooding occurs often, especially during storm and/or rain
events. Additionally, participants felt that these roads were not adequately able to handle
the amount of traffic during evacuation, especially during summer tourist season. Routes
26 and 54 are both 1-lane roads, and the Indian River Inlet bridge floods often, rendering
it unusable – this happened during Sandy, when water and sand closed the road off for 5
days straight. One participant who helped evacuate people out of the Bethany area during
Irene said it “cost them $50,000 since it was Labor Day weekend,” a major tourist/beach
day for many. Another participant who evacuated from Ocean View during Sandy said his
experience made him never want to evacuate again because he thought he was going to
be stranded on the highway during the storm due to the traffic. Other people said they
purposely left early in the morning (for example: 2am) to avoid the traffic during the day.
Many people mentioned the concerns over evacuation routes in terms of SLR – if the
ocean and bay levels continue to increase, it would mean more frequent flooding-out of
these evacuation routes, which would mean increased chances of isolation and entrapment. One participant expressed concern that if they continue to allow more development in the area without developing adequate evacuation plans, traffic concerns would increase exponentially and make it much more difficult to leave the area in the event of a storm/rain event.

Participants' concerns over the evacuation routes seemed compounded by the fact that the area in and of itself is low-lying and surrounded by an extensive network of wetlands, creeks, rivers, ocean and backbays. Finding any high/safe ground to create a new route would be very difficult. Additionally, raising the existing routes would pose a problem for people living adjacent to them because it would create a bathtub situation in which water would be pushed onto residential/commercial properties from road runoff. Because of this, many residents did not know what would be a good solution for the evacuation route problem.

In conclusion, interviews seemed to indicate that there are definite and commonly-perceived issues with the current evacuation plan/routes south of the IR Inlet. These seemed to be most influenced by people's personal direct experiences during evacuation procedures. People with negative experiences during evacuation tended to not want to evacuate again. Instead, they would rather take more in-home personal precautions so that they did not have to leave. As area development increases, traffic increases; without developing an evacuation route system with adequate traffic capacity, people may be less and less willing and able to evacuate as they accumulate more and more negative evacuation experiences (and stories of others' negative experiences). This phenomenon, coupled with increased flooding that could result from SLR creates a
situation where larger and larger amounts of people may be isolated and cut-off from resources and escape routes during dangerous storm and rain events.

Additionally, participants tended to trust their own flood-history rather than what the forecasters predict, which implies that with the event of SLR many people may be at an even greater risk in the future. If people rely on their past experiences, but ocean/bay levels are increasing, precedent will less accurately indicate a household's risk of damages from flooding. However, if people are increasingly distrustful of official news sources and continue to rely on their past experiences (which would be by default less reliable as ocean/bay levels rise to amounts unprecedented in residents' lifetimes), it may take further experiences with destructive in-area storms to change people's willingness to evacuate the area. On the other hand, judging from what I observed in some of my interviews, their experiences may instead encourage them to take personal preparedness measures that will enable them to feel more comfortable staying home instead of evacuating. This could have some very important implications for the evacuation and preparedness information for the state, which are discussed more fully in the Discussion section.

4.2 Relevant Information Sources

It seemed that a large part of what participants cited as having an influence on their views was their exposure to news/other sources of information, though it seemed to have much less influence than their own personal direct experiences did. Interviewees overwhelmingly concluded that most of their information about SLR was gathered from local newspapers (namely The Wave, Coastal Point and The News Journal). Some also
read the more national papers and news magazines, like Time, the Washington Post and the *New York Times*, but mostly more people placed emphasis on the local paper because it was *Personally Relevant* to their area. They also concluded that SLR was not a topic that normally came up with friends or family (unless they were talking about flooding experiences and personal concerns), so much of their information did not come from non-work-related word-of-mouth avenues. The exception was when a participant had a close friend or family member involved in land-use and/or SLR – there were a few participants who knew some more detailed information, or more information in general, because of discussions, emails and/or presentations given by their friend/family member on the topic. This suggests that local social-capital (personal resources that people have as a result of their social connections) may also be a factor in one's exposure to resources and on their understanding of SLR. This observation is also consistent with the phenomenon of “opinion-leadership,” the idea that individuals play a significant role in shaping public opinion and behavior by serving “as vital go-betweens and information brokers, passing on messages about climate change and energy conservation that speak directly to their otherwise inattentive peers, coworkers, and friends” (Nisbet 2009). Those involved in volunteer organizations reported receiving information on SLR from those organizations, as well.

Those who worked in the field of land-use and/or public office seemed to have a wider range of sources of information regarding SLR. They tended to have more knowledge of where to go for SLR information as well as more access/exposure to these sources. In particular, they tended to have more exposure to the more specialized knowledge related to SLR (especially within DE) rather than just the general theory
behind it. This seemed to be related to both Prior Interest in the topic (and therefore more effort put into seeking out relevant information) and ease-of-access to this information. For example, many of the participants who were more involved in SLR activism/public official positions cited gathering information from different meetings (or representatives from their workplace who attended the meetings on behalf of their agency) and documents presented by DNREC officials, the Army Corps of Engineers, FEMA and/or the Center for the Inland Bays as well as ASBPA. Many times these meetings were required for their particular job. Participants generally did not attend many of these meetings voluntarily, mainly due to either timing, inconvenience and/or lack of interest. Retirees seemed more willing or able to attend these meetings because “they had the time” to attend, given that they had no children to care for and no responsibilities. Additionally, people tended to be more willing to attend meetings if the topic was something that was Personally Relevant to them. Personal Relevance also affected whether the meetings they attended or the information they received made them more interested in the topic, especially when it related to their career/income. This finding emerged for realtors, public officials and fishermen.

Sources of information seemed influenced by prior knowledge, interest and experience. Much of the more specialized sources of information are designed for scholarly audiences who can interpret the results of scientific studies presented in jargon-laden and acronym-heavy language. Given this, it makes sense that people without those backgrounds or connections, however interested they are in SLR and protecting themselves from it have limited access to the resources necessary to gain a deeper understanding of the problem. At the same time, some participants have made little to no
effort to learn anything more about SLR due to lack of interest, which seemed most strongly influenced by the perceived *Personal Relevance* of the issue. It seemed as if people with more scholarly backgrounds were more involved in SLR and community-issues than people who did not have these backgrounds, who tended to be more concerned with their own personal livelihoods than communal ones. This was reflected in the concerns people had regarding SLR in their area. The people who were more involved talked about the effect SLR would have on the community, NFIP rates and building code regulation. People less involved seemed more concerned with the general idea of flooding and inundation to the point of not being able to live in the area and/or becoming trapped by flooded evacuation routes.

Participants, especially those with scientific backgrounds/interests, tended to describe using differentiated and specialized sources of information, such as tide-gauge data and scientific articles, to gain more in-depth understanding and knowledge of the topic. They also seemed more confident in their views on SLR (which tended to favor a strong belief in the real danger behind SLR and their own community) than people with more limited source exposure. The participants who were the most involved in the topic had multiple articles, maps/photos (especially ones taken of the same place over time, showing the differences in water levels and barrier island formations), graphs, statistics and e-newsletters and other sources of information at their disposal that they: a) cited during interviews; b) offered to send to me post-interview and/or; c) showed me during the interview. Some people also offered me home-videos and photos of their home during flood events. These tended to be the same people who offered me multiple other sources in addition. When I asked them about what specific measures they thought would be
good solutions to Delaware's ability to deal with the effects of SLR and flooding, people with more expertise with respect to the specific measures offered me more detailed responses. They tended to discuss the minute complications behind the measure, and have an “it depends” answer rather than strictly labeling it a good idea or a bad one. At the same time, the same responses emerged when participants seemed unsure of themselves due to lack of knowledge or understanding on the topic. I heard frequent assertions of “I don't know – I am not a scientist” when asked about whether they thought an event had anything to do with SLR or when asked about specific measures that could be taken to deal with the problem.

Some interviewees, especially those uninvolved in land-use and/or SLR legislation/planning, expressed concerns that they did not know where to go for unbiased and accurate sources of information. They cited politicization of information as a factor in this lack of availability. It seemed to them as if any information provided that was in-favor of planning and preparing for SLR as a real and imminent threat was provided by “fear-mongering,” “scare-tactics” and/or “doomsdaying” liberal sources touted by Al Gore. At the same time, people thought much of the contrary views came from conservative agencies with their own agendas. As a result, some participants did not seem to think they had access to any unbiased and factual information that was not promoted by anyone's personal or political agenda. They cited that disagreement among experts and conflicting information often left them confused and distrustful. They did not know what to believe.

One overarching and important thing I noticed throughout the interviews was that residents seemed to trust themselves more than news sources. This could, however, also
be due to an unwillingness to learn more about SLR/acknowledge SLR as a threat. On the other hand, it could be a reflection of unequal access to understandable and trustworthy sources of information – one participant, who was extremely involved in SLR planning and research for the state, acknowledged that he thought he was probably “more informed than the average citizen” because of his roles, scholarly background and access to resources, and that part of the reason many people are so uninformed is because scholarly sources with unbiased information (as well as government documents) are not written for the average person to read. Therefore all their information comes from someone else's interpretation of it, which may or not have an apparent agenda. Multiple people expressed the need for more communication between citizens, public officials and the scientific community in order to effectively raise awareness. Another person with a similar background said he thought people with scientific backgrounds had a “different way of thinking about these sorts of problems” than non-scientists. This point of view is illustrative of the knowledge/resource gap between academia and the laypublic – they do not speak the same language, and at times they may have fundamentally different ways of thinking about certain issues. This is problematic because without a common language or mindset it becomes difficult to communicate information effectively and in a way that people can understand. When put into a SLR context, this lack-of-communication limits scientists' ability to communicate their findings to both public officials and to residents, ultimately leading to a misunderstood issue and uninformed policy practices. Judging from my interviews, those with scholarly backgrounds and interests tended to discuss SLR differently than those without them.
4.3 Prior Interest

Participants seemed more involved in coastal/SLR issues if they had prior interest in them. This prior interest seemed mostly caused by whether people grew up around coastal areas and their issues, or if they were interested in natural science and therefore discovered SLR and climate change etc. as interesting issues from a scholarly perspective. They mentioned interest relating to general coastal issues, caring for the natural environment, natural science (especially climate science), community issues and economics. These seemed to have an influence over what concerned people in terms of SLR. Namely, prior interest seemed to influence people's motivation to seek out information on the topic (their exposure to *Sources*). This may have to do with what is known as “information-seeking behavior” (Turner *et al.* 1986; Nigg 1982). This is when people seek out relevant, reliable, definite and satisfying information in order to supplant the often vague, unreliable information given during disaster/hazardous situations. Originally research on this topic focused on earthquake scenarios, but it is applicable in this case as well (Turner *et al.* 1986; Nigg 1982). If SLR was a topic people were already interested in, or if it related to such a topic, it seemed that people wanted further information to clarify the ambiguities left by the original information they received. This seemed especially applicable if people thought it would be *personally relevant* to their lifestyle.

Additionally, this prior interest seemed strongly influenced by their prior beliefs and values as well as their personal experiences. If they grew up in the area, or at least a non-Delaware coastal beach area, they found it more important to be informed and involved in these kinds of issues. If they had a scholarly background they tended to be
more interested in SLR from a scientific point of view and thought it important for people to be informed on it. These were the people who tended to seek out information on the topic – they “read everything” and described themselves as being born with an “intellectual curiosity.” It also seemed as if the further inland that I conducted interviews, the less interest people seemed to have. This may have to do with Personal Relevance.

One participant in Ocean View described it in this way:

I don't follow SLR because there is so much going on all the time. I'm sure it's discussed but I assume they have a handle on it... We don't have a lot of control over (land-use/SLR) stuff. People have other interests, other concerns... there is always something vying for your attention, time, money, resources... it's just a matter of what intrigues me.

Interviewee's time-availability also attributed to being involved in SLR issues and gathering information on the topic. People often cited being “busy with work and family” and therefore unable to be involved in SLR issues. This could be interpreted a few ways. People normally make time for things that greatly interest them. This lack of time could be a reflection of how important SLR is to them in relation to other issues. In the cases of my interviews, it seemed to rank much lower on people's priority lists than personal economics, family and household concerns. To take it further, it could be a reflection of the gradual nature of SLR (Moser 2010a; CRED 2009). Since SLR is something that seems to be a “future” issue to many, people may not feel the same sense of urgency towards it if they have other immediate concerns to worry about (Moser 2010a; CRED 2009). Additionally, it could be that because participants “did not have time” to seek out any initial information, they do not hear any information that could potentially pique their interest and encourage them to look into SLR further. Some people did express interest in the topic and said they would love to be more involved “if I had the time –
maybe when I retire.” A few participants said that since they were retired they had the
time to devote to SLR issues.

The people who were already very involved with SLR were mainly either in
public office (and therefore already in a position to deal with SLR and be informed about
it) or they were retired. Many people who were already involved in public office tended
to do more volunteer activities. They tended to keep more up-to-date with what different
volunteer organizations were doing either through their work or e-newletters etc. One
public-official participant noted that “since our positions are volunteer in this area, if you
are interested in any of these issues, you run for public office. Not many people other
than government officials are as involved.” People cited time, conflict-of-interests and
lack of interest as explanations for why they did not become involved.

4.4 Current and Future Personal Relevance

Participants overwhelmingly concluded that a highly influential factor in how
involved they were with SLR issues was its level of Personal Relevance. The general
consensus, whether it was through NFIP rates or flood-damages, tax increases or extra
fees of any kind, as that participants consistently expressed an increased involvement and
interest in SLR and coastal issues if they threatened to cost them more money and a way
of life. Because of the gradual nature of SLR, too, people's perception was that since it is
not an immediate concern, they do not worry about it. This perception is consistent with
the literature. One public official said:

People do not generally get involved unless it's a not-in-my-backyard issue, and
then they will come out in droves.... no one is going to come out to a 7pm
meeting for curiosity's sake when they could go out to dinner instead.
Another noted that:

People tend to come to meetings if they think it'll directly impact them. They don't think about 10 years down the road – they think a) will it impact me today b) what will it cost me and c) what are you going to make me do that I don't want to do. They tend to get real interested if it'll cost them money. With climate change and SLR, the effect is not immediate, so it is hard to get at local level people interested in it.

Participants, especially public officials, agreed with all these statements. One noted that as soon as people found out he was involved in SLR issues, the first questions they would have for him had to do with how much these issues would cost them and how SLR consequences would personally affect them. The non-public-official participants generally confirmed the applicability of this generalization.

There were notable differences when I spoke to people living in the nearby vicinity of a body of water as opposed to people who lived further inland. Generally, people living in Ocean View or far enough away from major flooding bodies of water were much less involved and concerned with SLR and coastal issues. In almost all cases, people who are in danger of flooding or who have already flooded in the past had a much higher tendency to be involved and interested in SLR or coastal issues. One Ocean View participant noted that:

Community members have as much power as they put forth or think they have, but unless you are in a flood zone, it's not a concern.... If I was ocean-front or in a flood-zone, I'd be much more aware (of SLR/coastal issues) because I would have to pay higher flood insurance; but since I'm not, it doesn't affect me... I don't really think about it.

Some participants also expressed the opinion that, although some of them were relatively involved and engaged in SLR issues, they were not as concerned as they normally would be because by the time it is projected to start affecting the area, they would “not be
around” due to their age; but, some who said this also said that they hoped not everyone took their attitude. A few people said that they were more concerned about SLR because they wanted to hand their house down to their children. In fact, a common way participants had ended up moving to the Indian River Inlet area in the first place was inheriting their childhood beach home. A few participants noted that they had hoped their children would have been able to experience the area and all it had to offer as they had. Some had discussed the issue with their children, some had not. Participants said that they mostly did not discuss SLR and other issues with their friends and family. The conversations were very relative to what sorts of experiences they were having at the time. If they had flooded or there had been a recent storm or storm warning, these topics tended to come up more often, and usually in the following contexts: if they believed SLR was happening, how it affected them in the past, how it would affect them in the future and what they would do about it if it would.

4.5 Beliefs and Values

People's beliefs and values seemed to influence their opinions and perceptions of SLR, as well. These beliefs and values seemed influenced by multiple facets and core categories, particularly *Personal Relevance* and *Direct Experiences*. They could be split into economic, social, political and environmental subcategories. Overwhelmingly, people said it was very important to them to live in a coastal beach area, and mostly those who expressed that sentiment were more involved in coastal issues and SLR than people who did not find it as important (which relates back to *Personal Relevance*). Most of the people I spoke to placed a lot of personal value on community, social and economic
interests over environmental interests. Largely the sentiment I heard was that people valued the environment expressly because it provided for the economic and personal efficacy for their lives and the lives of the community. Only a few people expressed interest in protecting the natural environment for its own sake. There were many people who mentioned their love of beach-related recreation, the relaxed atmosphere and the community life in the area, but only one or two people mentioned anything about respecting the water or environment as its own entity.

It did seem, too, that much of the reason people settled in the areas I interviewed in was due to economics. When participants retired, they wanted a nice, calm place to go that they could afford. For the beach scene it has to offer, the area is much “more affordable than similar places in New Jersey,” as one participant put it. People who lived further inland away from flooding and other water-related hazards seemed to lean more towards favoring an approach to SLR that “let nature take its course” (in essence, a retreat strategy). In the end, they believed trying to maintain a way of life in these areas was “fighting nature.” One participant who lived 1.5 miles inland expressed this sentiment talking about her “mixed feelings” on beach nourishment:

[Beach nourishment] certainly helps, but it's so temporary. You have to keep doing it and it's expensive. But if you stop... you will lose a whole bunch of beach communities. I think you have to do [beach nourishment], but it seems illogical to keep putting sand in places where nature just takes it away. Over and over. Maybe nature is trying to tell you something.

Many of the people who took this approach expressed dissatisfaction with knowledge that their tax dollars went to beach nourishment. To them, it was a waste of money and resources trying to stabilize an inherently impermanent coastal area, especially since they did not live in those areas personally (going back to the theme of Personal Relevance).
One inland participant who expressed this viewpoint curbed his opinion with a caveat, saying he knew he was “speaking from a safe distance” as he suggested that people let the water-front communities go to nature. Other participants, especially those who lived closer to the coast, favored a more adaptive approach that would allow for the survival and continued viability of their communities. Although, there were marked concerns over how they could avoid being cut-off and isolated in the future from flooding roads.

Politically, people's concerns over private property-rights and government regulations were common. Many said that they wanted to place restrictions on land-use and development to protect against damage from SLR. Others said they placed too much value on private property-rights to favor this and did not want too much governmental power. One public official stated the following:

Logically it would make sense to stay [in the area] and start building away from the water in terms of SLR, but then what do you do about all those people who own the property down there? You can't just say, 'Too bad you just spent a million dollars on that piece of property – now you can't build there.'

Beliefs about citizens' personal efficacy were also factors in how much people paid attention to and became involved within issues. People who were largely uninvolved (but not necessarily uninformed) tended to almost have a defeatist attitude. They were wholly convinced that other people and governmental organizations were going to do whatever they wanted anyway, because all they care about is money and there was no way to change them. One participant who had been involved in emergency management but not land-use or SLR put it in this way: “Experts probably look at individuals and say ‘Well, what do you know?’” A realtor that I spoke to said she “would have appreciated being able to weigh in on [the recent FEMA decision to change the NFIP policy on second-homes], which we didn't find out about until after the fact.” Another interviewee, who
had been involved in emergency management as well as beach-related volunteerism, stated:

Community members have NO impact on land-use – there are so many hands and politics and ideals and vision and not enough community engagement... volunteerism is already on the decline. Then there are other people that, like me, that think "What can I even do about it?" And then those who do speak out are established as a minority because the majority are not interested. And the people making decisions are not interested in hearing from the minority. And that's not just here – that's everywhere.

On the other hand, people who were more involved took a different approach, believing that they had the capacity to make a change and also believing that government was there to listen to its citizens. One very involved official said that in his experience, “people's concerns are very much taken into account in land use decisions. People running these meetings are there to listen to them, not just check off a box.” He said that personally, he realizes how important it is not only as an elected official to be on top of these issues and make sure people have them on their radar so that it will lessen impact in the future. This sentiment was echoed by many public officials that I spoke to who were involved in public office because of a sense of responsibility to their community and a desire to represent members' needs. This seems to be a clear implication that there is a communication divide between public officials and citizens.
Chapter 5

CONCLUDING REMARKS

5.1 Summary

Overall, it seemed that people who considered the area to be a part of themselves and their lives seemed more concerned and informed than people who did not. It depended on other factors, namely source exposure, whether they turned this concern and information into actual involvement. People who seemed more pessimistic and defeatist believed they had no power to do anything anyway, because those in power did what they wanted for the sake of money. Then there were those who wanted to be more involved but either did not have time or did not know where to go. The ones who lived further inland did not care as much about SLR and sometimes expressed some disdain for the fact that many people (in government especially) had put so much money and effort into the issue. But mainly there were those who cared about the community they lived in and went into public-office or a volunteer organization to try to protect it. Regardless of this distinction, everyone seemed concerned about evacuation routes.

The findings imply that making SLR information applicable and relevant to people's personal experiences, interests and views may greatly enable SLR-awareness – the know-your-audience principle. But, they also imply that having access to consistent and understandable sources of information may increase the level of trust people have in the information they come across. This is especially important for anyone trying to communicate SLR information to the public. It seemed that because residents did not feel
they had accurate, unbiased, consistent, trustworthy informational sources, they turned to the only source they knew they could trust – themselves – in order to make sense of it all. This also had to do with how relevant the issue seemed to them as well as what sort of interest they may have previously had in the problem. Unfortunately, there is so much information out there about SLR and related issues, much of it incredibly contradictory or blatantly biased. As a result, there may not be an easy solution for people trying to raise awareness and deliver the facts to people in a way that’s both accurate and understandable. However, the findings do give some insight into what kinds of messages may be more willingly and ably accepted by residents.

5.2 Contributions to Current Knowledge

Generally my results were consistent with the research I laid out in my literature review. However, the findings relative to the use of interpersonal communication to gather information differed from a common finding in disaster-related literature. In my study, people very rarely talked about sea-level rise issues with friends and family. But, usually when faced with a vague/ambiguous threat, people usually go to their friends and family to gather information and understanding. Further research may be needed to fully explain why this was, but I will offer a few preliminary explanations. It could be that it is a reflection of the lack of immediacy the issue poses – it does not come up in conversation often because it is not one of those events that is associated with an immediate threat. When it did come up, it had to do with storm and flood events – during these events, the threat was more immediate. It could also be a reflection of awareness. Overall, my interviewees were at least somewhat aware, but their friends and family may
not have been. This would potentially make sea-level rise related conversations difficult to carry. The instances in which my interviewees noted that they did have conversations about SLR with friends/family were when they found out that the interviewee was knowledgeable and involved in the topic, which implies that people may want to broach the subject with people but if they are equally ignorant it may not serve a purpose.

Related to the difficulty in carrying these conversations, it could also be a reflection of people's reluctance to talk about politics. Sea-level rise as a legitimate threat carries a political connotation, which may lead to undesirable conversations to have in social situations. This is especially true if not everyone has the same opinion or awareness on the subject. I did have some interviewees tell me that they knew of people who did not think sea level rise was happening, including some of their good friends and close relatives. As a result, those conversations were off-limits on an agree-to-disagree basis. I can imagine someone being reluctant to broach the subject with others until they are certain of their opinions, though acquiring that certainty involves bringing the subject up in the first place. Again, more research is needed to look into this finding.

In addition to communication knowledge, the results yielded important evacuation information for the area. Because these communities have inadequate evacuation routes that flood often, and because they may be more and more unwilling to try to evacuate because of this, encouraging them to take personal preparations and stay in place may be necessary to a degree. This is especially true due to the fact that it is impossible to elevate everything without ending up with a Venice-like situation. Thus, communicating which preparations are necessary and what specific risks storms can pose may ensure more people's safety. If people are going to try to stay home more anyway, giving them as
many resources as possible to prepare properly would be helpful. Because of the evacuation route situation in these communities, considering earlier evacuation orders, especially during tourist season, may also be a viable option with the understanding that there may be more false alarms. Coupled with this, perhaps adopting a disclaimer policy in which Emergency Management personnel go around to citizens’ homes to express to them that they may be trapped there for extended periods of time without a rescue-opportunity if they stay. The fact that the majority of the community is relatively older may create some complications as well – a few participants did mention that they would have no place to go if they evacuated, and some elderly may not be as mobile as others. This could mean that it may be more feasible for many to stay than try to leave. Probably the least desirable option to address these issues would be to stop developing in the area to ensure evacuation-route capacity. Ultimately, more ambiguity implies the need for more mitigation.

5.3 Next Steps

As mentioned previously, the findings highlight the importance of knowing your audience when attempting to properly inform them and provide them with the tools to change their behavior accordingly. Hopefully, these results will enable practitioners – specifically organizations like DEMA, DNREC and its SLRAC, ASBPA, CIB and others – to tailor their SLR publications to their audience. Additionally, increasing the level of trust and collaboration between governmental agencies and citizens may encourage more effective communication between the two entities, especially in terms of dealing with future SLR threats. Most importantly, this communication could aid entities like SLRAC
in creating an effective and community-supported adaptation plan. Mass-produced materials like reports, newsletters and especially newspapers have seemed to have some success as far as distributing basic information about SLR and its effects. However, many people's negative experiences and perceptions of governmental organizations and biased or contradictory informational sources prohibit some from taking these publications seriously regardless of how scientifically sound they may be. This in turn results in people trusting their own observations – if they do not personally see or experience anything, they may not make any changes or support any community-wide planning that changes the way they want to live. This may be compounded by the amount of protection from dunes/beach nourishment ocean-front beaches receive because it may lessen their risk-perception of SLR as a hazard to be taken seriously.

One solution to effective agency-citizen communication would be to try as much as possible to increase the level of trust between governmental/non-governmental agencies concerned with SLR issues and the general population. A potential way to do this may be to use the opinion-leader strategy, mentioned in the discussion section. Agencies and officials in the area already use the internet, mass publications and public meetings/informational sessions, but these may not be enough due to their impersonal nature. They are aimed at everyone, yet no one at the same time. During interviews, most people, even those very passionate and involved in SLR issues, noted that they did not discuss the subject of SLR with family/friends (namely because it just “didn't come up”). But there were a few people who did become involved or at least interested in the issue mainly because someone they knew was involved and knowledgeable about it. This suggests that in addition to providing trustworthy and reliable SLR information through
as many channels as possible, ensuring that some of those channels are through personal friends/family contacts may more effectively pique people's interests because there is already an existing level of personal trust between the two parties. Word-of-mouth conversations may stimulate more discussion and awareness regarding SLR than only relying on impersonal publications and meetings that not everyone is willing/able to attend. One opportunity for future research on this approach would be a network analysis of opinion leadership in these communities.

Another avenue to explore would be the use of churches and religious communities as a source of information about sea-level rise and climate change. If there is a persistent distrust in government regardless of their efforts, potentially looking into religious organizations as options for awareness and outreach may be an effective way to inform people through an institution that they do trust. However, this approach does have the potential to backfire – because of the political connotation of SLR, some churches may not be willing to serve as sources of information. Additionally, some people may be turned off by the fact that their church is addressing a political issue. This approach may need to be situationally dependent, as some are more open to addressing those subjects than others. However, using religious organizations to communicate information on personal preparedness and risk-level in terms of individual storm and flooding events may prove very effective.

In terms of this personal preparedness, my study revealed a potential connection between preparedness actions and their personal resources. I mentioned one interviewee who said he had such a bad evacuation experience that he bought a generator so he could stay home next time there was a storm. There was also a general sentiment that people
would prefer to stay home than to leave, and there were a few people who had at least expressed interest in accumulating more resources, like generators, so that they would not need to leave. This implies that further research is needed to look into evacuation issues in these communities since they are issues of great uncertainty. While personal preparation activities such as buying generators and stocking food are beneficial, if they encourage people to stay in their homes during potentially hazardous situations, especially with the event of often-flooding evacuation routes, it creates a situation where people are cut-off from resources. If they have the necessary resources to deal with the consequences, this is fine. But when they think they are prepared and then a situation occurs which they did not anticipate, it becomes a problem. For example, generators are useful for electrical-outages, but they do nothing to prevent a house from flooding, broken windows or ripped-off roofs. Ensuring people are not taking one-and-done safety-blanket measures becomes increasingly important considering the complicated evacuation situation in the area. Perhaps making certain that preparation communication is better linked to specific sources would be a way to do this.

For future research, I would suggest further delving into the role personal connections and conversations play in information-dissemination and public opinion. If I were to do the study again, I would immerse myself into the community to a greater extent than I was able to before, and hopefully expand the study to 60 people – 20 public officials, 20 people involved in volunteer organizations and 20 uninvolved citizens – to draw comparisons between their opinions, values and reasons for being/not being involved in SLR awareness and planning. Ideally, another issue I would like to explore is the comparison between private Delaware Bay beach residents and the more ocean-front
beach residents to see how those settings and experiences affect their understanding. This could prove interesting considering how much more protection ocean-front beaches receive from sand-pumping and dunes, which ultimately affects the personal experiences of residents during storm/flood events. I would also want to attend coastal land-use and SLR-related meetings and events in order to add to the descriptions I would receive from interviewees. Additionally, I would like to rely on a more systematic and random sampling process rather than snowball sampling in the future in order to ensure that I have an accurate and proportional representation of in-area viewpoints. Lastly, I would have liked to have read more in-area publications instead of only state-wide sources to broaden my sources.

Overall, it is important to understand how and why residents do or do not take personal actions to protect themselves and their communities against SLR. Just as important is understanding why they do or do not support collective action/public policy to do so. Delaware agencies have put forth multiple outreach and research initiatives on sea-level rise. Recent storms and flooding have caused major damage throughout low-lying and coastal areas of the state, and they are predicted to worsen as time goes on; meanwhile, the sea continues to rise. Given the integral importance of community engagement in the land-use resiliency planning process, it is crucial to understand residents' opinions and protective action decision-making processes. It is through this understanding that land-use decision-makers and residents can communicate and collaborate effectively to deal with a hazard like SLR.
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APPENDIX A

INTERVIEW GUIDE
Applying the Individual Understanding and Response Framework to Sea-Level Rise Perception South of the Indian River Inlet in Delaware

Subject Unique ID:_______________________________

Referred From Unique ID:_______________________________

Interview Date:_______________________________

Interview Time:_______________________________

Time Start:_________

Time End:__________
Applying the Individual Understanding and Response Framework to Sea-Level Rise Perception South of the Indian River Inlet in Delaware

Hi, my name is Anne Goodman and I am a graduate student at University of Delaware in the Disaster Science and Management Program. I would like to ask you a few questions about coastal issues. If you are not comfortable answering any of these questions, we can skip the question. As the Informed Consent statement said, I am interested in understanding coastal land-management and community-engagement in the Bethany/Fenwick areas. I’m also interested in your thoughts and ideas about different coastal threats, especially sea-level rise. Feel free to ask me any questions during our conversation.

Interview Guide

Basic Questions

1. On this map of the Bethany/Fenwick area, please pinpoint the location(s) where you live, work, and/or own a business if possible. How long have you lived/worked/owned a business here?

2. How important is it to you that you live in a coastal/beach area?
   Scale:  1: Not important at all, 5: Very Important
   (PROBE: Please take a few minutes to explain these feelings to me?)

3. How did you come to live here?
   (PROBE: Did you have any concerns about coastal threats?)

4. Do you describe yourself as someone who has a formal role in coastal-land management in the Bethany/Fenwick area?
   1. What is your role?
   2. How long have you worked there?
   3. What sort of issues come up at your job? Do any of them involve sea-level rise to your knowledge?
   4. Would you say that your formal role has had any impact on how attached you are to the area you work in? Please elaborate.

5. Do you have an informal role that deals with coastal-land management in the Bethany/Fenwick area?
   1. What is your role?
   2. How long have you worked there?
   3. What sort of issues come up at your job? Do any of them involve sea-level rise to your knowledge?
   4. Would you say that your informal role has had any impact on how attached you are to the area you work in? Please elaborate.

6. Outside any formal role, have you ever attended a meeting where beach-related issues
were discussed?
  (PROBE IF NO: Could you explain to me your reason(s) for not attending one? If yes, what motivated you to attend this/these meetings?
  (PROBE IF YES: Who ran the meeting? Where was the meeting? What happened at the meeting?
  (PROBE IF YESb: Did it make you more interested in any of these issues? Please elaborate.)

7. As a citizen, have you ever belonged to a group that was concerned with beach-related issues?
  (PROBE IF NO: Could you tell me what reason(s) you had/have for not getting involved with any groups concerned with beach-related issues?)
  (PROBE IF YESa: Name of organization?)
  (PROBE IF YESb: What motivated you to become involved with this group?)
  (PROBE IF YESc: How has this group involvement influenced your concern-levels regarding different coastal hazards?)

8. Do you know who makes decisions about the use of coastal land in the Bethany/Fenwick area? I’m particularly interested in names of organizations and positions within those organizations, but if you just know a name, that’s fine as well. (Give examples if needed)
  (PROBE: Any others? Do you know their responsibilities? Please briefly outline what those responsibilities are.)

1. Do/Does (Name/Anyone) try to engage community-members in these decisions?
  (PROBE for each: IF YES, Tell me about the strategies they use to engage.)
  (PROBE for each: IF NO, please tell me how you came to this conclusion)

2. To what extent do you think community concerns are taken into account in these coastal land-use decisions? (PROBE: Tell me why you would describe it that way)

3. How engaged would you say area residents are in these decisions? (Options: A great deal, somewhat, not much, not at all?) Why do you say that?

4. Have you ever been involved in any of these decisions? (PROBE: Please tell me more about your experience(s)?)

9. Now let’s talk about sea-level rise. Do you think it will affect the Bethany/Fenwick area?
  (PROBE: Please tell me how you came to that assessment of the situation for this area.)

10. To your knowledge, has your home or workplace ever been flooded?
  (PROBE IF YESa: How has your property/home been affected?)
Have you been able to take any steps to reduce that risk for the future?
  (PROBE IF YES: Tell me more about those strategies.)
  (PROBE IF NO: Tell me about some of the reasons for not taking those steps.)
  (PROBE IF YESc: Do you think the flooding was due to sea-level rise? Please tell me how you came to that conclusion.)

11. Thinking about now (in the present-day), do you think that coastal decisions-makers should be doing anything about Sea Level-Rise?
   (PROBE IF YES: Please tell me about some of the things you think they should be doing.)
   (PROBE IF NO: Please tell me about why you think they shouldn’t be working on this issue at this time.)

3. Do you think that sea-level rise is something coastal decision makers should work on in the future?
   a. (PROBE IF YES: How far into the future should they begin doing something? Please elaborate on your conclusions.)
   b. (PROBE IF NO: Tell me about why you think they shouldn’t be working on the this issue in the future.)

12. What about community members or residents? Should they be doing anything now?
   (PROBE IF YES: Please tell me about some of the things you think they should be doing.)
   (PROBE IF NO: Tell me about why you think they shouldn’t be working on the this issue at this time.)
   a. Do you think that sea-level rise is something community members/residents should work on in the future?
      (PROBE IF YES: How far into the future should they begin doing something? Please elaborate on your conclusions.)
      (PROBE IF NO: Tell me about why you think they shouldn’t be working on the this issue in the future.)
   b. If you found out your home was in a projected sea-level rise inundation zone, what sort of action would you take?
      (PROBE: Please elaborate on why you would take this/these action(s).

13. How much influence do you think community members have on those who make coastal land-use decisions? Please elaborate on how you came to this conclusion.

14. Have you ever heard of the Sea-Level Rise Advisory Committee?
   (PROBE, IF YES: can you tell me what you know about that group?)
   (PROBE: Have you heard of any other group or organization that specifically deals with sea-level rise issues?)
   (PROBE IF YES: Which groups? How did you receive information on them? What do they do? Are they local, regional, national? Do you know
anyone who is a part of any of these groups?)

15. How have you received information about sea level rise and its impact in this area?
   (PROBEa: Which of these sources has most influenced your understanding of sea level rise here in the Bethany/Fenwick area? Could you elaborate on how these sources have influenced your understanding?
   (PROBEb: What about your understanding of sea level rise in general?)

16. Is sea-level rise a topic that you discuss with friends and/or family?
   (PROBE IF YESa: Tell me about the nature of those conversations.)
   (PROBE IF YESb: How frequent would you say you have these conversations?)
   (SCALE: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = All the time)
   (PROBE IF NO: Please tell me more about why you do not normally discuss sea-level rise)

17. Scientists and engineers, among others, have given several suggestions about dealing with possible sea-level rise consequences. Please tell me if you think any of the following measures should be taken within the next 5 years or not. (HAND CARD WITH LISTED OPTIONS TO R) (PROBE FOR EACH ONE MENTIONED: Please me tell about why you think or do not think this is a good strategy to implement.)
   a) Continue beach-nourishment practices or replacing sand lost during storms
   b) Build or strengthen sea-walls
   c) Establish large dunes along the coast
   d) Elevate the ramps to the Indian River Inlet Bridge
   e) Require houses on the beach, bay or rivers to be elevated or raised to a certain height
   f) Require businesses on the beach, bay or rivers to be elevated to a certain height
   g) Require homeowners to notify potential buyers that their home is in a predicted sea level rise inundation zone
   h) Not allow property owners and developers to build on currently vacant land that is in a predicted sea-level rise inundation zone
   i) Have the County government develop a long-term plan to gradually remove structures from projected sea-level rise inundation areas
   j) Restore wetlands to absorb more flood-waters

18. Now let's talk about Superstorm Sandy. Do you think people in this area are talking more about coastal land use issues, like sea-level rise, since Superstorm Sandy?
   (PROBE IF YES: What topics seem to be discussed more now? Could you explain why you think this is?)
   (PROBE IF NO: Please tell me why you think this is the case?)

19. In hindsight, was there anything anyone could have done beforehand to prevent/lessen the damage caused by Sandy? (CLARIFY: looking for “coastal land-use” actions/decisions)
   (PROBE IF YES: Tell me about what you think could have been done.)
   (PROBE IF NO: Tell me about the reasons you believe there was nothing that
could have been done in this case)

20. Are there any concerns about flooding that you have now that you did not have before Sandy? Or any that you now do not have?
   (PROBEa: Please tell me your specific concerns. How did Sandy influence these concerns?)
   (PROBEb: What about concerns over sea-level rise?)

21. Has another storm or rain event besides Sandy ever influenced any of your concerns about flooding?
   (PROBE IF YES: Please tell me about your specific concerns and how the storm/event influenced them)
   (PROBE IF NO: Please elaborate.
   (PROBE: What about concerns over sea-level rise?)

Evacuation
Now let’s talk about Irene and Sandy. First, on Friday August 26, 2011 at 11:00 in the morning Governor Markell issued a mandatory evacuation order due to Hurricane Irene for all residents within 3/4 mile of major bodies of water. Delaware coastal residents had until 9:00 Saturday morning to evacuate. Then, Governor Markell issued an evacuation order for Superstorm Sandy on Friday October 27, 2012 requiring all residents within ¾ mile of the coast and the Delaware Bay to evacuate the area by 8pm on Saturday October 28, 2012.

1. Were you in the Bethany Beach or Fenwick areas during the Hurricane Irene evacuation order on August 26, 2011.
   1. If so, did you evacuate? Tell me about your reasons for that decision.
      1. If you evacuated:
         1. Where did you go?
         2. Which route did you use?

2. Were you in the Bethany Beach or Fenwick areas on Saturday October 28th 2012 when the evacuation order for Hurricane Sandy was given?
   1. If so, did you evacuate? Tell me about your reasons for that decision.
      1. If you evacuated:
         1. Where did you go?
         2. Which route did you use?

3. Did your decisions or actions during Hurricane Irene influence your evacuation decision during Superstorm Sandy? (PROBE: If yes, Please tell me more about how it influenced your decision.) (PROBE: If no, please elaborate on why it did not have any influence.)

Demographics
Now, let me ask you a few questions about you and your household.

1. GENDER:  Male   Female
2. How old are you?     _____________ YEARS OLD
3. And, what is your marital status?  ___________________
4. How would you describe your race?     _________________________
5. How would you describe your ethnicity?  _______________________
6. Please tell me your current employment status. (If employed, please tell me your current occupation).
7. How many people live in your home?  ______________
   1. How many are 17 or under?      ______________
      (PROBEa: To your knowledge, have there been any flooding issues at your kids' school(s)?)
      (PROBEb: Has the school’s flood history had any impact on your attitude towards sea-level rise?)
   2. How many are 65 or older?       ______________
   3. Does anyone in your home have a physical or cognitive disability or a health condition? (IF YES, please describe for me that disability or health condition ______________)
8. Is anyone outside of your household dependent on you for care during an evacuation? (Examples: This could include a family member in an assisted care facility, an elderly parent living on their own who would need help, a child living elsewhere, or another person who would rely on you.)
   (PROBE: If yes, Please tell me how that person would be dependent on you)
   (PROBE: Is this person one of the above that you mentioned previously or someone else.)
9. Do you have any pets or animals at your residence?
   (PROBE: What about livestock? Have you thought about how to protect them in the event of a severe flood or storm? If so, please explain.
   (PROBE: Would you evacuate the animals under an evacuation order?)
   (PROBE IF NO: Tell me about the reasons for this decision.
   (PROBE IF YES: Tell me about how that would take place, both in terms of transportation and sheltering.)
10. What is your highest obtained level of education?
11. What is your Annual Household Income (circle/check one)?
   a. Less than $9,999
   b. $10,000 - $24,999
   c. $25,000 - $39,999
   d. $40,000 – $54,999
   e. $60,000 – $74,999
f. $75,000 – $89,999

g. $90,000 – $104,999

h. $105,000 – $149,999

i. Over $150,000
APPENDIX B

INFORMED CONSENT
INFORMED CONSENT FORM

Title of Project: Sea-Level Rise Awareness and Community Engagement in the Bethany Beach Area of Delaware

Principal Investigator: Anne Goodman, Master's Student in Disaster Science and Management

You are being asked to participate in a case study aimed at understanding Bethany/Fenwick-area residents' attitudes towards sea-level rise. If you choose to participate, you will be asked to answer a few general questions about your experiences and thoughts related to coastal land management and sea-level rise. Some of these questions are in the context of Superstorm Sandy and hurricane evacuation. By participating, you will provide us with important and useful information regarding the well-being of your own community as well as coastal communities in general. Please read the information below and ask me questions about anything I have not made clear before you decide whether to participate. Your participation is voluntary and you can refuse to participate or withdraw at anytime during the interview. If you decide to participate, you will be asked to sign this form and a copy will be given to you to keep for your reference.

WHAT IS THE PURPOSE OF THIS STUDY?
The purpose of my Master’s Thesis study is to learn more about how people understand and form opinions on sea-level rise in the Bethany/Fenwick areas, including how/if they have changed as a result of Superstorm Sandy and other storm experiences. I will also be asking a few brief questions about possible evacuation plans in the event of a storm or flooding emergency. You are being asked to take part in this study because you are a resident of this area and could be directly affected by the outcome of coastal management in Delaware. You may be excluded from the study if you are not a full-time Bethany/Fenwick-area resident and are uninvolved in coastal land-use management in that area. This study will include at least 20 interviews, possibly more.

WHAT WILL YOU BE ASKED TO DO?
Answer a few general questions regarding your experiences with flooding and coastal land-management before, during and/or after Superstorm Sandy. Our conversation will take around 40-50 minutes. I will also be asking a few brief questions about evacuation plans in the events during Hurricanes Sandy and Irene, as well as some basic demographic questions.
WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?
None anticipated.

WHAT ARE THE POTENTIAL BENEFITS?
You will not benefit directly from taking part in this research. However, the knowledge gained from this study may contribute to our understanding of coastal management and community involvement not only in Delaware but in coastal communities in general. This knowledge could ultimately lead to improvements in coastal management in your community and others.

HOW WILL CONFIDENTIALITY BE MAINTAINED?
It is the University of Delaware’s policy that all research records are confidential. Any initial information that could be associated with you or this address will be removed from the interview upon my return to the university. In the event that there is a publication or presentation made using the interview material in this study, no personally identifiable information will be shared (pseudonyms will be used). Records will be stored for at least as long as it takes to complete the thesis, which will be at least until May of 2014. While there are no plans to destroy the data, all materials—after being stripped of identifying information—are secured in file cabinets in locked storage. Some interviews may be recorded – if you do not wish to be recorded, note-taking will be used during the interview.

WILL THERE BE ANY COSTS RELATED TO THE RESEARCH?
There are no costs associated with participating in the study.

WILL THERE BE ANY COMPENSATION FOR PARTICIPATION?
There is no compensation offered at this time.

DO YOU HAVE TO TAKE PART IN THIS STUDY?
Taking part in this research study is entirely voluntary. You do not have to participate in this research. If you choose to take part, you have the right to stop at any time during the interview. You may also decline to answer any specific question that makes you feel uncomfortable. Any refusals on your part will not influence current or future relationships with the University of Delaware.

WHO SHOULD YOU CALL IF YOU HAVE QUESTIONS OR CONCERNS?
If you have any additional questions about this study, please feel free to contact my thesis advisor, Professor Joanne Nigg at 302-831-6618 or by email at nigg@udel.edu.

If you have any questions or concerns about your rights as a research participant, you may contact the University of Delaware Institutional Review Board at 302-831-2137.
Your signature below indicates that you are agreeing to take part in this research study. You have been informed about the study’s purpose, procedures, possible risks and benefits. You have been given the opportunity to ask questions about the research and those questions have been answered. You will be given a copy of this consent form to keep.

By signing this consent form, you indicate that you voluntarily agree to participate in this study.

_________________________________                               ______________
Signature of Participant                                                            Date

_________________________________
Printed Name of Participant

Your signature below indicates that you agree to being audio-recorded.

_________________________________
APPENDIX C

IRB APPROVAL LETTER
DATE: September 12, 2013

TO: Anne Goodman, Master's Student

FROM: University of Delaware IRB

STUDY TITLE: [510593-1] Applying the Individual Understanding and Response Framework to Sea-Level Rise Perception South of Delaware’s Indian River Inlet

SUBMISSION TYPE: New Project

ACTION: APPROVED

APPROVAL DATE: September 12, 2013

EXPIRATION DATE: September 11, 2014

REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited review category # 7

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation. Please remember that informed consent is a process beginning with a description of the study and
insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office. Please note that all research records must be retained for a minimum of three years.

Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure.

If you have any questions, please contact Nicole Farnese-McFarlane at (302) 831-1119 or nicolefm@udel.edu. Please include your study title and reference number in all correspondence with this office.