PRESSURES INFLUENCING COASTAL TOWNS TO ADAPT TO SEA LEVEL RISE

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ABSTRACT

Climate change is a global problem that is going to bring about changing weather patterns and rising sea levels. While mitigation, or decreasing greenhouse gasses, is an important strategy to reduce global vulnerabilities, adaptation on the local level will help vulnerable towns maintain their viability in the face of an uncontrollable, external threat. This paper covers the sources of pressures on town-level adaptation to sea level rise on the Eastern Shore of Maryland.

In 2006, the Maryland General Assembly passed HB 1141, which required all towns that exercise local planning authority to update their comprehensive plans, the planning document that outlines the growth and development goals of the town. Towns had to include new sections about their water resources and municipal growth element. This paper comes on the heels of this legal change, where all towns had to update their plans by 2009 or lose their ability to develop new land projects, providing a ripe time to study how towns adapt. All towns had to take the time to update, and they were all doing so in approximately the same political and technological climate. Only nine towns on the Eastern Shore took this opportunity to include provisions to adapt to sea level rise.

This research paper uses a two-pronged approach to understand the sources of pressures. The initial component is four case studies where the project interviewed key informants involved in the planning process and asked them about the content included in the update as well as the process they used to determine the content. All

informants were directly involved in the process and worked to craft the document. Through these interviews the research project discovered themes of what the towns understood as their pressures for or against adaptation, as well as uncovered different levels of citizen participation in the process. By law the comprehensive plan must be completed with a mandated minimum of government openness and inclusion of the citizens of the town. Within the four towns studied there were three levels of participation, ranging from minimum participation to unprecedented, citizens-empowered participation. The case studies uncovered themes of pressure from above, through either the Maryland State government or local county governments, pressure from within, such as through citizen action, and pressure from outside, a consultant who presented sea level rise as just another issue the town had to address.

Paired with the qualitative case studies analysis was a quantitative model that used if the overarching county government had adapted, the characteristics of the town, the vulnerability level of the town to sea level rise, and their use of a consultant to predict if the town undertook adaptive efforts. These harken back to the three sources of pressure brought up by the key informants in the qualitative study: pressure from above, pressure from within, and pressure from outside. Because this research study looked at all Eastern Shore Maryland towns that were required to update, the data set was small (n=48).

Results from the quantitative segment of this project suggest that towns understand and respond to their scientifically determined vulnerability to sea level rise and respond to a strong leader effect by the consultant that they hire. Paired with the

issues that emerged in the qualitative segment, this is expected and probable. Further research must be conducted on other coastal towns in other states with similar enough planning authority to test if the responsiveness to vulnerability and the specific consultant is consistent in other areas. This paper concludes that the two most important features in influencing a town to adapt to an external threat are the validity of the threat to them and a hired expert who packages it as a non-controversial issue that they must address.

BIOGRAPHICAL SKETCH

Emily M. Ranson grew up in Ellicott City, Maryland. She received her Bachelor of Science with honors from Cornell University's School of Industrial and Labor Relations with a minor in Science of Earth Systems in 2012. In the fall of the next year she began work on a thesis for a master of science. Her research focuses on the use of conflict resolution in environmental disputes.

For my parents, who are always there

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vulnerability according to the Coastal Vulnerability Index, whether or not the town received outside funding, and whether or not the town used one or more consultants.

LIST OF ABBREVIATIONS

CVI – Coastal Vulnerability Index

HB 1141 – House Bill 1141

USGS – United States Geologic Service

Introduction

By aggregated land and water area, Dorchester County is the largest county in Maryland, second largest when only land mass is counted. A primarily blue collar area with low incomes, it is facing a climate crisis that is increasingly tangible. With rising sea levels, homes and towns are anticipated to flood, but these projections are oftentimes just that, imprecise predictions based on science that people may not understand. But what people are seeing is captured in the images of abandoned homes on hills completely surrounded by flooding water. With saltwater intruding into what was once fresh water, farmers and lumbermen are seeing their livelihoods threatened. In the face of this, abandonment of properties has already begun as people try but fail to sell the home that now represents what could be the extinction of a way of life on the Eastern Shore. (Cole, 2008)

This paper aims to begin to answer how and why communities respond to the global phenomenon of climate change by focusing on the Eastern Shore region of Maryland. Through a two-pronged approach of both case studies and data set regression, this paper addresses what influences communities to adapt to sea level rise, an effect caused by rising global temperatures decreasing the amount of water stored as ice. What impacts a community's capacity, or even baser their willingness, to respond to a threat has two major implications, one for reducing vulnerabilities and the subsequent costs of unpreparedness for a disaster, and the other for the administration of grants trying to entice at-risk groups to take an action. Assuming that there is nothing particular about the people of the Eastern Shore, and that their behavior is not somehow fundamentally different than the behavior of any other people facing an external, and uncontrollable, threat then their reasons for adapting or not adapting could be generalizable to

other groups in a similar situation. Climate change is a global problem that is going to have local impacts. Unfortunately for at-risk towns there is little to be done about mitigation if there is not major, at least national, commitment to reducing greenhouse gas emissions. For towns whose citizens' livelihoods will be threatened by changing weather patterns or rising sea levels, their best option is swift adaptation, converting their infrastructure now so when sea level reaches a threatening point for them they are prepared.

In this research project, I compiled a data set of the forty eight towns on the Eastern Shore of Maryland that were required by the State of Maryland to have valid Comprehensive Plans. Villages and other settlements which do not operate planning and zoning authority were not included in this data set. These settlements are covered by the county level comprehensive plan. 42.3% of the population of the Eastern Shore is covered under a town level comprehensive plan (United States Census Bureau, 2013). Comprehensive Plans are documents adopted by a town's local government body which "spells out the manner in which a municipality, county or sub-area of a county must develop" (Maryland Department of Planning, Comprehensive Plans). It includes policies spelling out how the town will protect environmental features, provide water for development, and how anticipated growth will impact community facilities and the surrounding environment. There are eleven required sections, two additional ones for towns located on tidal waters or have current geological information available. Towns must review and, if necessary, update the Comprehensive Plan every six years. This research follows on the heels of House Bill 1141 and House Bill 2 from the 2006 Maryland General Assembly which instituted changes to the requirements and added a Water Resources Element and a Municipal Growth Element, which had to be included in all comprehensive plans no later than October 1,

2009. This forced all Maryland towns to draft new sections and provided a ripe environment for studying adaptation. Towns had no statutory requirement to include provisions for, or examine their risk due to, sea level rise. Through the use of this forty eight town data set, I ran logistic regressions to determine which influences on the town, ranging from leader effects to vulnerability, had the strongest role in effecting adaptation. From this data set of forty eight towns, four towns in Cecil and Dorchester County were identified and interviewed to develop a narrative about the process their towns used to develop their new sections and update their Comprehensive Plans.

Literature Review

What is a Comprehensive Plan

In Maryland, Comprehensive Plans are the vision that towns have for the future of their town. State law requires the town to draft a plan for land use, transportation, community facilities, development, critical areas, sensitive areas, how they intend to implement the plan, how much development they anticipate is possible, a municipal growth element, and a water resources element (Maryland Department of Planning, Comprehensive Plans). The municipal growth element and water resources element are new sections required after the 2006 legislative session. These plans require a significant amount of technical information and understanding, from scientific to economic to social. The process that towns use to craft these plans is generalizable to many other public interest disputes, because the decisions made by a subset of the population impact the rest of the population of the town. Many of its subsets align with environmental public policy, as towns are forced to consider their natural environment and how their growth and development impacts local ecosystems as well as the town's long term

sustainability.

The land of the Eastern Shore is regulated on four levels: the local or town level, the county level, the state level, and the federal level. This leaves land use debates open to multiple players with their own interests, and covers land differently. Maryland law requires towns to maintain consistency with their individual county's comprehensive plan as well as with the state (Maryland Department of Planning, Comprehensive Plans). Furthermore, large areas of federally owned and administered land is interspersed with county and town managed land. Each of these levels have their own culture and agenda which they desire to implement, leading to a complicated and ever changing setting for town level comprehensive plans.

Environmental Conflict Resolution

Environmental conflict resolution is an umbrella term for various means for resolving conflict that are not determined through litigation or authoritative administrative decisions. Its various expressions share five common characteristics: voluntary participation, direct participation, all parties have the option to withdraw and seek resolution through a more formal process, a third-party neutral not able to impose an outcome, and the parties must agree to the outcome or resolution (Emerson, Nabatchi, O'Leary, and Stephens, 2003, p. 6). While the conflict has an environmental subject matter, environmental conflict resolution encompasses the interconnected issues of the biophysical, economic, political, and social systems (Glavovic, Dukes, and Lynott, 1997). Its advantages include less risk (Emerson, Nabatchi, O'Leary, and Stephens, 2003), a reduction in cost compared to more formal means (Sipe and Stiftel, 1995; Emerson, Nabatchi, O'Leary, and Stephens, 2003), increased efficiency of the outcome, and increased likelihood of a stable agreement (Bacow and Wheeler, 1984). Anecdotal evidence

suggests that involved parties frequently experience a positive relationship improvement (Talbot, 1983; Susskind, McKearnan, and Thomas-Larner, 1999; Dukes, 2004), enhanced negotiating skills (Buckle and Thomas-Buckle, 1986), and trust (Innes, 1999).

This study focuses on towns developing an update to their Comprehensive Plan. The method of Environmental Conflict Resolution which is important for this study is negotiated rule making, where government agencies, in this case local government, negotiate with interested stakeholders to reach agreement on the proposed changes to the law (Emerson, Nabatchi, O'Leary, and Stephens, 2003, p. 12). It is a relatively new process of environmental conflict resolution and is the institutionalized acceptance of environmental conflict resolution in governmental policy and decision-making (Amy, 1987).

Environmental policy is difficult to craft because of both the nature and scope of environmental issues. An issue requiring a policy will include many parties, but not all parties will be immediately obvious when the issue is first identified. Environmental decisions have long range impacts on the surrounding, or possibly distant, area and have serious public policy implications. In the case of planning documents, such as a town's Comprehensive Plan, these difficulties come hand in hand. Planners have to weigh the merits of community participation with their available resources while dealing with a plan that outlines the town's plan for how it will handle their future.

Features of Environmental Disputes

Attachment and Identity

Attachment to a place is based on cognition and effect (Low and Altman, 1992;

Proshansky, Fabian, and Kaminoff, 1983), and through the physical and symbolic aspects of a particular place can contribute to an individual's sense of self (Proshansky, Fabian, and Kaminoff 1983). A theorized explanation for why some municipalities adapt and others do not is sense of place and how it impacts place-protective behavior. Place-protective behavior is when individuals engage in an action that serves to protect an area of interest from change, such as making changes to buildings and the surrounding environment in order to protect their town from rising waters (Stedman, 2002). Individuals are more likely to engage in place-protective behavior when they are attached to the location and are unsatisfied with its conditions (Stedman, 2002). This attachment can form because of psychological investment with the place that develops over time (Williams & Patterson, 1999) because of repeated exposure (Moore and Graefe, 1994). While identity is individualistic, shared meanings of a place can lead a group to develop similar attachments and similar definitions of what that place means (Van Liere and Dunlap, 1978; Greider and Garkovich, 1994). Common understandings of place can increase feelings of belonging to the community, improving cohesion (Relph, 1976; Tuan, 1980). As a result, if a town reaches a common identity, it can engage in behavior to protect or improve the location to maintain congruence with the shared attachment.

Fundamental Issues and Value Differences

Additionally, environmental disputes are oftentimes rooted in fundamental issues that differentiate the parties and prevent sustainable resolution. These issues include individual and community health, racial and ethnic justice, survival or death of an entire species, integrity or destruction of whole ecosystems, and the economic or cultural viability of various human communities (Dukes, 2004, p. 191). Other researchers describe them as moral conflict (Burgess

and Burgess, 1996) or different worldviews, values, principles, or social structures (Amy, 1983). Differences in how people understand the world frames not only their values and goals, but it limits what actions are available to them (Hunter, 1989). Unfortunately for resolution, these fundamental beliefs, or values can lead to "resistance to resolution" (Campbell, 2003).

Scientific controversy in the environment oftentimes rest on these value differences, not fact. Environmental science is not neutral because it rests on value judgments in its analysis and standards, such as if biodiversity is good (Carolan, 2008). Communities must complete assessments of risks and determine how much risk is acceptable (Crowfood and Wondolleck, 1990, p. 7). Does the community value environmental integrity? Do they feel obligated to protect biodiversity? How much risk is acceptable? With scientific controversy spurred by value differences, these disputes can maintain resolution resistance.

Uncertainty

Environmental issues entail uncertainty so policymakers cannot fully understand the impacts of a policy over time. In his 1993 book *Compass and Gyroscope: Integrating Science and Politics for the Environment*, Lee suggested that policymakers treat new policy as an experiment. Adaptive management allows policy makers and scientists to update their approach as new information about the impact of policy implementation comes to light (Borsuk et al, 2001). This approach requires public confidence in order to overcome unexpected outcomes and reframe them as opportunities to make adjustments as well as mechanisms for public participation and social learning (Umemoto and Suryanata, 2006). Comprehensive Plans in the state of Maryland must be reviewed every six years, and the legal and scientific framework of

these Comprehensive Plans is continually shifting. How towns respond to political and scientific uncertainty could be interpreted by how well they engage their communities, persuading them that they benefit from new policy.

Science can bring its own uncertainties not entirely attributable to politics. On its own it can breed controversy and conflict. Carolan explains that science is “pure” when it is confined to its narrow conditions of the experiment, but when extrapolated into the social context uncertainty arises, breeding conflict of interpretations (2008). Researchers understand that when they address risk they cannot take all variables and interactions into account and can reach consensus in the absence of certainty/direct evidence (Carolan, 2008). However, this is easier in the absence of public policy implications. A predictive model that scientists find meaningful may have very little meaning to the general public and policy makers (Borsuk et al, 2001). Highly complex scientific models are difficult to translate for policy makers, limiting their ability to make optimal decisions (Borsuk et al, 2001). With science pertaining to public policy, sides have reason to find scientists who already agree with their position, “'fishing for experts in roughly the correct positions...who interpret 'the facts' in a manner consistent with their own” (Carolan, 2008). These scientists do not seek to win over mainstream, peer-reviewed science but instead aim to create a wedge issue which inspires uncertainty in the eye of the public (Carolan, 2008). The media's norm of balancing issues allows this to shape public opinion, presenting extreme viewpoints as an acceptable alternative to the mainstream and gives undue representation to the fringe.

Value differences and scientific uncertainty are not the only challenges besetting communities as they update their Comprehensive Plans. The process of developing agreement

and a new plan comes fraught with its own unique hurdles. Communities must deal with an iterating relationship and parties have to consider how they handle the planning process now will influence the relationship and decisionmaking processes in the future. There are three basic approaches to dispute resolution according to Ury et al, those which determine who is right, those which determine who is more powerful, and those which reconcile the disputants' underlying interests (1988). For community conflict management the dominant approach to dispute resolution falls with those strategies that reconcile the disputants' underlying interests, hopefully preserving a fruitful and peaceful relationship.

Types of Conflict

Conflict in general exists in many different forms every day. For this paper important level of conflict is that which influences the decisions of a town. A personal-level conflict may reach influence if the person involved has power within the town, but for the most part these involve economic, environmental, and political disagreements spurred by factions within or around the governing structure. This paper adopts a neutral use of the word conflict and does not assume that conflict is negative. Therefore, while the negotiations that emerge around a comprehensive plan may not be contentious, they are a form of conflict. Conflict can have two sides, one positive and the other negative. Morton Deutsch in his 1973 book *The Resolution of Conflict* writes that within a community there are two types of conflict: destructive and constructive.

Destructive Conflict

Destructive conflict is “characterized by a tendency to expand and escalate. As a result,

such conflict often becomes independent of its initiating causes and is likely to continue after these have become “irrelevant or have been forgotten” (Deutsch, 1973, p. 351). The underlying interests of the parties are forgotten and become less important than the goal of winning the conflict, which leaves parties ignoring the possible win-win solution. This occurs because of three interrelated processes that occur within the community based on competition, misperception, and commitment. The competition is rooted in human nature and economics, the parties want to win the conflict. This is escalated because competition encourages the parties to have unreliable and impoverished communication (Deutsch, 1973, p. 353). This focus on competition encourages the parties to adopt a “suspicious, hostile attitude that increases the sensitivity to differences and threat while minimizing the awareness of similarities” (Deutsch, 1973, p. 353). In other words, competition between groups within the community reinforces in group and out group dynamics and frees people to behave with a different set of morals than those that they would use with people who were similar to themselves.

In addition to the competitive processes these destructive conflicts are riddled with misperception and biased perception. Much as the competitive processes allow for in and out group stereotyping and frees people to dehumanize their opponent, misperception and biased perception escalates the conflict by putting yet another barrier between the groups involved. Biased perceptions encourage parties to escalate the conflict and ignore possible win-win situations by impacting how people are able to judge the conflict and related information. As Deutsch notes, “The biased perception of what is a fair compromise makes agreement more difficult and thus extends conflict” (1973, p. 355). Not only does this cloud the parties' ability to evaluate what is a fair compromise, it also prevents them from accurately judging the other side's

willingness and capability to fight (Deutsch, 1973, p. 356).

Finally, as alluded to earlier, group dynamics which lead the parties to want to win the conflict and be unable to accurately judge the terms of agreement and the other side's willingness to fight also lead to increasing commitment due to pressures for cognitive and social consistency (Deutsch, 1973, p. 352). Festinger emphasized in his theory of cognitive dissonance that people tend to act in accordance with their beliefs, or alter their beliefs and attitudes to they are consistent with their actions (1962). The pressure for self-consistency may lead to "an unwitting involvement in and intensification of conflict because one's actions have to be justified to oneself and to others" (Deutsch, 1973, p. 356).

Constructive Conflict

Constructive conflict, on the other hand, is characterized by creative thinking and cooperative problem solving. Much like how destructive conflict is furthered by misperception, competition, and escalating commitment, the key features of cooperative problem solving are benevolent misperception and cooperative commitment (Deutsch, 1973). Constructive conflict occurs when the parties choose to adhere to a process that encourages creativity and cooperation, and very few conflicts are inherently destructive.

Creative thinking is a process that encourages the parties to think outside of the metaphorical box. It occurs after a first unsuccessful period where the parties experience a problem that motivates them to take effort to solve it, a period of effort through their normal channels which is unfruitful, and subsequent frustration, tension, and discomfort (Deutsch, 1973, p. 360). The parties are then motivated through their commitment to fixing the problem to view it from a different perspective and reformulate their understanding and attempt new orientations.

They then find a tentative solution, experiencing exhilaration, and ultimately test the new solution against reality until they find a durable one. The key psychological elements of creative thinking include appropriate levels of motivation, conditions allowing the parties to reformulate the problem once an impasse has been reached, and the availability of diverse ideas that can be flexibly combined into new patterns (Deutsch, 1973, p. 360).

Public Involvement in Decision Making

This projects focuses on public involvement in developing sea level rise adaptation plans, and therefore it is important to understand the nuances in the ways public officials include the public. Consultation is not public involvement according to Roger Sidaway of the University of Edinburgh in his 2005 book *Resolving Environmental Disputes: From Conflict to Consensus*. The differences lay in the role the public plays in decision-making, the timing of such involvement, and the initiators' motives in seeking involvement (Sidaway, 2005). To be meaningful public involvement and not mere consultation, the public must play an active role in decision-making and creation of the plan and must not simply be asked for comments or approval about the draft plan. To play an active role in decision-making, the public needs to be involved from the outset, and not brought in after a draft plan has already been created and effectively decided upon. For it to not be an "empty ritual of participation," the public must have real power to be able to change the outcome (Arnstein, 1969).

Under Maryland law, public consultation is required in the process of developing a new Comprehensive Plan. Towns must have public hearings and allow the public to comment on their proposed drafts. Anything more than consultation is over and beyond what the law requires. Some towns when responding to the requirement to update their Comprehensive Plan

embraced a participatory process and the conflict that goes hand-in-hand with it and attempted to utilize this conflict and creativity to draft a plan that the people were committed to and reflected the individuality of the town.

Benefits of Public Involvement

Public involvement is known for encouraging the adaptation to new ideas by shaking up the status quo. While traditionally public officials will make decisions and ask the public to approve them, injecting new ideas by encouraging public involvement from the conception of the project helps officials adopt new understandings and new ways to think about the issue (Sidaway, 2005). It allows officials to incorporate local knowledge and values, which helps guide a planning document that properly reflects the needs and wishes of the people it represents (Beierle and Cayford, 2003). Furthermore, public involvement incorporates new ideas, brokers change, develops new acceptable solutions, sharing of risk, and social learning, helping the parties develop a greater understanding of interests and issues (Sidaway, 2005).

As the parties begin to think creatively and learn about the issue, they can lose their fervent allegiance to positions. Frequently at the beginning of the process the parties do not fully understand their underlying interests and needs. The parties, as is common in the adversarial process, frame their wants as needs and may internalize these. Their underlying rationales may be obscured, and the substantive issue or apparent cause of the conflict may not be what is the most important for the disputing parties (Amy, 1983). Instead, the parties begin disagreeing about a possibly related – but not identical – issue but are unable to reach resolution because the disagreement is centered on an underlying issue (Amy, 1983). As parties learn about the issue they learn about themselves and their own real interests, providing opportunities for an

integrative solution (Dukes, 2004).

Additionally, public involvement has roots in American democratic ideals. Thompson gave reasons for why participation is necessary, such as when an action in the public interest may have an adverse effect on a minority, when the democratic process fails, and when local government officials are incompetent (Thompson, 1977). Unfortunately for democracy, those in charge are not always in touch or in sympathy with the majority of people affected by their decisions. Furthermore, local government officials are not guaranteed to have the time nor the expertise to deal with complicated social or technical issues, where environmental issues are firmly rooted. Finally, public involvement reflects democratic ideals, such as social harmony, desirable social change, social reform, empowerment, right to participate, and social inclusion (Sidaway, 2005). Proponents of these environmental and public policy dispute resolution processes claim that they "empower individuals and groups to reclaim their voices, increase their self-esteem, democratize their neighborhoods, involve the disenfranchised in policy deliberations, and create new social or governing structures" (Birkhoff & Lowry, 2003, p. 31). Benefits extend to increased resources and efficacy in future negotiations, increased legitimacy and respect, and challenges to existing power relationships (Birkhoff & Lowry, 2003, p. 31). Public involvement, however, is not always as simple as a government being open to it. Towns frequently have trouble garnering interest from their citizenry, which stalls any attempt to benefit from public involvement.

Problems with Public Involvement

Cooperative problem solving involves a common problem for which conflicting parties have a joint interest in reaching a mutually satisfactory solution (Deutsch, 1973, p. 362).

According to Deutsch, “there is nothing inherent in most conflicts that makes it impossible for the resolution of conflict to take place through a cooperative process” (Deutsch, 1973, p. 363). There are certain enduring myths about cooperative problem solving and including the public into meaningful decision making (Sidaway, 2005, p. 125). One is that involving the public leads to paralysis and inaction, and it is better for public officials to make authoritative decisions. Amy writes, “Efficiency is a virtue which has been long championed by those who wish to *minimize* public participation in policymaking” (1983, p. 349) [Emphasis in original]. However, removing public involvement from decision making to preserve authoritative decision making powers comes with significant drawbacks, notably during implementation. Many authoritative decisions are challenged by opponents and those who felt like their concerns were not taken into account in the final plan. Advocates of meaningful public involvement in administrative decisions argue that public involvement, not authoritative decision making, is the more efficient option (Amy, 1983, p. 350). More time will be spent on crafting the policy, but it will make implementation and enforcement easier. Patemen observed that those who participate in policymaking tend to internalize the policy as their own, “[enabling] collective decisions to be more easily accepted by the individual” (Patemen, 1970, p. 27). Including public participation in the process resolves conflict among competing interests (Beierle and Cayford, 2003). Therefore, despite the enduring myth that public involvement is inefficient, its benefits to implementation and enforcement discredit the idea that it is best to use authoritative decision making.

Related, public involvement may be misused by single issue groups and can be used to stall and delay an action they disagree with (Beierle and Cayford, 2003). Public involvement includes a tradeoff between the quality of participation and the number of people who can be

incorporated into the process. But as noted previously, groups are already able to use obstructionist tactics through the courts, and instead involvement may be used to help parties internalize the decision as compliant with their needs. In towns where the issue is local, it is possible for opposing, loose coalitions of neighbors to emerge and work to minimize any undue influence of an unpopular single issue group. The barriers to entry in a publicly funded, locally sourced negotiation is much smaller, limited to who has the time to attend planning meetings.

Much as public involvement could be misused by single issue groups, it can also give undue influence to vocal minorities which are unrepresentative of the silent majority (Crowfoot and Wondolleck, 1990, p. 23). This criticism assumes that public officials represent the unvoiced desires of the majority, which may or may not be a fair assumption. Even if public involvement balanced the influence of vocal minorities and is supporting a position of the majority, the public may be irrational and emotional and their arguments are invalid and not based on facts, so it is irresponsible to include the public. However, especially in the case of scientifically technical issues, it is unwise and unfair to assume that decision makers have the time or capacity to understand and deal with the problem.

Cooperative Processes for Public Decision Making

Cooperative processes lead to productive conflict resolution because it is characterized by open communication, recognition of legitimacy of the other parties, and trust. Open communication is important to cooperative problem solving in conflict resolution because it allows the parties to honestly share information and tackle the problem with the most knowledge of the issue (Deutsch, 1973, p. 363). This also increases learning among the parties, enhancing their understanding of the problem and its implications as well as expanding their grasp of

conflict resolution tools, ideally helping the parties engage in cooperative problem solving earlier in the next conflict (Beierle and Cayford, 2003; Sidaway, 2005). Public engagement helps the parties develop an understanding about their own needs and how to address them (Sidaway, 2005).

Additionally, cooperative problem solving encourages the parties to recognize and respect the legitimacy of the other party's interests and accepts that resolution will occur when the solution is responsive to the needs of both sides. The adversarial method that tends to be dominant in the American legal system polarizes issues and the parties, escalating conflict (Sidaway, 2005). Cooperative problem solving avoids these pitfalls, instead it serves to limit the scope of conflicting interests and reinforces mutual interests. It also minimizes the need for defensiveness because both parties accept that both sides must be satisfied in order to reach resolution (Deutsch, 1973, p. 363).

Furthermore, it improves trust and the relationship of the involved parties (Beierle and Cayford, 2003; d'Estrée, 2003). As the parties increase their positive affect they increase their sensitivity to the similarities they share with the other side and simultaneously reduce the salience of differences. Cooperative problem solving stimulates a convergence of beliefs and values in the parties (Deutsch, 1973, p. 363). Mediators observe that through jointly working together, parties develop rational relationships and lead to parties identifying with their previous adversary (Birkhoff and Lowry, 2003, p. 30). Collaborative processes, by having parties work together to create a new solution, improves the relationship and social capital of involved parties.

When applied to a community taking a prominent role in crafting the vision and plan for their town, this emphasis on cooperative problem solving and its influence on promoting

legitimacy and trust may have a restorative effect on the community. As open communication and a decrease in stereotyping occurs, it is reasonable to believe that the in group and out group dynamics within a community may begin to disintegrate. Groups may begin to have increased respect for the needs and desires of the other, and trust may maintain conflict at a healthy, or constructive, level (d'Estrée, 2003).

Much as there is constructive conflict, Coser, in *The Functions of Social Conflict*, theorizes that conflict is actually a stabilizing process in social groups (1956). Conflict allows groups to make small adjustments in social norms and power as conflicts arise, helping them be "flexible" social structures that tolerate conflict and eliminate dissatisfaction. On the other hand, "rigid" social structures spurn conflict and lack tolerance or institutional mechanisms for dealing with conflict. As a result, this rigid social structures do not have a safety valve which helps them make minute adjustments before dissatisfaction can grow and threaten stability. (Sidaway, 2005, p. 46)

Of course, public involvement, despite how it encourages creative thinking and cooperative processes, has its limitations especially when it is co-opted. Public involvement can be interpreted as a token gesture by the public. This is especially true when the process fails due to too high of expectations by the public, it falls short of delivering desired political change, or endorses what the planners and/or politicians already had planned (Sidaway, 2005). To protect itself against actual or perceived co-option the process needs to be seen as legitimate, fair, balanced, and open. Special care needs to be taken in how the process is initiated, its level of inclusivity, and whether the relevant information is readily available to all parties (Sidaway, 2005).

Community Characteristics

While the previous literature gave theoretical context of the process and reasoning behind responding to environmental issues through public involvement, community characteristics provide a more specific explanation for why, not how, a community might adapt to an external environmental threat.

Leader Effect

There are three levels of government above the local government making the decisions about what to include in its comprehensive plan: the federal government, the state government, and the county government. Of these three, the state government of Maryland is the most active in shaping the growth and future of local municipalities.

Specifically in the state of Maryland towns must comply with the Critical Area Act of 1984, 2006 HB 1141, and the Smart and Sustainable Growth Act of 2009. The Critical Area Act of 1984 identified Critical Areas "all land within 1,000 feet of the Mean High Water Line of tidal waters or the landward edge of tidal wetlands and all waters of and lands under the Chesapeake Bay and its tributaries" (Critical Area Commission). Its goals were to minimize adverse impacts on water quality from surrounding development's pollutants, conservation of habitat and local species, and establish land use policies that allowed for growth while minimizing adverse impacts of pollution and increased human presence in Critical Areas. The Critical Area Commission places limits on how towns may develop land located within the Critical Area. HB 1141 dictated new sections that towns had to include in their comprehensive plans, the Water Resources Element and Municipal Growth Element, which spurred the updates to comprehensive plans which this paper studied. Finally, the Smart and Sustainable Growth Act

of 2009 requires consistency between zoning and the comprehensive plan in municipalities and includes a state created education course for local planners. The Smart and Sustainable Growth Act was specifically created to overturn a county zoning decision to allow a housing development (Maryland Department of Planning, 2009). Maryland updated its requirements for community "smart growth" and "sustainability" in 2006, 2009, 2010, and 2012. Maryland laws apply to all Maryland towns and does not explain variation seen in adaptation.

With a state government active in shaping growth, it is unclear if the county governments have the power to exert their own, distinct influence. Three counties have emerged as concerned and interested in enforcing adaptation to sea level rise on a county-level: Queen Anne's, Wicomico, and Worcester. Because local governments are required to maintain consistency with federal, state, and county level mandates, it is possible that a county leader effect may explain the variation observed in which Maryland towns adapt to sea level rise.

Income and Funding

Growth machine theory predicts that high-income municipalities have greater ability and are most likely to sustain activism on land use issues and therefore are the most likely to limit development density (O'Neill, 2011). Wealthier communities have the ability to afford limiting growth, or afford adaptation efforts. It is important to remember that in most cases the threat of sea-level rise and even global warming in general is in the future. Maryland, as noted previously, will experience two to three feet of sea level rise over the next hundred years. In relative terms, it costs the wealthy less to prepare for a threat that will happen in a hundred years than those who are living at the brink. However, the State Planners of Maryland work with towns to help them find and apply for grants, which may be an equalizing force.

Non-Economic Characteristics of the Town

While wealthier communities can afford to make the changes that will reduce their future vulnerabilities, the more educated are more likely to understand the complex nature of global climate change and its associated sea-level rise. A common strategy employed by citizen organizations is education about the issue that they are trying to mobilize people about (Nelson, Manring, Crowfoot, and Wondolleck, 190, p. 152).

Additionally, the political ideology of the town may contribute to the willingness of a community to feel the need to adapt to a hot-button issue that has become increasingly politicized: global climate change. Skepticism about climate change has become a feature of Republican ideology, according to the analysis of trending polls on climate change opinion by Riley E. Dunlap, a Gallup Scholar for the Environment. "Recent Gallup Poll results suggest that this skepticism among Republican and conservative elites has led rank-and-file Republicans to follow suit" (Dunlap 2008). In the recent Presidential election, the Eastern Shore was strongly Republican, with Romney receiving over 50% of the vote in every county, specifically 59.1% in Cecil County and 52.7% in Dorchester ("2012 Maryland Presidential Results" 2012). However, there is variation among the 2012 Senate race, which could be an interesting variable in analysis to see if the mixture of voting preferences is correlated with adaptation. In Cecil County 45% of the vote went to the Republican challenger – as compared to 35.8% to the Democratic incumbent ("2012 Maryland Senate Results" 2012). Dorchester County, on the other hand, voted 43.2% for the Democratic incumbent and 37.9% to the Republican challenger ("2012 Maryland Senate Results" 2012). The information is readily available and helps to provide greater distinctions between the behavior of Cecil County versus Dorchester County.

Finally, migration patterns is an exploratory variable that protected the data from possibly representing highly mobile people that are leaving a town instead of trying to prepare it for future threats. Dorchester County is already experiencing residents abandoning their homes because of increased flooding, and they are unable to sell them. This type of instability, if widespread, could have had one of two effects. It could have theoretically increased the willingness of the remaining residents to engage in adaptive behavior because they see that their neighbors are unable to sell their homes and might be frightened into a more drastic change in order to protect their investment in their home. It also could have decreased the willingness of the remaining residents to engage in adaptive behavior because they may have pessimism about the future of their area and may be more interested in attempting to salvage what economic worth their home still has and relocate.

Vulnerability

When an event or change threatens an individual's or group's sense of place, place disruption occurs (Brown and Perkins, 1992). This causes those with a threatened sense of place to undergo emotional responses, such as anxiety, feelings of loss, or even psychiatric trauma in some cases (Brown and Perkins, 1992; Devine-Wright, 2009). Place attachment can lead to environmentally responsible behavior (Vaske and Kobrin, 2001) and dissatisfaction with the current condition of the place can lead to action (Stedman, 2002). Disruption's impact is characterized by extent (how much?), rapidity (how fast?), and control (how controllable is it?) (Devine-Wright, 2009). The threat does not have yet to be manifesting in order for it to change behaviors, a populace merely has to have the impression that a disruption is going to occur. Place attachment may be psychologically disrupted before it happens and a sense of threat may

be more important than the actual threat (Devine-Wright, 2009).

Through the use of the 2006 legislative change as the vehicle through which community capacity to respond to a threat can be explored, the implications for important environmental issues abound. Climate change is one of these issues that is going to have significant impacts on communities, both coastal and those inland through changing weather patterns, warming, and sea level rise. Its costs will be significant, especially assuming the planet stays on its current greenhouse gas emissions trajectory. Within coastal communities economic impacts will include, but not be limited to, loss of land, loss of built property, loss of infrastructure, increased costs to maintain roads, industry relocation, and loss of vegetation with economic worth – such as crops and timber forests. The literature on the difficulties of scientific policy, cooperative processes, and public involvement informs the case study component of this research project, drawing attention to previously determined beneficial processes and shortcomings that groups in conflict face. In the case studies, towns fall on a spectrum of public involvement and willingness to embrace scientific uncertainty and adapt to sea level rise. On one extreme, a short-staffed town that outsourced its planning and involved the public as a bare minimum, and on the other a large town that experienced unprecedented levels of public involvement and crafted a forward-thinking plan for preserving the local ecosystem and addressing sea level rise vulnerabilities.

Methodology

The two-pronged research method allowed for the case study interviews to inform the quantitative research and lead the research to explore features that were not immediately obvious. There are three possible explanations for why a community adapts to sea level rise

apparent in this study: pressure from above, pressure from within, or pressure from outside. Pressure from above is the overarching government, such as the county or state government, forcing towns to adapt to sea level rise. Towns with a homegrown desire to adapt because they are concerned about their vulnerability and are willing to make sacrifices to reduce it, is pressure from within. Pressure from outside is if there is someone external to the government structure who does not have a vested interest in the long term viability of the town, in the case of this research this role is fulfilled by the consultants that the towns hired to develop their Comprehensive Plans.

Which type of pressure is the most important in influencing towns to adapt to sea level rise? Are adaptive towns merely responding to pressure from an adaptive county? What characteristics in a town influence it to adapt? Do towns respond to scientific measures of vulnerability or do they perceive risk by their exposure to waterfront? Does the expert towns hire to help them develop their updated Comprehensive town influence adaptation?

Case Study Methodology

To attempt to provide context for these questions, the case study component of this project compared towns in two counties within the Eastern Shore of Maryland: Dorchester County and Cecil County. Dorchester County applied for funding in 2008 for a project titled "CCI - Comprehensive Plan Revisions for Compliance with HB1141, Water Resource Element" to incorporate sea level rise adaptation strategies in their county codes as they updated them to comply with the 2006 legislative change. As of 2013 they have not incorporated these into their Comprehensive Plan. Cecil County has not applied for guidance, and has not included sea level rise in its Comprehensive Plan. These counties were chosen because both have a large number

of towns that were required to update their Comprehensive Plan, when compared to other Eastern Shore counties, six in Dorchester and eight in Cecil. Dorchester County had three adaptive communities and Cecil County had two, while in Somerset, the only other county with multiple adaptive communities, all of its two towns required to update included adaptation. Despite differences in their projected risk – Dorchester is anticipated to be more vulnerable than Cecil County in the event of sea level rise – the two counties have similar economies. Both have approximately 80 percent of their civilians employed by the private sector, and both counties four most prominent industries are manufacturing, trade/transport/utilities, education and health, and leisure and hospitality (Cecil and Dorchester Brief Economic Facts, 2013). In Dorchester manufacturing is more prominent with 19.1% of employment, while in Cecil trade/transport/utilities is more prominent with 22.8% of employment. Therefore, with the greatest number of towns required to update their Comprehensive Plans as well as similar economic make ups, this research project considered Dorchester and Cecil Counties to be the best counties from which to choose towns.

This project assumes that all of the towns on the Eastern Shore of Maryland have approximately the same capacity to adapt to sea level rise. While there are variations in income, population, and education, the communities all have access to state government resources and funding. One particular resource is the Maryland Department of Natural Resource's CoastSmart Communities Initiative which provides hands-on training and planning tools, as well as grants, to local communities. It serves to provide local communities with the resources and knowledge they need to address their vulnerability to coastal hazards and climate change. Of the forty eight towns on the Eastern Shore, nine applied for CoastSmart funding to update their Comprehensive

Plans, only four of which included adaption in their Comprehensive Plans. One of the Coastsmart grant recipients has not updated its Comprehensive Plan, which leaves four of the grant towns not adapting. Other grants also exist to fund Comprehensive Plans. State Regional Planners serve the towns in their regions by connecting towns with grants for which they are eligible.

Unfortunately, no CoastSmart adaptive town planning members were willing to be interviewed. Towns in Dorchester were identified as adaptive based on if they included the text "sea level" or mentioned the risk in their updates to their Comprehensive Plan. Ideally the project would include towns with comparable risk to the adaptive towns, but unfortunately Dorchester County has few enough incorporated towns that were required by law to update their Comprehensive Plans that non-adaptive towns were selected based on convenience. First and foremost, towns were selected based on if their town planner or other key informants were willing to be interviewed. As a result, two towns were interviewed, one independently adaptive and one non-adaptive. In Cecil County the towns were selected in a similar fashion. Like Dorchester County, Cecil County has one independently adaptive town, and like in Dorchester County, this was the only adaptive town willing to be interviewed.

To measure the perceptions of the town and understand how they interpret the threat of sea level rise as well as their attachment to their location, semi-structured interviews were used to understand the story behind the updates to the town Comprehensive Plan. Key informants were identified as people privy to the process, such as town planners and members of the town planning commission. These key informants were initially asked about the economy, prominent forms of recreation, political leanings, trust, and contentious issues as context for the town. Next

they were asked about the content of the comprehensive plan and the process that they used to update it. These questions queried planners about their perception of the risk of sea level rise, if they had received input from people of the town that they were concerned, and reflected the sentiments brought up during the town meetings. Questions in particular focused on the role of the public in developing the update to the comprehensive plan as well as possible controversy and blocks to final implementation. A full list of questions is included in Appendix A. The questions were modified based on the type of town I classified it as: adaptive or unadaptive. The key informants, who likely had similar understandings of place as the community, were asked about the town's interaction and relationship with the surrounding area. To avoid the politically contentious issue of climate change, all questions specifically asked about sea level rise and its impacts, such as flooding or salt water intrusion, which may have secondary causes. In the Chesapeake Bay, sedimentation and erosion occurs which leads to flooding and intrusion. While ideally all towns that had to update their Comprehensive Plans would be interviewed, time and logistical constraints applied. As a result, for this case study the following matrix applies:

	Adaptive	Unadaptive
Cecil	Chesapeake City	Perryville
Dorchester	Cambridge	Secretary/East New Market

Table 1: Matrix of case studies.

	Cambridge	Secretary	Chesapeake City	Perryville	All Towns
Median Income	$38,398	$51,042	$47,750	$65,417	Average: $52,621,

					Min: $30,909 Max: $81,031
Population	14,443	652	750	4345	Average: 3,625 Min: 86 Max: 29,808
Poverty Rate	24.1%	10.6%	10.0%	14.3%	Average: 13.6% Min: 0% Max: 35.3%
% Population with Bachelor's or Above	15.3%	9.8%	14.4%	19.5%	Average: 19.4% Min: 0.5% Max: 43.8%
Unemployment Rate	13.5%	10.6%	5.3%	8.7%	Average: 7.7% Min: 0.8% Max: 20.7%

Table 2: Case Study Towns compared to Full Data Set

Unfortunately because of the limited geographic area and the study's reliance on the cooperation of town planners and other similarly positioned individuals, the saturation is less than ideal. Very few planners had the time, or were willing, to be interviewed and only enough towns to fit the matrix were able to be included. Table 2 shows how the four towns included in the study compare to the rest of the data set. While self-selection bias is possible, these towns are not outliers in the data set. It is possible that towns that were proud of their comprehensive plan were more willing to be interviewed and that planners that had undergone a contentious comprehensive plan update may not have wanted to share that moment in their town's history. As a result, each town included serves to represent all of the towns that fit in its category, which is too low of a sample to draw conclusions. This is why the case study is paired with a

quantitative regression in order to inform and guide the patterns that emerge. To improve reliability Town Hall Minutes were used when available. These minutes are relics from when the town was going through the process and offered a glimpse into what was happening without the recall error of an involved party three or more years in the future.

Finally, because this is an exploratory case study, semi-structured interviews were the best vehicle to gain information from key informants because there may be underlying reasons why some towns adapt and others do not that have not yet been considered. This allowed the parties to take the interview in unanticipated directions, that provided greater insight into understanding the differences.

Minutes from the meetings, news articles where possible, and the text of the comprehensive plan provided further context and information about the content and process that the towns produced. The case studies show the difference in the processes that the four towns used and the differing levels of public input. Most importantly, when paired with the quantitative model, these case studies drew the project's attention to the importance of the consultant in driving the process of adaptation.

Quantitative Model

To complement the case study component of the project, I developed a quantitative model to predict which towns adapt to sea level rise. The model includes four groups of independent variables that might impact a community's willingness to engage in adaptive efforts to minimize their risks of sea-level rise to create the logistic regression model:

$$\text{adaptation} = f(\text{leader, economics, threat, consultants})$$

where the dependent variable adaptation is if the town included provisions for sea level rise in its

update to its comprehensive plan. The leader effect is if the county that the town is in engaged in adaptive efforts, coded as 0 if they did not and 1 if they did. This information was found in the Comprehensive Plans that the counties produced for the 2006 legislative change. Economic factors that are theorized to influence adaptation in the town are poverty, the unemployment rate, and the income of the town. Income of the town is a generated as a representation of the tax base of the town, median income * population. It is theorized that economically disadvantaged people will be less likely to pursue adaptation because it is expensive to draft new sections to a comprehensive plan and by pursuing adaptation these economically disadvantaged people will be losing flexibility to develop growth. For example, preserving marshland puts limits on how and where a town can develop, and will possibly take valuable waterfront property off of the market. The income of the town reflects the tax base that the town has available. The American Community Survey 2007-2011 data was used to populate these economic fields.

To understand the threat facing towns, the paper defines the threat level in two ways, one being the actual scientifically-based threat provided by state scientists and the other the threat level as it is interpreted by the people in the town. To measure the scientifically-based threat, this paper used the Coastal Vulnerability Index published by the United States Geological Service. This index was developed rating areas as either very high, high, moderate, or low vulnerability based on the physical variables of the area that contribute to coastal change (Woods Hole Field Center and Coastal and Marine Geology Team, 1999). It includes the geomorphology, shoreline erosion/accretion rate, the coastal slope, relative sea-level rise rate, mean weave height, and mean tide range (Pendleton, E.A., Williams, S. J., Thieler, E. R., 2004). It is possible that the reason towns do not act to adapt, despite pressure from above and the

vulnerabilities that scientists are projecting, is that they, for some reason, discount the risk. This could be from a myriad of reasons, such as ideology, belief that global climate change is not happening, distrust of science, or some other behavioral component of the people of the town that influences the town to make present-oriented decision and refusing to invest in long-term adaptive efforts. In analysis of case study towns, current vulnerabilities such as flood and high tide risk are addressed. For the quantitative model, the variable "waterfront" is included to take into account if the town is located on a body of water, either a local river, the Chesapeake Bay or one of its inlets, or the Atlantic Ocean. Compared to the influence of scientific vulnerability, the waterfront variable reflects if a town is merely responding to the proximity of water. As discussed in the literature review, perceived risk may be more influential than actual risk, and towns with day-to-day exposure to water may perceive more risk to a waterborne threat than those without this exposure.

Finally, the consultant variable is if the town used an outside consultant to guide them in creating their update to the comprehensive plan. This variable's importance first emerged during the case studies component of the project, as two interviewed town planners strongly recommended that I speak with their consultant. The model uses a dichotomous variable of if the town used a consultant, although the individual impact of consultants is further discussed in the findings of the quantitative model.

The entire data set includes 48 towns that were required to update their Comprehensive Plan on the Eastern Shore. Adaptive towns were coded as those which addressed sea level rise or climate change vulnerabilities in the text of their Comprehensive Plan Update. Seven towns within this data set have not yet updated their Comprehensive Plan and were removed.

This project seeks to add to literature about why certain areas are willing to engage in adaptive behavior and others are not by looking at a single region with the same overarching state and federal government. All towns involved had the 2006 legislative requirement that they update their comprehensive plans, but only nine communities within the region have included sea-level rise adaptation into these plans, despite the state of Maryland providing funding and assistance to help communities assess and adapt to their vulnerabilities.

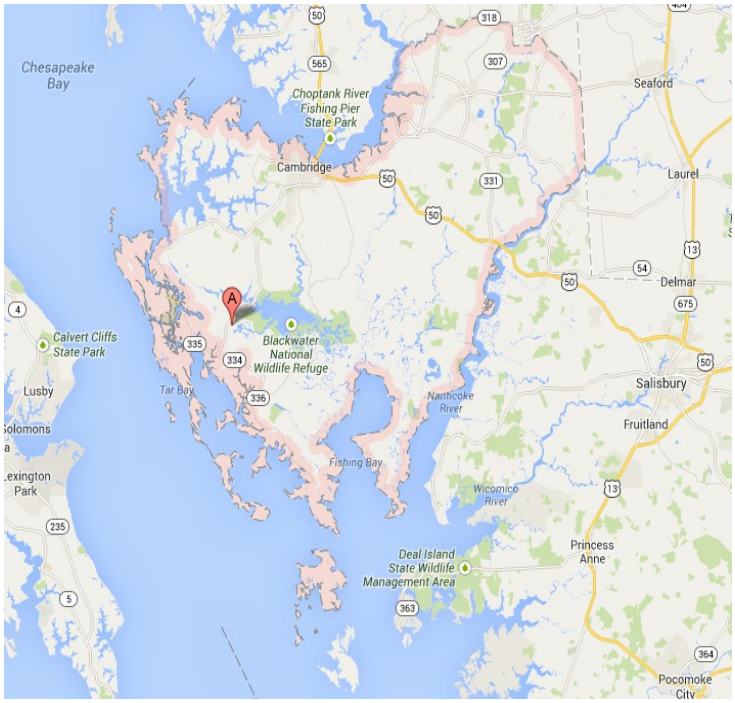
Case Studies

This component of the project details four towns located in the Eastern Shore of Maryland that updated their comprehensive plans. This section is divided under two headings, Dorchester County and Cecil County. For each county background information on their geography, economy, government, and vulnerability is given. The two towns studied in Dorchester County are Cambridge, its county seat, and Secretary, a small town with comparable risk. While the town planner for Cambridge served as its key informant, Secretary does not have such a position but instead relied on the State Regional Planners for its area. The planner interviewed focused on Secretary, but also provided generalized information about the other towns that he has worked with. After the Dorchester County case studies, the paper continues with the Cecil County case studies, Chesapeake City and Perryville. Chesapeake City does not use professional planning staff, so a member of the town planning commission served as a key informant, while Perryville has professional planning staff.

Dorchester County

Dorchester County is located firmly on the Eastern Shore of the Chesapeake Bay, divided from Talbot County to the north by the Choptank River and Wicomico County to the South by the Nanticoke River. To the west Dorchester is bordered by Delaware. Prominent water features include the Choptank River and the Blackwater River, as well as the Blackwater National Wildlife Refuge.

Map: Google Maps 2013



It's county seat is Cambridge, once a prominent food processing town on the Choptank River. Dorchester County uses the Charter Home Rule form of government, which means that its affairs are managed by five County Council Members representing the five districts of the county (Dorchester County). It has nine municipalities, six of which exercise planning and zoning authority and therefore had to update their Comprehensive Plans in compliance with HB 1141. Dorchester's current Comprehensive Plan is from 1996, although they have adopted a Water Resource Element in 2009 and an amendment covering growth areas in 2012. The Water

Resource Element was supported by the Coastal Zone Management Act of 1972 as administered by the office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration. It covers both a framework for preserving their public drinking water supplies as well as protecting the County's waterways and riparian ecosystems by managing pollution (1). It does not address sea level rise, although it does address saltwater intrusion as a threat to their freshwater aquifers, a symptom of sea level rise.

Dorchester County's workforce is dominated by private industry, with 78.7% of its residents employed in the private sector, 12.1% in local government, 7.4% in state government, and 1.8% in the federal government. Major industries include manufacturing (19.1%), trade, transport, and utilities (17.8%); education and health services (14.0%); and leisure and hospitality (10.7%). Its largest employers are Amick Farms, a poultry processing plant employing 975 people and the new Hyatt Regency Chesapeake Bay Golf Resort which employs 585 people year round. (“Choose Dorchester”, Dorchester County Economic Development Department, 2013)

EMPLOYMENT[4] (2012, BY PLACE OF WORK)

Industry	Estab-lishments	Annual Avg. Empl.	Emp. %	Avg. Wkly. Wage
Federal government	22	197	1.8	$1,148
State government	9	798	7.4	892
Local government	25	1,315	12.1	796
Private sector	743	8,538	78.7	631
Natural resources and mining	25	290	2.7	847
Construction	90	365	3.4	727
Manufacturing	40	2,070	19.1	750
Trade, transportation and utilities	209	1,932	17.8	538
Information	9	53	0.5	518
Financial activities	62	301	2.8	792
Professional and business services	89	501	4.6	905
Education and health services	70	1,517	14.0	655
Leisure and hospitality	72	1,158	10.7	393
Other services	77	351	3.2	334
Total	799	10,848	100.0	680

Includes civilian employment only

Figure 1: Employment by Sector, Source: Dorchester County Brief Economic Facts, 2012

Dorchester prides itself on its ideal location for recreational boating, seafood, challenging wildfowl hunting, and natural areas (Dorchester County Overview & History, 2013). Capitalizing on their flat terrain, which ultimately does lead them vulnerable to sea level rise, Dorchester markets itself to the person who travels “kayak or canoe, sailboat or powerboat, bicycle, or on foot” (“Everything Outdoors”, 2013). The Blackwater National Wildlife Refuge was named by Outdoor Photographer magazine as one of the top spots worldwide for nature photographers (“Everything Outdoors”, 2013). Dorchester County is also the “homeland of Harriet Tubman” the county where she was born, escaped, and subsequently returned to lead

others to freedom. Today Dorchester County has preserved her legacy through museums, tours, and outdoor recreation.

Dorchester has 220.2 square miles of vulnerable land, which is the area of tidal wetlands plus the area of land within two feet above spring high water according to a federal report of sea level rise (Nuckols, Johnston, Hudgens, & Titus, 2010). With 0-4 feet of sea level rise Dorchester has 85.2 square miles of land that is expected to flood and 27.6 square miles of nontidal wetland. Nearly 60% of the county is within the 100-year floodplain, and if sea level rises one foot much of the local landscape will be inundated during the twice-monthly spring high tides coinciding with winds blowing from the south (Cole, 2008, p. 5).

Its settlement patterns have left it particularly vulnerable to sea level rise. It is Maryland's second largest county in land area but is the second smallest county by population (Cole, 2008, p. 3). It faces risk due to sea water inundation and intrusion; focused on land area lost due to persistent water, damage to roadways due to inundation, damage to homes, damage to septic tanks, and loss of access to fresh water. Additionally, when roadways are impassable due to tides or storm events, emergency response time is hampered, a significant problem for small towns which may not maintain their own emergency personnel.

With its low population density, Dorchester County has the pattern of people settling far away from employment or schools, leaving them reliant on maintained roads. Unfortunately, given the low population base and the high amount of land area to cross, road maintenance is a huge burden. According to “Sea Level Rise: Technical Guidance for Dorchester County,” “In some areas, the cost to continually maintain road infrastructure most likely outweighs the fair market value of the properties they serve” (Cole, 2008, p. 3). The problem for Dorchester

County is two fold: not only do they have a small, lower income tax base but their maintenance costs on roads are higher than in other counties because of “freeze-thaw, inundation by tides, and heavy-vehicle traffic,” that is traffic from heavy vehicles, and not a large number of vehicles (Cole, 2008, p. 3). According to the Maryland Department of Business and Economic Development and the Dorchester County Economic Development Department, 34.5% of the workforce commutes out of the county, tying roughly a third of the county's livelihoods to accessible roads.

Villages, or towns that are not incorporated, are mostly located “at the southern or westernmost tips of long peninsulas, and surrounded by extensive areas of tidal marsh and open water” (Cole, 2008, p. 4). This is a situation where small population bases in these villages depend on roads through vulnerable areas – tidal marsh especially – in order to receive services and to commute to work. Additionally, in especially vulnerable areas in these villages most properties are of low to medium market value and the people who live there are primarily blue collar on the lower end of the pay scale (Cole, 2008, p. 4). In effect, “These are the people most at risk to the effects of inundation by sea level rise, and the ones least able to afford the costs associated with elevating or relocating homes, or repairing flood-related damages to structures and septic systems” (Cole, 2008, p. 4).

The soils of Dorchester County exasperate its difficulties with flooding: they are hydric soils that have poor surface drainage. This poor draining soils support wetland vegetation, and as sea level rises so will the groundwater table, and as water rises a process called tidal conversion will begin to take place. In tidal conversion type of wetland habitat shifts, so that areas that were freshwater wetlands convert to high salt marsh, areas that were high salt marsh

transform into low salt marsh, and so on down until open water. As the "Sea Level Rise: Technical Guide for Dorchester County" points out, "...aerial photography of Dorchester County confirms that these scenarios have already played out over the last 50 years" (Cole, 2008, p. 6).

Expected impacts of sea level rise in Dorchester County include, but are not limited to: conventional septic systems failing, saltwater intrusion leading to decreased suitability for agricultural use and forests that are unable to regenerate, increased road damage, and the increased abandonment of homes because they are no longer suitable for human inhabitants.

Within Dorchester County, two towns are included in the case study portion of the project: Cambridge and Secretary/East New Market. While Secretary and East New Market are different towns, they are in very close proximity to one another and used the same method to update their Comprehensive Plan. When asked, both of these towns referred me to the same office to direct all questions, and the informant spoke of the two almost interchangeably as he explained the difficulties and pressures they face. As a result, this paper treats the two towns as representative of small, Dorchester towns. However, East New Market is not projected to experience the same vulnerabilities that Cambridge and Secretary are expected to face.

Despite the great differences in population between Cambridge and Secretary, 14,443 and 652 respectively according to the 2007-2011 American Community Survey, they have similar mean incomes, $54,342 and $54,833. But most importantly, Cambridge and Secretary currently experience similar vulnerabilities and their future vulnerabilities are again alike. Both towns are waterfront communities on connected rivers. Secretary is along the Warwick River, a tributary of the Choptank River which Cambridge is along. Their built environments are both currently within the 100-year floodplain and the elevated tides hazard area. The elevated tides hazard

brings with it additional building requirements because of wave and wind action which puts buildings at a greater risk because waters can reach more inland or to higher points that they could in a still, flooding environment. With 0-2 feet of sea level rise, both are anticipated to lose a small amount of their land, but serious intrusions into their built environment occurs with 2-5 feet of sea level rise, and there are major losses of their main street and business districts projected for 5-10 feet of sea level rise. In fact, most of the areas to the west and south of built Cambridge are expected to be flooded with 5-10 feet of sea level rise (Maryland Emergency Management Agency). With these similarities in not only the vulnerabilities they presently face but those they are projected to face, this researcher believes it is appropriate to compare the two towns.

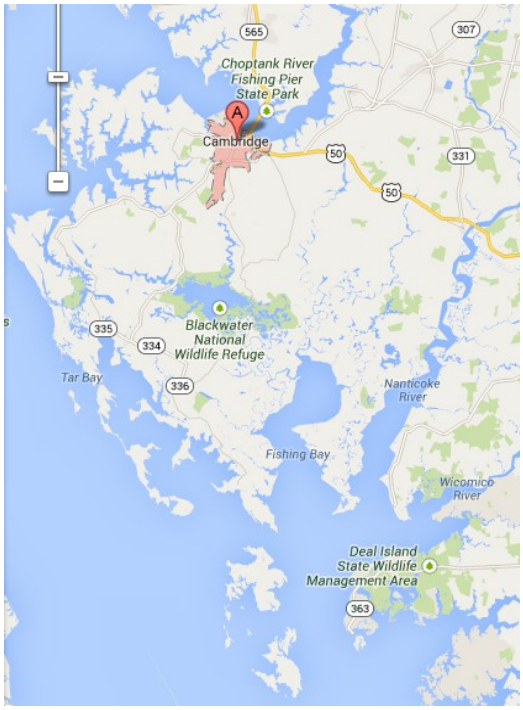
Cambridge

Cambridge, the county sea of Dorchester, is a coastal town on Cambridge Creek and the Choptank River. It is the largest town in the case studies, despite still being considered small with less than 12,000 people. Of the towns in the larger quantitative data set, Cambridge is the fourth largest behind Salisbury, Elkton, and North East. Historically, the lifeblood of Cambridge has been the water, and the main industry until the 1950s was seafood and canning. Cambridge was settled in 1684 as a seaport on the Choptank River and has a rich maritime history. Much like the other towns in the study, their main forms of recreation are anything water related, including fishing and crabbing.

The city of Cambridge is governed by a mayor and five commissioners who represent their ward. All serve four year terms. Additionally, the city maintains several departments with

professional staff as well as city boards. Unlike many smaller towns on the Eastern Shore, Cambridge has a professional planning and zoning staff.

Map: Google Maps 2013



Cambridge's historical positioning means that the oldest parts of the town are built on hills that are resistant to flooding or have reinforced walls to resist surges. Despite their historic resistance to flooding, they already experience frequent flooding events on certain roads, and with time their proximity to water and their soil composition will compound to increase vulnerabilities. As the Comprehensive Plan points out, "A combination of high water tables, soils that do not drain well, low elevations, subsidence, and sea level rise creates a situation where rainwater and tides heavily influenced the landscape" (Cambridge Comprehensive Plan, 2011, p. 42). These hydric soils form under conditions of saturation and typically support wetland vegetation. This is a common phenomenon in Dorchester County, in which 44% of its

land cover is considered wetland (Cambridge Comprehensive Plan, 2011, p. 45).

Unlike in other places, Cambridge already is witnessing and measuring sea level rise, with an average of 3.52 mm/year or 1.15 feet/century (Cambridge Comprehensive Plan, 2011, p. 55). As the Comprehensive Plan cautions, "The sea level is predicted to rise another two to three feet by the year 2100 in the Chesapeake Bay region – that is, two to three over the life span of a child born today..." (Cambridge Comprehensive Plan, 2011, p. 55). Cambridge readily accepts its increased vulnerability to sea level rise and frames it as a real threat that will occur not in the future, but in the lifespan of living children, which humanizes the threat.

Like much of the Eastern Shore, Cambridge is a fairly conservative area which voted for Romney in the last election. However, historically they have been registered Democrat while they vote Republican (interview). Locally their government tends to be balanced between the two ideologies and their current mayor is both the first woman and the first African American mayor.

Prominent interest groups in Cambridge include the West End Citizens Association (WECA), Dorchester Citizens for Planned Growth, and the Eastern Shore Land Conservancy. WECA formed in 1992 to "enhance the quality of community life for all residents of the West End of Cambridge" (2007 Newsletter). The West End of Cambridge includes the historic district, downtown Cambridge, and the waterfront. According to their "What is WECA," the group formed after they perceived a threat to their "unique Eastern Shore community" by the practices of the local government and wanted to "preserve and enhance our Eastern Shore 'personality' for our children and grandchildren" (3). They continue to act to protect this "Eastern Shore personality" and support projects that re-mediate blight and encourage good

property management. This mission, taken on by WECA, may suggest a salience of place within at least some people in Cambridge. The people involved in WECA have a common definition of what Cambridge means to them and how it should move forward, and are active to preserve this idea. Dorchester Citizens for Planned Growth cites its mission as guaranteeing "a public voice in issues of land and water use" (Johnson, 2013). They also advocate "for the promotion, maintenance, and conservation of the natural resources, farmland, waterways and open spaces of Dorchester County" (Johnson, 2013). Like the Dorchester Citizens for Planned Growth, the Eastern Shore Land Conservancy works to preserve communities and landscape and culture for the entire Eastern Shore.

Cambridge is similar to Baltimore on the micro level with similar economics and similar culture. The area is poor with high crime and high poverty, although according to the Cambridge Police Department crime is on the decline. Additionally, it is a "city of neighborhoods" where people are affiliated with the localized area where they live and not the town in general. There is still defacto segregation and it is very easy for arguments to be seen as racially motivated, a remnant of the historic difficulty Cambridge had during the civil rights era and before.

Trust, however, is improving in the town and has really improved with the current mayor, who commands a lot of respect in the town. The wounds and distrust from Cambridge's history are still there, but the town is moving forward.

The most significant environmental conflict in Cambridge has been the Egypt Road project, which according to the informant was one of the conflicts that spurred the 2006 law HB 1141 which mandated that municipalities include a municipal growth element and a water resource element. In 2004, Cambridge tried to annex land for a golf course, which quickly

became very controversial because of its place on the Little Blackwater River, which flows into the Blackwater River which is a part of the Blackwater Wildlife Refuge. The Critical Area Commission ultimately denied the project and in the weeks leading up to a contentious gubernatorial election, the incumbent governor announced that the state would purchase 2/3 of the land as protected green space. The project inspired a far reaching letter writing campaign and vigorous community opposition. In 2006 HB 1141 passed, in part driven by the Critical Area Commission responding to similar development and conservation disputes.

Cambridge is a poor municipality with high levels of poverty. As of the American Community Survey 2007-2011, Cambridge has 24.1% poverty, which is approximately ten percentage points higher than Dorchester County and much lower than that of Maryland. However, for its status as a moderately large city, comparison to Baltimore shows similar income, poverty, educational attainment, and employment.

	Cambridge	Dorchester	Maryland	Baltimore
Mean Income	$54,342	$61,799	$94,020	$57,679
Median Income	$38,398	$46,683	$72,419	$40,100
Poverty	24.1%	15.0%	9.0%	22.4%
% Population with High School Education, age 25+	78.7%	82.2%	88.2%	78.5%
% Population with Bachelor's Degree, age 25+	15.3%	18.0%	36.1%	25.6%
Unemployment	13.5%	12.1%	7.3%	12.6%

Table 3: Comparison of Cambridge, Dorchester County, Maryland, and Baltimore City.

Source: American Community Survey 2007-2011, 5-year estimates

Their largest employers include the hospital, Board of Education, the Hyatt Regency Chesapeake Bay Golf Resort, and tourism. The Hyatt Hotel is the second largest employer in Dorchester County and employs 585 people year round, 700 in the summer (Dorchester Brief Economic Facts, 2012).

Cambridge did not have to apply for CoastSmart funding because they already had funding for their Comprehensive Plan as a line item. However, the planning department did know about that funding opportunity. They have applied and received an EPA grant for their updates to their Ordinance Plan, which is the law behind implementing the Comprehensive Plan.

Sea level rise is a real issue for Dorchester County, and as its position as the county seat and one of the larger towns in Dorchester County, it is important, according to the planning department, for Cambridge to be a sustainable city. Their ordinance encourages infill and development where they already have existing infrastructure. To help them develop a Comprehensive Plan in line with their leadership position, Cambridge hired a consultant to help them develop their plan.

Cambridge's process design is on the extreme end of citizen participation within the case study. The process was based on the premise that, as the Comprehensive Plan spells out in section 1.2, "citizen participants in the work of planning know the challenges the community faces and the opportunities on which to capitalize" (Cambridge Comprehensive Plan, 2011, p. 2). This is in spite of a populace that is not especially educated in the terms of urban planning or even sea level rise, a problem that is frequently cited as a reason not to include citizens, or as an excuse for why it is too difficult to include them. This is also the largest city in the case study.

The consultant and the Planning Commission believed that not only did their people have the capacity to evaluate policy issues and appreciate the interconnected, and oftentimes difficult to understand, nature of urban problems, but they also believed that educating and involving the community in planning decisions is important in order to "facilitate a comprehensive and broadly supported response to challenges and opportunities" that could be identified by the community (p. 2). This is frequently cited as a reason supporting community-based management, but it is time consuming and difficult. In Cambridge, by the time the decision-making step was underway, the citizens who were interested in participating were well informed about sea level rise.

In including the community, the consultant used a four step planning process, which he outlined in the Comprehensive Plan.

1. Understanding the problem through public input
2. Exploration
3. Organizing Policy Response
4. The Plan's Response

To address features in the Comprehensive Plan, local residents and property owners were allowed to form and join three large, open work groups that were organized based on three themes: "A City that Moves, Growth of the City, and Our Comparative Advantages" (3). According to both the City Planner and primary consultant, these work groups were very accessible to any interested, but not technically knowledgeable about planning or sea level rise, citizen. People, they believe, understand the what their town is facing, and the planning process sought to use the interested citizenry to identify the challenges. One such issue that the citizen

work groups identified was development growth in Cambridge. While the fact that it was identified as an issue, which appears to be a convenient, obvious issue for a planning document, how the process continued to keep Cambridge's community involved in this issue is what is striking. As a planner explained, the consultant allowed them to form committees which took leadership in shaping and understanding the document, and by the time they reached the decision-making stage people were very well educated about sea level rise.

While it seems reasonable to end meaningful citizen participation at collecting what they perceive as the problem, in Cambridge the City Planner and consultant took the involvement a step further. They involved people in what the consultant called the "Exploration" step, where citizens worked together to understand what was causing the problems that they were facing. Again, people worked within the three work groups to understand not only what the challenge was, but also why they were facing it. If a common reason not to include the average citizen in policy and planning is that they cannot understand highly technical issues, it is surprising that the process in Cambridge involved citizens further than merely asking them to input what they felt was wrong with the city. Take, for example again, the "Growth of the City" work group which identified growth in Cambridge as an issue that the city needs to address. The consultant explained that this work group had to understand the complexities of growth and economic development while also understanding the importance of environmental resource conservation. They had to consider the human dimension, how development can have a mixed impact on the quality of life for rich and poor alike, and their natural resource base

When interviewed, the consultant continued to drive the point that these work groups consisted of the average citizen and that they literally took ownership of the plan. In the

"Growth of the City" group alone there were 30 to 40 people that attended the meetings and participated. He explained that the "Growth of the City" work group covered complex issues such as environmental trade offs, and that lacking formal education on technical environmental issues, planning issues or even economic issues does not hold people back from understanding and being able to fully participate and shape the direction of their Comprehensive Plan. These three work groups met three times each before sending a spokesperson to report their findings and priorities to the Cambridge Planning Commission at a public meeting.

The 2011 update to the Comprehensive Plan aimed to incorporate these citizen-determined findings. During the actual writing of the update, the Planning Commission held multiple work sessions on the draft that opened the in process work up to the public and allowed them to make and discuss comments about how the document was forming. On a Saturday in June, 2009 the Commission hosted a "day long Planner-in-Residence Day" which allowed for "an open house of sorts for informal but detailed review and discussion between citizens and the City Planner and her consultants" (3). Further supporting Cambridge's goal of open access and input by its citizenry is the fact that not only did Cambridge hold sessions for "informal but detailed review and discussion between citizens and the City Planner and her consultants" but they held it on a Saturday, when it would be more convenient for the citizenry to attend.

Because of their involvement, the transparency, and the use of a private consultant, people perceived the projection of risk as very neutral. As an informant pointed out, the use of hard facts was important because it is hard to ignore or oppose facts. Furthermore, the process took the time and effort to educate the city about sea level rise and its implications on their lives.

The process was completely transparent, over and beyond state requirements for

transparency. The process used a series of subcommittees that met on specific topics and brought back their findings into public community meetings. Most of these public meetings had very good turnout, which is unusual for Cambridge, which usually has very little involvement. The planner interviewed ties this to the consultant, who used a very unique process in order to let non-expert citizens become directly involved in crafting the plan and take ownership as well as the controversial Egypt Road project which broke apathy. In Cambridge there is a new, huge expectation of community involvement and engagement, although much of this involvement and engagement is divided on racial lines. After the 75 meetings on the Comprehensive Plan, the citizens felt like it was their plan.

The only roadblock to agreement on the Comprehensive Plan was a disagreement about annexation. Annexation occurs when a town incorporates land outside of their boundaries for use and development. The plan originally called for no more annexations, instead aimed to require developers to use land already incorporated into Cambridge and infill, or develop areas within the town boundaries so that it becomes denser and does not sprawl into previously untouched areas surrounding the city. Chapter 3.3 in the Cambridge Comprehensive Plan is "Physical Expansion: A Course Correction." The plan asserts that "the expansion of City limits is no longer needed through the foreseeable future" (28). However, a blanket policy of preventing future annexations was strongly opposed by a single council person who stalled adoption of the plan for a year. The plan required compromise to fulfill the community's desire to prevent further growth while satisfying the council person who opposed these limits. The Comprehensive Plan spells out Cambridge's reluctance to allow for any future annexation, confirming and reaffirming that "Annexations are to be discouraged and are disfavored, as it is

the belief of the authors of this Plan that sufficient undeveloped, under-utilized or under-developed property exists within the existing corporate boundaries of the City of Cambridge for the foreseeable future" (Cambridge Comprehensive Plan, 2011, p. 28). However, the city realized that in order to implement their town compromise would have to be made with their growth element supporters, and negotiations began in order to develop a plan that would satisfy growth while fulfilling the needs and wants of those opposed to sprawl.

Cambridge decided that annexation would be only allowed in one area with four restrictive requirements that had to be met: the proposed land development had to be for industrial or non-retail commercial use and had to be supported by independent economic analysis, the annexation must include a contribution to the Greenbelt which is given to the City for public use, the development must protect high value ecological resources, and the development must accommodate sufficient and ample highway and utility/infrastructure connections for local throughways (Cambridge Comprehensive Plan, 2011, p. 28). Even with these restrictions, the City preserves its right to reject any request for annexation on these parcels, even if all four restrictions were met. The town planner who worked on this plan as well as the consultant noted that this restrictions helped soothe the community. It is important to note that these growth issues were dealt with by the community through their work group "Growth of the City" and with the strong relationship the planners developed with the community during the process it was important to preserve the integrity of what the people wanted.

The town council voted it in with a unanimous vote which is highly unusual for Cambridge. They are now hoping to roll this involvement and cooperation into updating their zoning ordinances with EPA grant money for training assistance, Coastal Community Initiative

for zoning, and the Department of Natural Resources Coastal Community initiative found them additional funding. Through this funding assistance, Cambridge is now able to immediately fund their update to the zoning plan. There is a continuing dialogue because they are now doing step two in rewriting the zoning ordinance, which is the enforcement arm of the Comprehensive Plan.

It is possible that the reason there was little opposition was because of the market. People may be willing to protect their landscape because right now the land has little economic value. When the economy recovers the willingness of people to conserve the land may change and people may seek to improve and/or build on the land. However, this lack of opposition is likely also due to the strong community involvement. As Carole Patemen observed, when people are allowed to participate in policymaking they tend to internalize the policy as their own (1970, p. 27). The people of Cambridge may have been so supportive of the Comprehensive Plan because they felt invested in the final product. In the future this may prevent challenges to what they crafted and may help create more durable, and enforceable zoning ordinances as those follow on the heels of this popular Comprehensive Plan.

Furthermore, the planner noted that the levels of cooperation and commitment seen as the community worked on the Comprehensive Plan are unusual for Cambridge. The planner attributes this to the Egypt Road project which spurred the citizens of Cambridge to action and increased their interest in having a say about what their planning documents, but the successful experience of the 2011 Comprehensive Plan may serve to further cement this. The community stayed involved in the plan through seventy-five meetings and in the end internalized it as their own plan. While activism and engagement still is mostly drawn on racial lines, as the community comes forward to work with each other to develop plans for the future of their shared

town, conflict resolution literature predicts that stereotyping will decrease and levels of trust will increase. For a city such as Cambridge, with wounds from a turbulent racial history and defacto segregation still strong, this cooperative process may be a boon. Deutsch and Sidaway predict that when groups interact in cooperative problem solving processes they experience a convergence of beliefs and an increased salience of similarities. Stereotypes fail as participants are confronted with each others' humanity and direct communication limits misperceptions. By racial groups engaging one another in negotiations over town planning and not a specific, value-laden issue, they are possibly able to make small adjustments in norms and power, allowing for the conflict safety valve about which Coser wrote. Through this engagement Cambridge may be able to develop itself as a community with a "flexible" power structure that allows for conflict to be a stabilizing process.

Secretary/East New Market

Unlike the other three communities studied in this paper, Secretary, a small town in Dorchester County, does not have distinct planning commissions. Instead, to learn about their planning structure the study focused on a state planner whose two person office covers five counties and twenty eight municipalities on the Eastern Shore. Together with his coworker, he provides local planning assistance, helping counties with minor technical assistance and taking a more prominent role for the twenty-eight municipalities. As he told me, only four or five of the twenty eight municipalities in his district have a professional planner on staff, and most don't even have non-professional planning staff. Instead, as a state regional planner he serves as a de facto town planner, although this role recently underwent a change and now he functions mostly

to find towns grant sources to help them hire consultants. The reasoning for the change is that state regional planners were competing against private industry and could offer services at a below market price as well as them being able to serve the towns in other functions, being both the creator of a plan while also judging its merit.

While previously State Regional Planners could essentially write the comprehensive plans and that used to be the norm, now their role is far more supportive in helping the town manage their consultants. The planners manage how the grant is dispersed, collecting hours and reports from the consultants. They also serve as town staff, making sure that the project gets done and keeping the consultants on track. It is important to recall that approximately eighty percent of the towns do not have professional planners on staff and most do not have planning staff or any additional staff to work with the consultants. Therefore, the State Regional Planners must fill this role.

For two Dorchester towns that this study deems non-adaptive because of their lack of language about sea level rise, the office has fulfilled both roles, acting as town planner and seeking grant money for consultants. The difficulty for these towns, the planner explained, is that there are new requirements for what towns need to include in their comprehensive plans, and that these municipalities cannot keep up with these changes on their own. While once there were seven to eight divisions required in the comprehensive plan, there are now twelve. Small towns, without a professional planner or planning staff, frequently with a small tax base and limited funds, cannot easily afford consultants. He pointed out that state mandates fall on every municipality the same and this makes a huge difference. The mandate will cost Annapolis and Secretary about the same, but their economies of scale are not equivalent. Annapolis has a

population of 38,394 according to the 2010 census, while Secretary has 535 and East New Market has 400. If writing a new section to comply with a new requirement takes five hours of a consultant's time it will cost both towns approximately $800, so it will cost every person in Annapolis two cents but in East New Market, two dollars.

He considered that the reason these towns do not include sea level rise provisions is likely two fold. First, sea level rise adaptation is not a requirement in state law and hand in hand with that is the fact that municipalities have limited budgets. They put out a contract for the bare minimum that they need to stay in legal compliance. He noted that planning consultants average $165 an hour as their billable rate, so towns cannot afford to do more than what they need to. Additionally, there may be hesitancy on the part of elected officials with respect to climate change because of potential for public outcry. He believes that this is likely limited to the lower eastern shore, where people simply are not concerned with a global issue such as climate change and instead are concerned with having a place to work and raise their kids. But, this possibility for outcry is not insurmountable, and he says that when the state planners focus on educating people on their risks the opposition is minimal. Instead, he believes that the main reason that towns do not address climate change or sea level rise because they can already barely do what they have to do. Ideological opposition to sea level rise as a component of climate change is minimum with little to no impact on aversion to adaptation. With education that is perceived to be unbiased, this planner believes that people can be convinced of sea level rise and its importance to their livelihoods.

This need for education is going to come into play in short order, because the recently adopted Maryland Planning Plan prioritizes funding for towns with climate change and/or sea

level rise adaptation policies. In order to protect their funding eligibility, towns are going to have to adopt Plan Maryland maps, and include sections in their comprehensive plans on how they are addressing or how they will address sea level rise. This has never been previously mandated, and still it is not mandated through legislation but instead the preferences in the executive branch on grant funding. The State Regional Planners are in the early stages of getting towns involved in including climate change provisions.

For Secretary, the State Regional Planners aided them in finding funding grants that allowed them to hire a consultant and incorporate two new regional plans – the municipal growth element where they mapped areas for annexation and the water resource element. Both of these new, required elements are very technical, too technical for small, rural towns without the assistance of their own professional planner. Secretary, for staff, has one town clerk and one public works employee. When contacted, the town clerk directed me to the State Regional Planner, offering no input on how she perceived the planning process. These town employees do not have the ability, or even if they do have the ability, they do not have the time, to write the new chapters. In Secretary the State Regional Planners secured money through the NOAA Coastal Zone program, and was awarded money through the CoastSmart Community Initiative.

As for the update to the comprehensive plan, sea level rise was not specifically addressed but it will be in the new update because of new state initiatives. This absence was not because of local ideological opposition or the desire to promote unfettered growth over an environmental issue, but instead simply because like many other small municipalities, they did the minimum because the minimum was all that they could afford. With changing rules in how they receive grants, many small municipalities will include sea level rise because without its inclusion they

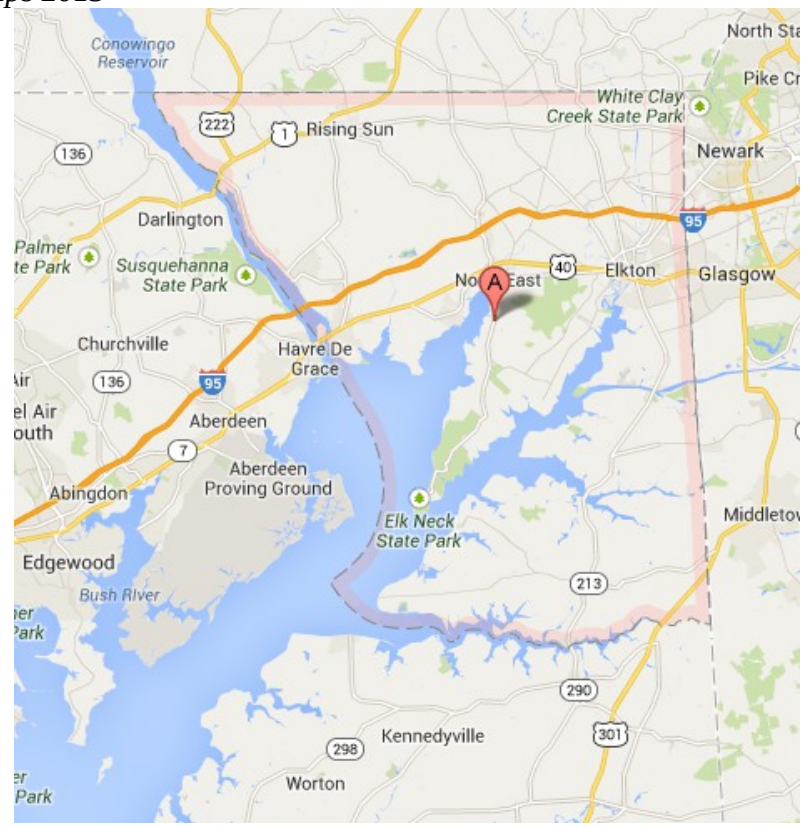
will be barred from the grant resources that help them meet the minimum standards for compliance with state law.

Through the interview with the State Regional Planner I discovered that the critical element of adaptation is not the Comprehensive Plan but instead the Implementation or Zoning Ordinance. The Comprehensive Plan is the planning element, but through the Implementation or Zoning Ordinance the Comprehensive Plan becomes an enforceable document. Unfortunately, the Implementation Ordinances are not as frequently updated as the Comprehensive Plan, likely a response to the legal requirement that towns update their Comprehensive Plans but not their ordinances. Following this, because there is no law to update the ordinances, there is less grant money available to towns to follow through with the legal changes called for in the Comprehensive Plan. For example, the Regional Planner pointed out that East New Market wrote their implementation plan in 1972 and in 1985 it received a minor update, and updated again in 2012. This lag is a common feature because grants, as he puts it, love comprehensive plans and other planning documents. But planning needs to be followed through by supporting implementation and by helping these towns developing their binding law, for by only supporting policy a situation occurs where it means very little. Secretary, in their 2010 update to their Comprehensive Plan, admit that implementation is key to the success of their planning program. The Comprehensive Plan is the "long-range development philosophy of the community," but its adoption does not guarantee implementation (65). As of 2013, Secretary has not guaranteed implementation through updating their 1979 ordinances. As of 2013, Cambridge is currently going through the process of revising their 2003 zoning ordinances.

Cecil

Cecil County is located on the headwaters of the Chesapeake Bay, where the Western Shore meets the Eastern Shore. It is the northernmost county along the Chesapeake Bay and is bounded by the Susquehanna River and the Sassafras River. It also includes the Chesapeake and Delaware Canal, which bifurcates Chesapeake City. It has 217 miles of shoreline and ranges in elevation from sea level to 535 feet above sea level (Brief Economic Facts, Cecil County, Maryland, 2012).

Map: Google Maps 2013



It's county seat is Elkton, a coastal town on the Chesapeake Bay which is not a part of this case study. Cecil County recently underwent a change in their government form, switching from a five person commission to a county executive and county council representing each of its

five districts (Cecil County Government, 2013).

Most civilian residents of Cecil County are employed in the private sector (78.5 %) followed by local government (15 %) and the federal government (5.2 %). The most prominent private industries are trade, transportation, and utilities (22.8 %), manufacturing (14.8 %), and education and health services (12.8 %) (Cecil County Brief Economic Facts, 2012). As discussed previously, this is similar to the industry make up in Dorchester. Unlike Dorchester, in Cecil County 53.6% of citizens commute out of the county for employment. Cecil County has over 10,000 acres of preserved forest, fields, trails, hiking and biking paths, and waterfront vistas, which accounts for 4.3 % of land in the county. Recreation and leisure includes a long tradition of equestrian pursuits and water sports.

Cecil County is expected to have minimal risk due to sea level rise, projected to lose 1.4 square miles of dry land and 0.1 square miles of nontidal wetland with 4 feet of sea level rise. Cecil County's Comprehensive Plan, updated in 2010, does not include provisions for sea level rise.

Chesapeake City

Chesapeake City is a small town split by the Chesapeake and Delaware Canal. South of the canal is the historic district, a mainly commercial part of town with shops and other tourism activities. On the north side of the canal it is mostly residential but also houses the marine commercial district. Much like the other towns covered in this study, most of the recreation is based on the water and is especially focused on boating.

Chesapeake City grew up around the demands of the Chesapeake and Delaware Canal,

growing from a mere two structures in 1829 to a population of 400 in 1849 when the town incorporated. Today the Chesapeake and Delaware Canal is still in use, connecting the Delaware River to the Chesapeake Bay and ultimately the Port of Baltimore. According to the Army Corp of Engineers, Philadelphia District, the canal carries 40 percent of the shipping traffic to and from the Port of Baltimore (US Army Corp of Engineers).

Chesapeake City is an incorporated town with a mayor, town council, planning commission, zoning administrator, and historic district commission. The planning commission consists of seven members who are residents of the town and appointed by the Town Council (Chesapeake City Comprehensive Development Ordinance, 2012, p. 10). The town does not have a professional department of planning, and the planning commission is not a full-time commitment. Chesapeake City developed their new Comprehensive Plan in 2009 and followed it with an update to their Comprehensive Development Ordinance in 2012.

Their Comprehensive Development Ordinance, or Zoning Laws, adopted May 14, 2012 and effective June 4, 2012, outlines their specific purposes as promoting and preserving the character of the town. They seek to "protect the small town character" while protecting and improving "the small town and historic character of Chesapeake City and the social and economic stability" of what already exists (Chesapeake City Comprehensive Development Ordinance, 2012, p. 5). In developing, they espouse a dedication to "efficient land use" which includes development that "conserve and protect water, energy and other resources and discourage land consumptive, low density, and single-use development" (Chesapeake City Comprehensive Development Ordinance, 2012, p. 5).

Chesapeake City, because of its location around the canal, has a history of flood events.

Floodplains of the town are present along the Chesapeake and Delaware Canal as well as around the Back Creek Tributary Basin. Also located around these waterways are most of the town's tidal and non-tidal wetlands. The town is entirely located in the Chesapeake Bay Critical Area which places restrictions on their development and land use as to not harm the environment or create unnatural water flow and flooding.

Within the town the local government is nonpolitical, and people appear to vote for local office independent of party affiliation. Within the town there is only one significant interest group that pops up from time to time, but it is only loosely organized and is referred to as the "anti-noise" group. This is a small group of vocal people that shifts depending on the noise source they are opposing. The rest of the town tends to not get involved unless they perceive that something negative will happen to them.

The level of trust within the town depends on who you talk to, but while there is always conflict it is manageable. There are two civic organizations in the town, one for north of the canal (residential) and the other for south of the canal (commercial). In general the two civic associations do not communicate, which is evident in the Historic Commission which is dominated by the south side of the town's interests and only recently was forced to include a northern representative. Conflict in the town boils down to control issues. For example, Canal Day was an in-town festival sponsored by the Chesapeake City District Civic Association. While it originally started as a family and art festival, over the years it attracted more and more people and descended into "drunken debauchery" (Pierce, 2012). As Canal Day got more and more popular, the original group that controlled it decided to canal the event. When the Chamber of Commerce stepped up to take over the event they were challenged over issues of

who controlled the event and were not able to get approval to use the trademarked Canal Day name. Ultimately it was renamed to Canal Fest as a compromise. After the interview with the member of the planning commission it came to light that the 2013 Canal Fest was canceled.

In Chesapeake City, people are only motivated to act when they perceive something negative will happen to them. For example, there was a large piece of land that was slotted for development. The developers who owned it allowed their permits to expire, and then a couple of years ago tried to use the land for low-income housing. This spurred the residents to have, and attend, a lot of meetings in opposition to the development and the planning commission ultimately denied the permit. The planning commission denied the development on findings of fact, but some of these facts might have been swayed by a populace that was very emotional about their opposition to the development.

Another, similar, dispute that roused the residents of Chesapeake City into fierce action was a plan to redevelop what had been a local, bankrupt restaurant and turn it into a Hooters. The northern civic association wound up in court over their opposition to the Hooters and the developers that were attempting to push it through. Eventually the developers sold the property and it has been redeveloped as a restaurant and marina, fitting appropriately with the idea of Chesapeake City that the people are comfortable with. This fits with the notion that Chesapeake City is strongly motivated by their sense of place. Not only are the people motivated to oppose development, but they are also acutely aware that this sense of place exists. In Chapter One of their Comprehensive Plan as they address their vision for the city, the town included that, “The Town has a distinguishing 'sense of place' in terms of its heritage, layout, architecture, and picturesque setting” (Chesapeake City Comprehensive Plan, 2009, p. 1). Chesapeake City

fiercely protects its collective, or at least dominant, view of what the city is.

The economy of Chesapeake City is dominated by tourism and the town has a lot of historic inns. The main industry, according to the U.S. Census and as accepted in their Comprehensive Plan, is accommodation and food services, while the main industry in Cecil County was retail trade. According to the Comprehensive Plan, approximately 13 percent of their workforce is employed within the town while almost fifty percent commuted to an out of state destination, namely Delaware. Of the 52.4% of the town that works in Maryland, 48.7% work within Cecil County. (Chesapeake City Comprehensive Plan, 2009, p. 8).

To fund their updates to the Comprehensive Plan Chesapeake city applied for and received funding from WILMAPCO, a non-profit funded by the government that works on transport and development as it is related to transport. This grant program funded some of their plan ($90K).

Chesapeake City chose to adapt to sea level rise because of pressure from the Maryland Department of the Environment and not home-grown pressure. Chesapeake City is largely located within the critical area, and because of this there are additional regulations that they are required to conform to. For example, as it was explained they cannot cut down a tree without a permit, and that permit requires that they plant X number of trees and/or shrubs to make up for the lost tree. Chesapeake City, and other towns in designated critical areas, are under heavy regulation for their environment and development practices. To help them develop their Comprehensive Plan, Chesapeake hired the same consultant that Cambridge hired, and they accepted his recommendations with minimal opposition. Their understanding of hiring a consultant was that he was the expert, and so it is in their best interests to follow his advice.

Chesapeake City, much like many other towns on the Eastern Shore do not have a professional planning staff but instead have a planning commission of interested and committed individuals of the town. As a result, in order for these towns to develop the technical aspects of planning strategy they hire professional consultants.

Despite their inclusion of sea level rise into their Comprehensive Plan, the understanding of their town is that they are not concerned about sea level rise. However, it should be noted that a member of their planning commission believed that hardly anyone in the town knew much about sea level rise, so their lack of concern may be tied to this. This may be because the town is small and on a man made and controlled canal. Unlike in Cambridge or Secretary, the people of Chesapeake City may not be as attuned to new variations in their water levels and may attribute them to different management of the canal or sedimentation, which occurs in the Chesapeake and Delaware Canal. Furthermore, they have moderate vulnerability compared to the very high ratings of Cambridge and Secretary. Still, people are concerned with flooding and Chesapeake City does have an issue with flooding. After Hurricane Isabel in 2003 much of the south side of the canal was underwater and in the north there was significant flooding in the prominent local installation of Schaefer's Canal House, the restaurant and marina that opened after the intense opposition to the Hooter's. After Hurricane Isabel the town added new regulations in building codes, including new utilities, electrical, and the requirement that there be water shut offs above a certain height in order to minimize flooding impact. The town is concerned about these flooding events and the worry that these events are becoming more frequent and/or more intense is in the back of people's minds. However, despite this framing their thoughts, they were not actively planning against sea level rise.

The people of Chesapeake City, if this is true, run contrary to the theory that people may have an intrinsic understand of their risk. The Maryland Department of Natural Resources projects that the areas of Chesapeake City immediately alongside the canal will begin to flood with 0-2 feet of sea level rise, and by 5-10 feet of sea level rise the Schaefer's Canal House will be inundated. A finger of water will encroach onto the business district at 0-2 feet, growing wider and reaching further with each subsequent increase in rise. People may have attributed their concern about something spurred by sea level rise to natural flooding, which may have eased the decision to attribute these changes to sea level rise in their comprehensive plan.

The process of developing the comprehensive plan very transparent and was open to the public and advertised, in accordance with the law. However, in Chesapeake City people rarely show up to these meetings, and there was no change from the norm in attendance for the comprehensive plan update meetings. Adopting the plan required a public hearing, and after that it was sent to the town council, followed by another public hearing, and then a vote, which passed with 100%. Despite the planning commission giving what they describe as “every opportunity,” there was very little public input into the plan. The informant mentioned that the final agreement is very similar to what was originally crafted because they worked on it as a group. The consultant would make a recommendation, the commission would discuss, change words, and were constantly involved in negotiation. Although the commission debated and discussed, they ultimately deferred to their hired expert for the meat of their plan. As one pointed out, “It would be foolish not to listen to him.”

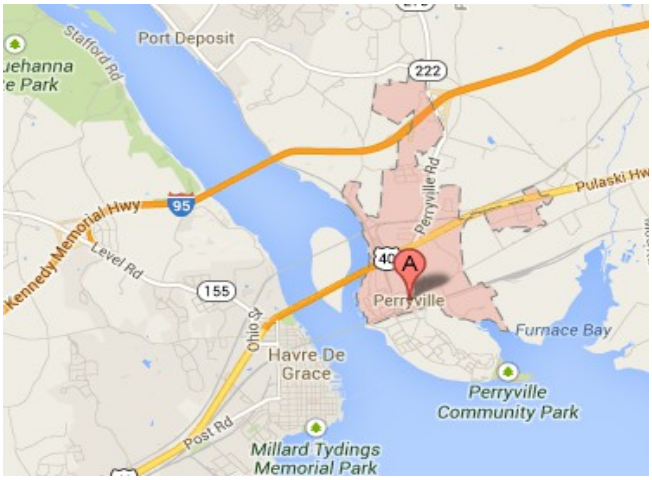
Despite the same consultant and the same result – adaptation to sea level rise, Chesapeake City's process of develop their update to the comprehensive plan was drastically

different than the massively participatory process seen in Cambridge. The consultant pointed out that the process he used with Chesapeake City is not the one he has developed for subsequent comprehensive plans. This may explain the drastically different response by Cambridge citizens.

Perryville

Perryville is a town in western Cecil County situated at the junction of the Susquehanna River and the northern end of the Chesapeake Bay. It connects to the Chesapeake Bay through Furnace Bay, and most of its water exposure comes from the Susquehanna River on its western edge. Like Chesapeake City's man made canal, the Susquehanna River also has a pronounced man made control device, the Conowingo Dam, which is a hydroelectric dam. This dam is upstream of Perryville. It is a moderately high income town with a significantly higher mean income than the rest of Maryland and Cecil County, and an income distribution that is moderately skewed to the right.

Map: Google Maps 2013



	Perryville	Cecil County	Maryland
Mean Income	$74,674	$66,903	$72,419
Median Income	$65,417	$29,079	$35,751
Population	4,345	101,696	5,884,563
Persons Below Poverty Level, percent	14.3%	9.4%	9.0%
Percent Population with High School Diploma, age 25+	87.2%	86.9%	88.2%
Percent Population with Bachelor or Higher, age 25+	19.5%	21.0%	36.1%
Employment Rate	58.8%	62.7%	64.0%
Unemployment Rate	8.7%	7.7%	7.3%

Table 4: Perryville Compared to Cecil County and Maryland, Source: 2011 year American Community Survey, U.S. Census Bureau, State and County Quick Facts

Perryville has a rich history tied to its position as a rail town, and modern Perryville has both freight and commuter rails, connecting the town to nearby metropolitan areas such as Philadelphia, PA and Baltimore, MD. The town is highly connected to Delaware for reasons such as geographic proximity, low taxes, and hefty tolls separating it from the western shore of Maryland.

Much like other coastal, Maryland towns, the recreation in Perryville is mostly water-based, including boating and fishing. Despite the close proximity to other, Western Shore towns, the town is isolated because while geographically close they face tolls when driving, and non-car alternatives are not a convenient alternative. An informant mentioned that they are separated from Harford County and the popular town Havre de Grace by a bridge, but unfortunately this

bridge charges a toll. The two major routes into Perryville are tolled, discouraging them from traveling into the Western Shore of Maryland.

Perryville has a higher mean income than the state of Maryland or Cecil County, although its median income is similar. The distribution of households above the poverty line is normal. Perryville has approximately five percentage points higher poverty when compared to Maryland and Cecil County, yet its mean income is significantly higher and it has a similar median income level. This suggests that there is significant inequality in Perryville.

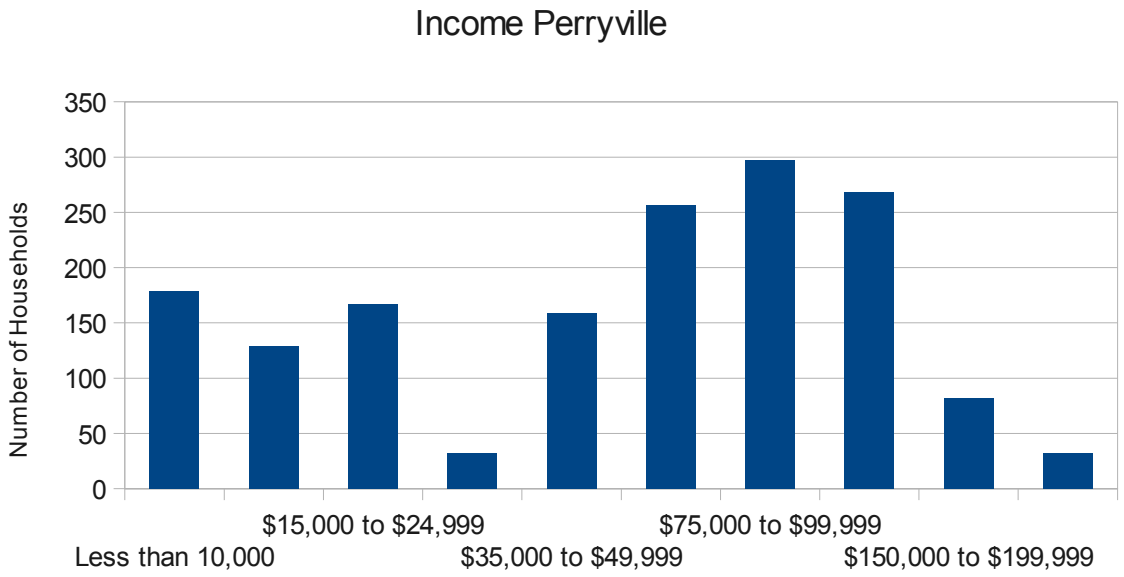


Figure 2: Income in Perryville of all Households
Source: ACS 2007-2011 American Fact Finder Survey

Compared to Maryland, Perryville has significantly less racial diversity. However, its racial make up is very similar to that of Cecil County. Figure 3 compares the percentage of different races (as self-reported on the census) between Maryland, Cecil County, and Perryville and shows that the rest of the state has a higher proportion of other races. Figure 5 deletes Maryland from the data set and compares Cecil County with Perryville and shows that Perryville has slightly less diversity than Cecil County as a whole.

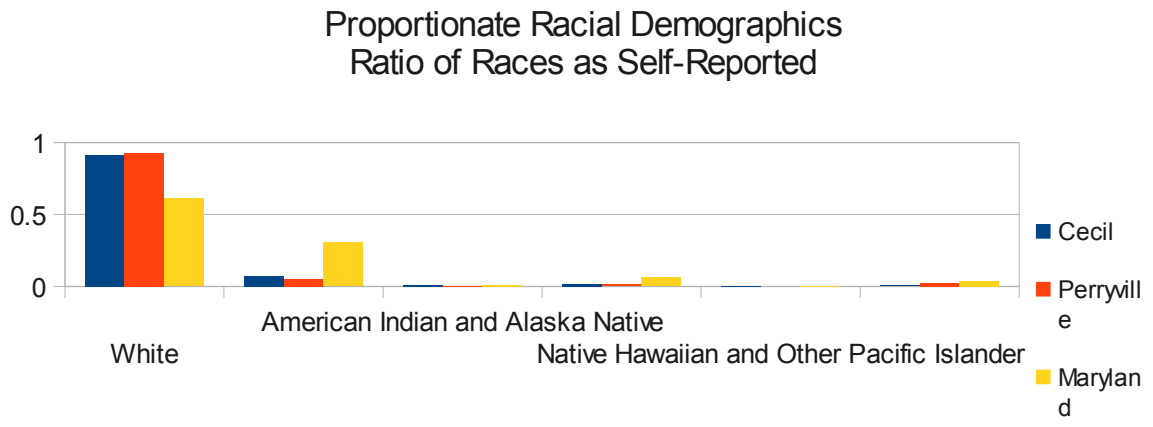


Figure 3: Racial Demographics of Cecil County, Perryville, and Maryland. Source: ACS 2007-2011 Community Survey

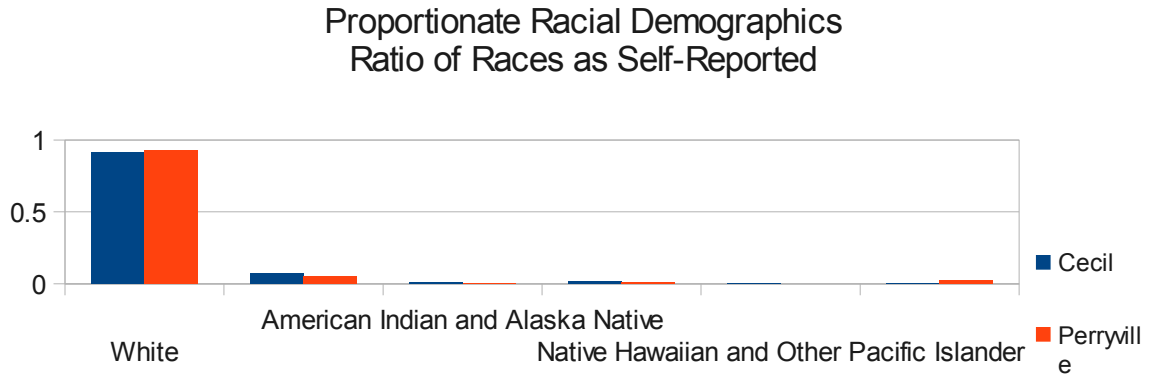


Figure 4: Racial Demographics Cecil County and Perryville. Source: ACS 2007-2011 Community Survey

Despite living in Perryville, most people in the town commute to Baltimore, Newark, or Philadelphia. The town wants to develop more local business but they believe that they are hindered by toll roads, which discourages people from traveling both in or out of Perryville. People living on the other side of the toll booths will factor in this cost when deciding to patronize Perryville businesses. The main local employer in Perryville is an Ikea warehouse, and Perryville is surrounded by agriculture and have agriculture on the outskirts of town.

Perryville's update to the Comprehensive Plan does not include provisions for sea level rise. They already enforce flood plains provisions strictly and are adjusting accordingly to updated 100 year floodplain maps that the state of Maryland publishes. A town planner noted that the town enforces restrictions on development in flood plains strictly. Sea level rise is not a major concern in Perryville, and while it is a problem it is not the most serious. The town does

not yet see it and they are more concerned with the Conowingo Dam. The flooding that impacts them is related to the dam releases, but because of their unique position next to a barrier island, the water is diverted away and does not impact them as much as their neighbors. Additionally, the dam operators notify the town before a release. The town has other things to be concerned about, and their history with flooding not from the dam is limited to hurricanes.

To update their plan, Perryville used a committee as well as a consultant, much like the other towns. It should be noted that in addition to this committee, Perryville has professional planning staff. The committee went through sections and developed their goals and objectives, deciding where and how far they wanted to grow. The committee and planning staff had discussions with the county to make sure that the plan aligned with the county plan. To keep the town informed of the plan the committee held discussions and updates, and at the end of the multi-year process the planning commission had meetings to develop and present their plan. Afterward, they held a hearing. Then the mayor and commissioners had a meeting and a hearing. The only notable dissent was about including compatibility with the county, and there were confrontations between the county, town, and the state. The changing maps and area designations make it difficult for the town to behave predictably, which is important for future growth. As the planner mentioned, despite the town using the most up to date flood maps at the time, the State is once again updating them, this time with improved wave activity predictions.

Community participation was minimal compared to the process seen in Cambridge. However, there was a noticeable change on behalf of public participation in Perryville. In a town that finds public participation challenging, 10-20 people would attend their meetings, despite what the planner discussed as a Comprehensive Plan with minimal dissent. Average attendance

is 5-6 people for meetings that are not covering a controversial issue.

Perryville's lack of diversity could play two different roles in preventing or facilitating conflict. Perryville, through its homogeneity, can avoid conflicts taking on a racial form, as they do in Cambridge. If all of the town is in the same racial in group, there may be less opportunity to develop an "us versus them" mentality, exacerbating conflict and leading to difficult resolution. Towns such as Perryville may have less stereotyping, yet Perryville does not have the expected high level of trust. In fact, between the government and town, and within the government, there appears to be very little trust. However, this may be a factor of personal disagreement and charismatic individuals who are driving this decrease in trust, and not an emergence of stereotyping or an "us versus them" mentality. However, a reasonable amount of conflict is healthy for a community system, and it helps spur them to innovate and confront conflict in a healthy, productive way. It is interesting that Perryville is a town described as being resistant to change, requiring a hard sell. Minor changes, such as developing new parks, are met with strong resistance.

Of the four towns interviewed, Perryville is the least vulnerable to sea level rise and the coastal vulnerability index of the USGS rates it at low vulnerability. They are most vulnerable as to their transportation out of the town, especially as their across the river neighbors are projected to have further reaching sea level rise which may require changes to bridges connecting Perryville. While 0-2 feet of sea level rise will have minimal impact within city lines in Perryville, perhaps only impacting some of their water recreation and marinas, 2-5 feet will begin to threaten waterfront high density housing, and 5-10 feet will inundate. Fortunately for Perryville, most of their built environment is further inland and their main street is significantly

inland and not threatened.

Interestingly, despite their pronouncement that they are not concerned with sea level rise or flooding, the future development in Perryville appears to set itself away from vulnerable areas, and care is being taken to minimize development that may put Perryville at risk for future flooding. Confronted with an area, Mill Creek, where development may increase erosion, sedimentation, and in the future damage the basin and increase flooding elsewhere, Perryville continues to operate under a development protection directive (Comprehensive Plan Perryville, 2010, p. 77). The Comprehensive Plan explains how Perryville is balancing growth as they try to meet the demands of a new military base while maintaining permeable surfaces, which slow water running into the Chesapeake Bay. It is important to note, that while the planner attributed most of their changes to meeting requirements set on them by the State, the Mill Creek area is not in the critical area and there is no indication that the limited growth plan they are engaging in for this area is an external requirement by the State or County.

Perryville, with its least amount of vulnerability compared to the other towns in the case study as well as its corresponding lack of concern about sea level rise, supports the theory that the citizens understand their level of vulnerability. While the people of Chesapeake City may be incorrectly judging their risk to sea level rise because of the man made feature of the Chesapeake and Delaware Canal, Perryville is not so burdened. They are correctly attributing floods to the dam and have not encroached development into their 100-year floodplain. While Secretary has also pursued a course of not adapting to sea level rise, in Perryville it appears that they not adapting because sea level rise is not a major threat. Instead, they appear to be properly focusing their water vulnerability efforts on supporting older decisions that limit growth in an area that

could increase flooding vulnerability for the town.

Case Study Lessons

Pressure from Above

Pressure from the state government is credited as one of the two main reasons according to the informant for Chesapeake City. According to the planning commission member, the Maryland Department of Environment pressured the town to adapt to sea level rise, a power that they exert because the entirety of Chesapeake City lies in the Critical Area. In line with this, the State Regional Planner explained that more towns will include provisions for sea level rise because new requirements from state of Maryland. On December 28, 2012, Governor Martin O'Malley signed the Climate Change and "Coast Smart" Construction Executive Order proclaiming that all state funded projects on or after July 1, 2013 must consider the risk of coastal flooding and sea level rise, and must be designed to minimize impacts. New recommendations for partially or fully funded non-state infrastructure projects have not yet been announced.

It appears that the state of Maryland can exert considerable influence on towns to persuade them to adapt to sea level rise. It is clear that coastal vulnerability is an issue that the current state government is interested in addressing. While Chesapeake City was pressured to adapt to sea level rise through its Critical Area requirements, towns not as restricted will be influenced by the Climate Change and "Coast Smart" Construction Executive Order as they compete for funding for local infrastructure projects. This new order was announced and came into effect after the four towns studied completed their updates to their comprehensive plans and

is not considered as having an impact. This may have an impact on future updates.

Aside from the complaint in Perryville that towns have to maintain consistency with their overarching county governments, no key informant cited county pressure as a reason for or against adaptation. A county leader effect is further explored in the quantitative model.

Pressure from Within

Another form of pressure driving adaptation could be a pressure from within by townspeople concerned about vulnerability. This form of pressure was noticeably lacking in the four case studies, except possibly in Cambridge. In Secretary, Chesapeake City, and Perryville key informants noted that the public was only marginally involved in the process. While Chesapeake City and Perryville both mentioned that the number of people attending planning meetings were slightly higher than normal, the impact of public input was minimal. A planning commission member for Chesapeake City lamented about how little public input there was into the plan, despite the public being given every chance. In Perryville two to four times the normal number of people attended meetings, but they did not drive the process.

Cambridge, on the other hand, had significant involvement of the public in its process as involved citizens were split into three work groups to drive what the comprehensive plan included. It is estimated that approximately one hundred people were involved regularly in these meetings. While the pressure from within to adapt to sea level rise did not exist originally, both the planner and consultant stressed that by the end of the process the interested townspeople understood and appreciated the risks due to sea level rise that face Cambridge. Furthermore, the process design utilized in Cambridge placed a significant amount of power and influence with

interested citizens, and it is unlikely that had the people not at minimum been neutral and amenable to adaptation they would have been forced to adapt.

The level of involvement in Cambridge is aligned with meaningful public involvement in local decision-making. The citizens were involved in the process from the very beginning, shaping the issues that they felt that the comprehensive plan should cover, developing how those issues pertain to their town, and drafting the content of how the town must deal with those issues. The level of participation and involvement in Cambridge far surpassed mere consultation. In line with the features and benefits of environmental conflict resolution, the final document incorporated local values and knowledge (Beierle and Cayford, 2003). The town planner spoke of trust improving in Cambridge and how by the end of the process the citizens understood the nuances of their vulnerability to sea level rise and other environmental risks. The planner did not attribute improving trust and relations in the town to the collaborative and cooperative process that they used, but it is a recent change and is theoretically predicted (Deutsch, 1973; Beierle and Cayford, 2003; d'Estée, 2003; Sidaway, 2005).

However, while the people of Cambridge may have enthusiastically supported the process and content of the comprehensive plan, another possible explanation for their inclusion of sea level rise is that the influence of the consultant generated this possible pressure from within. Without the consultant and city planners driving education about sea level rise, it is unclear that sea level rise adaptation would have been an issue that the people got behind. Without the consultant and city planners designing a cooperative process that included the citizens, it is unlikely that the citizens would have forced the town to include adaptation to sea level rise in the comprehensive plan. Given the opportunity and education, the citizens were able

to develop pressure from within. While the pressure from within can generate change in comprehensive plans, the case study suggests that first a process needs to be instituted empowering and educating citizens.

Pressure from Outside

At the end of my interview with the planning commission member from Chesapeake City, he highly recommended that I talk to the consultant that they hired to assist them with their comprehensive plan. I noted the name and moved on with my interviews of other towns. Before my interview with the city planner from Cambridge, she asked my permission to conference call the consultant that Cambridge used. While this did not occur for the interview, it made it obvious that the consultants that town used were considered integral to the process, at least in those two towns. It soon came to light that Chesapeake City and Cambridge used the same consultant and that he was very influential in crafting the updates to their town comprehensive plans.. The influence of the presence of a consultant is further explored in the larger data set in the quantitative analysis section, both by if any consultant is used and if the consultant that Chesapeake City and Cambridge used (five_consult).

Quantitative Analysis

To accompany the qualitative research component of this project, I developed a data set composing of the 48 Eastern Shore towns in Caroline, Cecil, Dorchester, Queen Anne, Somerset, Talbot, Wicomico, and Worcester Counties. These are the towns that were required by HB 1141

to update their Comprehensive Plans to include a Water Resource Element and Municipal Growth Element. Seven of the 48 towns have not yet updated their Comprehensive plans, and these towns were dropped from the data set. This study used these towns to answer five questions that emerged through background research and information brought up during the case study section of this paper.

1.) Is there a leader effect? Are the adaptive towns merely reacting to pressure from their county governments?

2.) What is the impact of income on the ability of towns to adapt? Does funding influence adaptation? Which towns receive funding?

3.) What is the impact of characteristics of the town on adaptation? Are more educated towns more likely to adapt?

4.) What is the impact of vulnerability on the likelihood of adaptation? Do towns react to scientific uncertainty or their proximity to water?

5.) What is the impact of towns using consultants on their likelihood of adaptating?

Before working further with the data, I ran a logistic regression to try to understand why seven of the 48 towns have not updated their Comprehensive Plan. It appears that the driver of why the non-updating towns have not updated is not captured in their economic or demographic data. The largest z statistic as well as coefficient is a large population moving in from another state, which does not explain why the town would be unable to reach a new update. Uncaptured reasons for this may be political. Perhaps this influx of people from out of state are bringing with them political instability in the town, and the town officials are experiencing too much uncertainty to develop a new Comprehensive Plan. Towns prefer a speedy update because

without an active Comprehensive Plan they are unable to approve new development projects, so one would expect these seven towns to be pressured to update the Comprehensive Plan as soon as possible. These seven towns were dropped from the data set. Before the non-updating towns were dropped, 18.75% of Eastern Shore towns had adapted to sea level rise according to their Comprehensive Plan (variable slrtown=1). With the seven towns dropped, this number increased to 21.95% of towns.

County	Frequency	Percent
Caroline	10	20.83
Cecil	8	16.67
Dorchester	6	12.5
Queen Anne	6	12.5
Somerset	2	4.17
Talbot	4	8.33
Wicomico	8	16.67
Worchester	4	8.33
Total	*48*	*100*

Figure 5: Distribution of towns by County.

Sea Level Rise Adaptation-Town	Frequency	Percent
0 – No Adaptation	39	81.25
1 – Adaptation	9	18.75
Total	48	100

Table 5: Matrix of towns that have adapted to sea level rise.

With non-updating towns dropped:

Sea Level Rise Adaptation-Town	Frequency	Percent
0 – No Adaptation	32	78.05
1 – Adaptation	9	21.95
Total	41	100

Table 5.5: Matrix of towns that have adapted to sea level rise, with non-updating towns dropped.

The Leader Effect

One possible predictor for why certain towns adapted to sea level rise but others did not was pressure from their county. Towns that adapted to sea level rise (slrtown=1) are shown below with if their county adapted to sea level rise (slrcounty=1). A table of the sea level rise action plans in towns versus their counties suggests that if this pressure existed, it was not persuasive. In the counties that include sea level rise provisions, only three of the fifteen towns took adaptive measures (20%). In counties where the county did not include provisions for sea level rise, six of the twenty six towns took adaptive measures (23%). A possible leader effect in this data set is not strong enough to influence town behavior. There is no evidence in this data that adaptive towns are merely responding to influence from adaptive county governments.

		County Level		
		0 – No Adaptation	1 – Adaptation	Total
Town Level	0 – No Adaptation	20	12	32
	1 – Adaptation	6	3	9

	Total	26	15	41

Figure 6: Matrix of adaptation by town and county.

To further test, I ran a logistical regression:

Number = 41

LR chi2 (1) = 0.05

Prob > chi2 = 0.8178

Pseudo R2 = 0.0012

Variable	Coefficient	Std. Error	Z	P > |z|	95% Confidence Interval	
County Adaptation to Sea Level Rise	-0.1823216	0.7958224	-0.23	0.819	-1.742105	1.377462
Constant	-1.203973	.4654747	-2.59	0.010	-2.116286	-0.2916592

Figure 7: Leader effect of county adaptation on town adaptation to sea level rise

The leader effect from the county is not strong enough to influence a town to adapt, or to not adapt. This lack of a result could be a symptom of the low number of towns included in the data set and low number which pursued adaptation. This is consistent with the case studies which did not cite county influence as a pressure on the town. Further study on a county-level leader effect could be generated using counties and town in other vulnerable coastal states.

Instead of a county leader effect it may be that if the town received funding they adapted to sea level rise because of pressure from the grant funder. Of the nine towns that included provisions for sea level rise, three did not receive funding. These towns include Cambridge,

Ocean City, and Princess Anne. It is interesting to note that these three towns, of the towns that adapted to sea level rise, are in the fourth highest for income*population. Salisbury has the highest tax base, then Cambridge, then Ocean City, and finally Princess Anne. It is possible that these towns did not apply for grants because they could afford to develop their own plan. An overwhelming majority (88%) of towns that did not receive funding did not adapt to sea level rise, compared 62.5% of towns that did receive funding. This suggests that funding may help a town adapt by providing resources, which makes sense considering the three towns that adapted without funding have the highest tax bases in the quantitative data set. However, the majority of towns that receive funding still do not adapt to sea level rise, showing that adaptation is not merely a response to resources or influence by the granting organization. Furthermore, 60.9% of the towns in the quantitative data set did not receive outside funding, which may be a reflection of short staffed planning departments, or nonexistant planning departments. As the State Regional Planner pointed out, the SRPs serve to find grants and help towns disperse them. Towns that do not receive grant money may be more of a reflection on an inability to coordinate and apply for grant, and a town that cannot coordinate the effort to apply for a grant may be unable to coordinate the effort to tackle sea level rise, even if they had a desire to do so.

		Funding Town Level		
		0 – No Outside Funding	1 – Outside Funding	Total
Town Adaptation	0 – No Adaptation	22	10	32
	1 – Adaptation	3	6	9
	Total	25	16	41

Table 7: Matrix of adaptation by if the town received outside funding or not.

The Economics of the Town

To test the second theory for why a town adapts to sea level rise, a logistical regression of economic variables was run.

Number of Observations = 41
LR $chi^2(3) = 4.30$
Prob > $chi^2 = 0.2311$
Pseudo $R^2 = 0.0996$

Variable	Coefficient	Std. Error	Z	P> |z|	95% Confidence Interval	
Poverty	8.10983	4.582271	1.77	0.077	-0.8721026	17.09007
Unemployment	-3.879153	10.55541	-0.37	0.713	-24.56737	16.80906
Income*Population	$9.52x10^{-10}$	$1.05x10^{-9}$	0.90	0.366	$-1.11x10^{-9}$	$3.02x10^{-9}$
Constant	-2.411	1.041472	-2.32	0.021	-4.45272	-0.3702261

Table 8: Logistic regression of economic impacts on town adaptation to sea level rise.

Poverty is the strongest economic variable predicting if a town adapts to sea level rise, and it is positively correlated with adaptation. This runs counter to growth machine theory which predicts that high-income municipalities will be able to make the sacrifices to protect environmental features and adapt to a changing environment. As understood based on literature as well as common sense, towns with lower income should not be able to afford adaptation measures and one would expect that they have tighter budgets. However, poverty is not positively correlated with adaptation to sea level rise at the 95% confidence level. I next ran a logistic regression on if the town adapted to sea level with their mean income (variable meanincome). This resulted with a negative coefficient on mean income, a z-score of -1.30, and

no certainty of a negative relationship at the 95% confidence interval. Understanding that mean income is not necessarily most representative, because mean income is skewed because of income inequality, I also ran a logistic regression on whether a town adapted or not on median income (variable medianincome). Again, median income has a negative coefficient is uncertain at the 95% confidence interval if the relationship is positive or negative. As the state planner mentioned a new section in the comprehensive plan costs towns approximately the same no matter how large they are. This means that it costs the small town much more per capita than a large town. If sea level rise is cheaper to deal with when you have an economy of scale, why isn't adaptation positively correlated with income? A larger data set would be necessary to draw any conclusion off of this data, because in a data set of 41 other, underlying, factors may be obstructing the correlation. The data set has a positive coefficient on the logistic regression of if the town adapted to sea level rise and income*population, and with a larger data set this relationship may reach statistical significance and may maintain its positive relationship at the 95% confidence interval. The more important finding is that this data cannot refute that smaller towns with lower incomes and lower populations find it too difficult to undertake adaptive language.

Number of observations = 41
LR $chi^2(1) = 1.86$
Prob > $chi^2 = 0.1732$
Pseudo $R^2 = 0.0430$

Variable	Coefficient	Std. Error	Z	P > |Z|	95% Confidence Interval	
Mean Income	-0.0000405	0.0000312	-1.30	0.194	-0.0001016	0.0000206
Constant	1.231113	1.904313	0.65	0.518	-2.501273	4.963498

Table 9: Logistic Regression on if a town adapted to sea level rise based on mean income.

Number of observation s= 41
LR chi^2 (1) = 3.80
Prob > chi^2 = 0.0514
Pseudo R^2 = 0.0880

Variable	Coefficient	Std. Error	Z	P > |Z|	95% Confidence Interval	
Median Income	-0.0000698	0.00004	-1.75	0.081	-0.0001481	$8.58x10^{-6}$
Constant	2.214531	1.945173	1.14	0.255	-1.597939	6.027001

Table 10: Logistic Regression on if a town adapted to sea level rise based on median income

One possible explanation for this is that poorer towns are more likely to win grants from entities interested in public planning. These grants may encourage, or force, towns to include provisions in line with the funder's ideology. Chesapeake City, for example, mentioned that they adapted to sea level rise because of pressure from the Maryland Department of the Environment, and a state planner spoke of new funding requirements that will limit state grant eligibility to those towns that have adapted. To test this I ran a logistic regression on whether or not the town received funding from a grant against the tax base of the town, the percent of the population over 25 with a high school education, and the percent of the population over 25 with at least a bachelor's degree. This was not statistically significant and was a poor predictor of who received funding. Wealthy towns and poor towns apply for and receive grants, so the income of the town does not influence adaptation through grant pressure. This may be because wealthy towns have the budget to afford a dedicated planner or other individual who can find these grants. Poorer

towns, meanwhile, have limited budgetary free time but do have access to state planners, who help towns connect with grant money. Another possible explanation is that education levels are more important in finding a grant. Towns with higher education may have people who are well connected in networks that are sophisticated in not only how to raise/find money but may also know about public funding vehicles. However, this, too, was insignificant.

Number of Observations = 41
LR chi2 (4) = 2.206
Prob > chi2 = 0.7247
Pseudo R2 = 0.0376

Variable	Coefficient	Std. Error	Z	P>|z|	95% Confidence Interval	
Income*Population	1.09x10-9	1.10x10-9	0.99	0.321	-1.06x10-9	3.25x10-9
% Population Over 25 with High School Education	3.462642	5.000587	0.69	0.489	-6.338328	13.26361
% Population Over 25 with a Bachelors	-2.768267	4.302484	-0.64	0.520	-11.20098	5.664446
Poverty Rate	2.499413	3.974078	0.63	0.529	-5289635	10.28846
Constant	-3.345907	4.077749	-0.82	0.412	-11.33815	4.646334

Table 11: Logistic Regression on if a town received funding by mean income.

The Town Characteristics Effect

To test how differences between towns impacted their odds of adapting to sea level rise, a third logistical regression was run:

Number of Observations = 37
LR chi2 (6) = 14.68

Prob > chi2 = 0.0229
Pseudo R2 = 0.3575

Variable	Coefficient	Std. Error	Z	P> |z|	95% Confidence Interval	
% Population over 25 with high school education	6.339278	11.6357	0.54	0.586	-16.46627	29.14483
% Population over 25 with college education	12.66714	7.277204	1.74	0.082	-1.595915	26.9302
% Voted Republican in Senate	1.100361	0.6563555	1.68	0.094	-0.1860724	2.386794
% Voted Republican in President	-1.490209	0.771212	-1.93	0.053	-3.001757	0.0213388
Moved from different county	-3.380805	23.78717	-0.14	0.887	-50.0028	43.24119
Moved from different state	-7.909331	26.0509	-0.30	0.761	-58.96815	43.14949
Constant	29.48839	16.45035	1.79	0.073	-2.753704	61.73049

Table 12: Logistic Regression of the impact of town characteristics on sea level rise adaptation

The three most important effects according to this model is how much of the population over 25 has at least a bachelor's degree, the percent of the population that voted for Romney in 2012, and the percent of the population that voted for the Republican candidate for Senate in 2012. Surprisingly, while voting Republican for president in 2012 is negatively correlated with adaptation, voting for Republican for Senate is positively correlated. This could mean that there

is a difference in the ideology of people who vote Republican for president and those who vote Republican for Senate. However, none of these effects hold with 95% confidence and a larger data set for towns and in other coastal states is the next step to test town characteristics.

The Vulnerability Effect

An expected finding that emerged as statistically significant is that people do respond to scientific uncertainty. Increased vulnerability (variable = vullevel) as determined by the Coastal Vulnerability Index was positively correlated to adaptation to sea level rise (z = 2.13). To test whether this was merely people responding to their waterfront lifestyle, all towns located on the Chesapeake Bay, a river, or the Atlantic Ocean, were assigned a 1 while towns not similarly situated were assigned a 0 in a new variable, waterfront. While positively correlated, the waterfront variable was not statistically significant and the 95% confidence interval suggested that it was possible for it to be negatively correlated. This water proximity dummy did not predict which towns undertook adaptive efforts, leading to the conclusion that somehow people living in the Eastern Shore understand their actual risk and are not merely reacting to how visible the water is.

Variable	Coefficient	Std. Error	Z	P > |z|	95% Confidence Interval	
Vulnerability Level	**0.470212**	**0.2210057**	**2.13**	**0.033**	**0.0370487**	**0.903373**
Waterfront	1.273094	1.193734	1.07	0.286	-1.066581	3.61277
Constant	-3.008408	1.121582	-2.68	0.007	-5.206668	-

						0.8101481

Table 13: Logistic Regression on if a town adapted to sea level rise on vulnerability according to the Coastal Vulnerability Index and if they are exposed to a body of water

The Consultant Effect

The most interesting finding of the study is not the importance of vulnerability or the economics, but that who the towns end up hiring to help them develop their plans is what matters. As Chesapeake City, Cambridge, and the state planner for Secretary/East New Market explicitly mentioned, many towns do not have staff that are able to, or do not have the time to, understand and respond to the technical nature of sea level rise. The planning commission and government for Chesapeake City completely deferred to their consultant while Cambridge, which has professional planning staff, allowed their consultant to drive the process.

Of the nine towns that adapted, eight of them used a consultant. Meanwhile, a town having used a consultant is positively correlated, albeit weakly, with the town having adapted to sea level rise ($z = 1.15$). Access to a professional planner, such as a consultant, who has fresh experience with comprehensive plans as well as is familiar with what other, similar, towns are discussing appears to influence towns to adapt. A t-test on which towns used a consultant determines that towns are likely to hire a consultant when they have access to external funding ($Pr(|T| > |t|) = 0.0013$). Upon closer inspection of the consultants used, it became apparent that the same consultants were being used by all of the towns, and that within this small group a pattern was emerging.

Number of observations = 41
LR chi2 (1) = 1.66

Prob ? chi2 = 0.1978
Pseudo r2 = 0.0384

Variable	Coefficient	Std. Error	Z	P > |z|	95% Confidence Interval	
Consultant	1.290984	1.127144	1.15	0.252	-0.9181783	3.500147
Constant	-2.302585	1.048809	-2.20	0.028	-4.358213	-0.2469575

Table 14: Logistic Regression predicting if a town adapted to sea level rise by their use of a consultant.

		Consultant		
		0 – No Consultant	1 – Consultant	Total
Town Adaptation to Sea Level Rise	0 – No Adaptation	10	22	32
	1 – Adaptation	1	8	9
	Total	11	30	41

Table 15: Matrix of adaptation by if the town used a consultant or not.

The 41 towns used the same eleven different consultants. The first two which showed up regularly, Maryland state planners as well as county planners, were visually strongly correlated with no adaption. Three towns used county planners, and none of these towns adapted. Ten towns used state planners and only one of those towns (Vienna) adopted adaptive measures. Vienna also used a private consultant in conjunction with the state planner. That private planner was not used for any other towns.

Towns using publicly funded planners to at least supplement their consultant could simply be a symptom of poor economics. However, a logistic regression predicting if a town used a county planner (variable countyplan) based on their mean income returns a positive

correlation (z = 1.98) and 95% confidence that the relationship is positive. Wealthier towns, according to this, may be more likely to use a county planner. Any relationship completely falls apart if the tax base is used instead of the mean income for the citizens (z = -.33) and low confidence. However, the coefficient is negative, which could suggest that towns with larger tax bases do not use county planners, because they can afford professional planning staff or a private consultant. It should be noted that only three towns in the data set used a county planner, so any correlation is weak and unsubstantiated at best. Any correlation is not present when using a state planner (z = -1.01), although it does have a negative coefficient, which again would make sense if wealthier towns can afford their own professional staff or a private consultant. Much like what occurred with county planners, the variable income*population does not correlate with the town's choice to use or not to use a state planner, but yet again it has a negative coefficient. Eight towns used state planners, however it should be noted that the state of Maryland recently limited the role a state planner could play and this may have impacted how these towns could have used the planners at their disposal. Perhaps their traditional use of the state planner inhibited their ability to navigate the private consultant market and develop an innovative plan.

Number of Observations = 41
LR $chi^2(1) = 5.44$
Prob > $chi^2 = 1.0197$
Pseudo $R^2 = 0.2534$

Variable	Coefficient	Std. Error	Z	p>|Z|	95% Confidence Interval	
Mean Income	**0.0001159**	**0.0000589**	**1.98**	**0.048**	**$9.13x10^{-7}$**	**0.0002309**
Constant	-10.8807	4.641699	-2.34	0.019	-19.97827	-1.78314

Table 16: Logistic Regression of the impact of mean income on the odds that a town will use a

county planner.

Number of Observations = 41
LR chi2 (1) = 1.15
Prob > chi2 = 0.7025
Pseudo R2 = 0.0068

Variable	Coefficient	Std. Error	Z	p>|Z|	95% Confidence Interval	
Income*Population	$-9.01x10^{-10}$	$2.72x10^{-9}$	-0.33	0.738	$-6.23x10^{-9}$	$4.42x10^{-9}$
Constant	-2.404189	0.6865041	-3.50	0.000	-3.749712	-1.058666

Table 17: Logistic Regression of the impact of tax base on the odds that a town will use a county planner.

The following regression is the logistic regression of the impact of a specific planner on if his or her client towns adapted to sea level rise or not. Four consultants, and the state planners, worked with multiple towns and could be included in the regression. The use of a county planner perfectly predicts non-adaption and was dropped as a variable for the following regression.

Number of Observations = 38
LR chi2 (5) = 13.14
Prob > chi2 = 0.0221
Pseudo R2 = 0.3158

Variable	Coefficient	Std. Error	Z	P>|z|	95% Confidence Interval	
State Planner	-0.4393221	1.332297	-0.33	0.742	-3.050576	2.171932
Consult A	1.729814	1.165945	1.48	0.138	-0.553954	4.015024
Five_consult	**3.815441**	**1.416265**	**2.69**	**0.007**	**1.039613**	**6.591269**
Consult B	2.104785	1.632015	1.29	0.197	-1.093905	5.303476
Nine_consult	-1.253603	1.461547	-0.83	0.391	-4.118183	1.610976
Constant	-2.104785	0.8145385	-2.58	0.010	-3.701251	-0.5083192

Table 18: The impact of the specific planner used on town adaptation to sea level rise

The two most frequent private consultants were used nine and five times. The first consultant (nine_consult) worked with eight non-adaptive towns and one adaptive. The second consultant (five_consult) worked with four adaptive towns and one non-adpative. However, while the town that is considered non-adaptive in the study because it does not include provisions for sea level rise, it does include a plan for forest conservation and mentions benefits of such an action, such as "Woodlands absorb and store carbon dioxide, removing this greenhouse gas from the atmosphere. Afforestation—converting lands to forest—increases the rate at which carbon is removed from the atmosphere (The Church Hill Comprehensive Plan 2010, 16). It should also be noted that the USGS rates this town as not vulnerable (vullevel = 0) and it is not a waterfront town. So while this paper only covers sea level rise as an adaptive effort, Church Hill is undergoing carbon mitigation by protecting and expanding forested areas. Nine towns in the study adopted adaptive measures, and this one consultant worked with four of them. For the purposes of regression, this consultant is identified as five_consult, because he worked with five towns in the data set.

		five_consult		
		0 – Did not use	1 – Used	Total
Town Adaptation	0 – No Adaptation	31	1	32
	1 – Adaptation	5	4	9
	Total	36	5	41

Table 19: Matrix of adaptive towns and the towns with whom five_consult worked.

This one adaptive consultant has a more statistically significant correlation (z = 2.01) to whether or not the town adapted than the tax base (z = -0.59), and vulnerability (z = 1.59). It happened to turn out that both the adaptive towns in the study used this same consultant, and the decision to interview him occurred before the data revealed how important of a role he played. The interview revealed that sea level rise is simply a piece of the package he presents to towns. It should be important to note that neither Chesapeake City nor Cambridge mentioned a reputation for sea level adaptation when they discussed their consultant. Chesapeake City did specifically mention that he was a well-respected consultant in the area. He won their bids through the competitive Request for Proposals process, and based on the three interviews nothing made it apparent that adaptive towns were more likely to select him, creating a bias.

Variable	Coefficient	Std. Error	Z	P>|z|	95% Confidence Interval	
Income*Population	$-1.50x10^{-9}$	$2.52x10^{-9}$	-0.59	0.553	$-6.44x10^{-9}$	$3.45x10^{-9}$
Poverty Rate	16.65569	10.17234	1.64	0.102	-3.281736	36.59312
College Education	5.568531	10.0667	0.55	0.580	-14.16185	25.29891
Unemployment Rate	9.709933	17.85565	0.54	0.587	-25.2865	44.70637
Waterfront	-0.5095182	1.841185	-0.28	0.782	-4.118175	3.099139
Vulnerability Level	.9163019	.577661	1.59	0.113	-.2158928	6.756584
Five_consult	**3.423938**	**1.700361**	**2.01**	**0.044**	**0.91291**	**6.756584**
Constant	-8.284614	3.88156	-2.13	0.033	-15.89233	-0.6768959

*Table 20: Logistic Regression of if a town adapted to sea level rise based on income*population, poverty, college education, unemployment, waterfront exposure, vulnerability, and if they used*

five_consult.

He was the prime consultant on two of the towns in the study, which came to light after the towns were chosen, but also worked on the plan for Crisfield and Queenstown, other adaptive towns on the Eastern Shore. He explained that while in both cases, in Chesapeake City and Cambridge, the end result was two towns addressing their vulnerabilities to sea level rise, the processes it emerged from were very different, namely in citizen participation. He did point out that he worked with Chesapeake City first, and so differences in the process may be a reflection on how he addressed them and not that there was a fundamental difference in the towns.

In Chesapeake City, the adaptive town in the study in Cecil County, he found it difficult to engage the public. He worked with the planning commission, but the general public was lacking in interest. This is the same narrative given by a member of that planning commission. The consultant remembered focusing on the resource conservation zone and how they included massive changes to zoning map. These changes were a reaction to sea level rise according to the consultant, although the member of the planning commission interviewed was under the impression that sea level rise was a minor concern. The end result included taking land out of development and preserving it as natural.

Meanwhile, in Cambridge, the process was strongly influenced by the people of the town. The consultant remembered strong public participation. He explained that consultants bring in the public participation by designing the process to require it. This is possible because most towns have a citizen-appointed planning commission and that creates space for the consultant to take charge. Like in Chesapeake City, most towns defer to the expertise of the consultant. Of

course, some towns, such as Cambridge, have their own professional planning departments. In Cambridge the budget allowed them to create an inventory of the environment and assigned resource values. They created a series of maps showing sea level rise, something that not all towns can afford. Cambridge had three groups of participation with thirty to forty of average citizens in each group. He explained that the public literally took ownership of the plan.

The levels of public engagement vary drastically between the four case studies. Cambridge, the largest and most diverse town, with its history of racial distrust had the most transformative experience. Both the consultant and planner spoke of a significant amount of citizen participation. The planner attributed new levels of participation to how the consultant brought in people and allowed them to make meaningful participation and take ownership through the three citizen work groups. In Cambridge citizen participation was accessible, attainable, and apparent.

Meanwhile, Chesapeake City had the same consultant, but their work with him occurred before he had developed the three citizen work group framework. Despite open meetings, citizen participation was sparse. However, those required to participate ultimately did view the plan as their own, and it passed unanimously which is not routine according to a planner.

Perryville, which did not use the same consultant as Cambridge and Chesapeake City did not experience the same heartfelt citizen participation that Cambridge did, but a planner noted that the citizen involvement was greater than normal. A planner noted that for the meetings concerning the Comprehensive Plan attendance was up two to four fold. While average attendance is five to six people for non-controversial issues, ten to twenty people were attending the meetings about the Comprehensive Plan. As mentioned previously, public participation in

Perryville is difficult to spur, but this Comprehensive Plan managed it with an absence of a contentious issue. The only notable dissent was over county compatibility.

Meanwhile, in Secretary and East New Market the towns were very much hands off, letting their state planners serve as the town staff that works with the consultant. There were no committee meetings like in the previous three towns, and the state planner pointed out that in Secretary there is a town clerk and one public works employee. While the towns met the minimum requirements for openness, they do not have the staff to craft work groups for the citizens or talk to a researcher about how many people attended meetings. Neither Secretary nor East New Market publish minutes online.

In general, he explained that people do not need a lot of reeducation about water resources and vulnerability. For coastal communities, being menaced by the sea is a "fact of life." Sea level rise is not controversial at the local level. The people can see that the water is higher and is flooding new areas during during high tides or storm surges. They are not interested in arguing larger philosophical ideology about climate change, they are interested in preserving their town's viability and reducing to their risk from the water next door. Furthermore, at least for communities along the Chesapeake Bay there is sedimentation occurring because of increased runoff from the western shore. The Chesapeake Bay is filling in from sediment and rising as a result of that as well as sea level rise, allowing those who discredit sea level rise to address the problem even with their ideological opposition.

Plus, it is possible to reframe their adaptation as not only minimizing risk, but also increasing opportunity. On the Eastern Shore, one of the new opportunities is recreation not only in the specific area but also connecting to a recreational network, specifically cycling and other

outdoor sports that benefit from the Eastern Shore's abundant natural area and flat topography. These new found economic opportunities capitalize on preserving areas naturally and working with nature to preserve forests and waterways. By framing these green areas as an economic gain and not as a loss, it becomes more palatable.

All in all, the most significant factor encouraging a town to adapt to sea level rise is who the town used as their consultant. The consultant that worked with five towns (five_consult) is the strongest predicting variable for if the town adapted to sea level rise, and even his non-adaptive town put in place carbon mitigating strategies. If the presence of the use of any consultant is controlled, then the coastal vulnerability level as determined by the United States Geologic Service is the statistically significant determinant of if the town is going to adapt or not, suggesting that despite claims that people are not scientifically well versed, they intuitively understand their technical risk of sea level rise. Other possible explanations, such as income, population, poverty, education, the unemployment rate, if the town is on the water, if they received funding, or if they used any consultant are not significant in the face of vulnerability.

Number of Obs = 41
LR chi2 (9) = 17.58
Prob > chi2 = 0.0403
Pseudo R2 = 0.4074

Variable	Coef.	Std. Error	Z	P>|z|	[95% Confidence Interval]	
Mean Income	-0.0000534	.0000727	-0.73	0.463	-0.0001958	.0000891
Population	-0.0000499	.0000925	-0.54	0.590	-0.0002313	0.0001315
Poverty Rate	7.267315	9.686074	0.75	.542	-11.71704	26.25167
College	5.379347	8.828782	.61	0.542	-11.92475	22.68344

Rate						
Unemployment Rate	1.93201	14.4602	0.13	0.894	-26.40946	30.27348
Waterfront	0.0304695	1.558883	.02	.984	-3.024885	3.085824
Vulnerability	**.9339145**	**.4463924**	**2.09**	**.036**	**.0590014**	**1.808828**
Funding	1.07385	1.325813	.81	.418	-1.524696	3.672395
Consultant	1.840876	1.967436	.94	.349	-2.015228	5.69698
Constant	-3.578079	5.918028	-0.60	0.545	-15.1772	8.021042

Table 21: Logistic Regression predicting if a town adapted to sea level rise based on mean income, population, poverty, college education, unemployment rate, waterfront exposure, vulnerability according to the Coastal Vulnerability Index, whether or not the town received outside funding, and whether or not the town used one or more consultants.

Conclusion

Towns on the Eastern Shore of Maryland respond to strong pressure from outside the town, not throughtheir counties but instead through the expert that they hire to help them design their comprehensive plans. The strongest predictor on if a town adapted or not is if they used the interviewed consultant, represented in the data as five_consult. For climate change, this could be a powerful tool in encouraging towns to voluntarily adopt adaptive measures. If consultants that towns work with to develop their comprehensive plans include sea level rise, or other changes that will come with climate change such as changing rainfall patterns or desertification, the towns will defer to their expert and will adapt. As a part of a smaller group, it is likely more efficient for concerned state governments, the federal government, or special interest groups to

focus their resources and persuade consultants that sea level rise is an important risk to take into account when planning.

However, the power wielded by consultants is concerning if meaningful citizen participation is considered an ideal for a democratic society. While in Cambridge the consultant designed the process to include citizens, this is not a guarantee. Based on the logistic regression as well as the interview with Chesapeake City, towns adhere to the suggestions given by their consultant. The town planning commission member of Chesapeake City characterized it as a waste to not listen to the expert which they hired. The state regional planner noted that towns without planning staff effectively let their consultant draft their plan. With this extreme power wielded by the consultant, representativeness in the comprehensive plan of the town is questionable. The comprehensive plan, the town's vision of their future, may not reflect the actual wants or needs of the town, but instead may simply fit the mold already designed by the consultant. While this power of the consultant can be used by groups to influence adaptation, the question stands if the ends of adaptation justify the means of an influential consultant dictating the plan for a town.

With the towns that worked with five_consult, sea level rise was simply part of the package that he presented to towns as he developed the plan to update their Comprehensive Plan. It was not controversial to him, nor was it controversial when he brought it up to the towns. This corresponds with what the state planner said when he explained how sea level rise is not controversial at the local level. For the most part, people on the Eastern Shore understand that they are menaced by rising waters, but he attributed a lack of movement because of high per capita costs of drafting a new section. The anecdotal evidence of the study, looking at adaptive

towns this is likely not true. In Somerset County, the two towns required to update in accordance with HB 1141 both adapted, despite being the two poorest towns in the data set. Church Hill, Queenstown, and Chesapeake City, all which worked with the adaptive consultant, have populations under a thousand people. These profiles of these adaptive cities, as well as the data set, refute the narrative that towns adapt when they can afford it. Instead, towns can afford adaptation if they hire a consultant who tells them that it is important.

This leads into why towns are so willing to follow the leadership of the consultant and ties into the strong impact that the scientifically derived vulnerability index has on if a town adapts or not. It is possible that when a consultant tells a town that it is important that they undertake adaptive efforts, that they are willing to go along with this because they intuitively understand that they are at risk. As five_consult said when interviewed, for coastal communities being menaced by the sea is a "fact of life." Citizens can see that water levels are higher, especially on the Eastern Shore which does not have the steep slopes of the Western Shore, because waves are eroding further inshore, high tides are reaching where it once was dry. This may be unique to the Eastern Shore because of their long history of water-oriented recreation. When the four case study towns were interviewed, all of them, including the state regional planner who has exposure to multiple towns in his region, mentioned that the primary form of recreation in their town is water oriented. As a result of their constant exposure to water, citizens may be more likely to notice subtle changes in water level either through recreational boating or because they are noticing roads flooding with greater frequency. As noted previously, especially in Dorchester County roads are especially vulnerable and the population is especially dependent on them for emergency services. Furthermore, because of the low topography of the Eastern

Shore, a unit rise of sea level will flood more area of land than on the Western Shore, which has steeper slopes. This may provide for a more obvious clue to citizens that the historical reaches of their local bodies of water are changing.

But it may be that, in general, laypeople understand when the natural state around them is changing, and they may be able to sense when their vulnerability is increasing. The people on the Eastern Shore may not be unique in their connection with the water around them and it might be possible to generalize that other people will understand their vulnerabilities to sea level rise and other climatic impacts. Further study should include other vulnerable towns that do not derive recreation from the source of their risk, and a larger data set of vulnerable towns.

There is a chance that towns on the Eastern Shore may react to their vulnerability because the state of Maryland may be subtly forcing vulnerable towns to adapt. A member of Chesapeake City's planning commission specifically mentioned pressure from the Maryland Department of the Environment as why they adapted. It is unknown if this pressure is the policy of the Maryland Department of the Environment or if this is the influence of a single office or individual. Towns' willingness to adapt and its strong correlation with their vulnerability may simply be a symptom of a strong state government which is concerned about sea level rise and long term viability of its Eastern Shore. As the state planner mentioned, soon to be eligible for state grants towns will have to include provisions for sea level rise adaptation. Further study of coastal towns in states that do not have a strong state government concerned about sea level rise could serve to test if adaptation in Maryland is merely a response to the state government. However, because the change in grant administration was officially announced after the towns in the study completed their updates to their comprehensive plans, these findings may apply to a

situation with a weak state government mandate and may exist in other situations.

While the leader effect of the consultant may help interest groups and governments encourage change without changes in law and the apparent awareness of vulnerability suggests that people intrinsically understand when their place is threatened, a more general conclusion coming out of this paper is that citizen involvement is feasible and beneficial even in a highly technical, scientific plan. As the town planner and consultant explained about the process in Cambridge, the general citizen understands the risk and understands how to address these risks. In Cambridge the government and consultant not only let interested citizens identify the issues they felt were important for the city, they also allowed them to tackle these difficult public planning issues and own the solution. Cambridge is not a town full of highly educated professionals, but is instead a mostly blue collar town with no history of citizens being involved in planning processes. Cambridge is not unique with citizen participation, there is no reason to believe that their citizenry is somehow more able to understand the technical issues around planning or climate change. In the end, both the consultant and the planner believed that by engaging the public in this meaningful and inclusive way they were able to craft a Comprehensive Plan that responded to the unique challenges and opportunities of Cambridge while maintaining broad support (Cambridge Comprehensive Plan, p. 2). Compared to the comprehensive plans of other towns, that of Cambridge appears substantively different.

The benefits of public involvement include increased creativity through new perspectives, citizen support for the plan, and a citizenry with new skills and knowledge. Cambridge included different voices when they developed their plan, allowing for different values and new understandings. This is one of the benefits that Sidaway attributes to public

involvement. The differences between the Cambridge plan and the one created in Chesapeake City, both aided by the same consultant but Chesapeake City lacking the level of citizen participation, are stark. From the beginning, the input of the citizens emerges in the guiding principles that the two plans work off of. While Chesapeake City enumerates "three principles of good town planning" Cambridge uses the three principles that the citizens developed in initial planning sessions (Chesapeake City Comprehensive Plan, 2009 and Cambridge Comprehensive Plan, 2011). The largest, most noticeable substantive difference is how Cambridge treats future growth and annexation. While Chesapeake City allows for growth and did not have any noticeable controversy over annexation, Cambridge was an entirely different story. The people of Cambridge, as discussed in the case study, strongly opposed future annexations of additional land, and when confronted with an impasse negotiated strong controls over how future land could be developed. They limited what land could be developed and guaranteed strict provisions that the proposed development would have to meet. The citizens controlled and shaped their town's planning document to prevent future physical expansion. Another noticeable difference between the two plans, and a feature unique to Cambridge, is the call for citizen responsibility for the plan. Unlike in the implementation sections of most of the other comprehensive plans, including that of Chesapeake City, Cambridge calls upon its citizens to remain engaged and active in supporting the implementation of the plan. It demands citizen engagement in holding elected and appointed officials accountable, citizen participation in advocacy groups that focus on implementing features of the plan, and citizen education about how the implementation of the plan is progressing (Cambridge Comprehensive Plan, 2011, p. 114). While other plans give planning commissions the duty of implementing the plan, Cambridge tasks its citizens to remain

engaged and committed.

Both the consultant and the planner drove the point home that in the end, the citizens of Cambridge felt like they owned the plan that was created. This is another benefit of public involvement, because the involved public will feel shared ownership and commitment to implementation and maintenance (Sidaway, 2005). As the Cambridge Comprehensive Plan explains, "The fundamental difference in outcomes between communities that successfully implement a Comprehensive Plan and those that do not is citizen engagement" (2011, p. 114). Future study should return to Cambridge to follow up on if they have been able to maintain citizen engagement in the implementation phase of their Comprehensive Plan.

Finally, the use of citizen involvement as was used in Cambridge may improve citizen involvement in future projects because the process left Cambridge with citizens with new skills and knowledge. While the planner did not believe that the citizens were especially versed in the nuances of sea level rise, by the end those involved knew a great deal and understood what was happening and how it will impact their town. Additionally, these citizens had experience with negotiation and cooperative decision making. According to Deutsch, cooperative problem solving improves trust and the demeanor of the parties towards one another, as well as reducing the salience of differences and increasing sensitivity to similarities (1973). Cambridge, as discussed, has a history with low trust and significant scars from a rocky civil rights history. The planner said that things are improving, and it is possible that this can be attributed to the benefits of the cooperative problem solving process the consultant crafted. Further study could look at towns that have used cooperative problem solving, albeit not deliberately, in their Comprehensive Plans and see how trust and stereotyping is impacted.

However, for all this paper comes out about the importance of the consultant, citizenry's intuition for vulnerability, and support for citizen involvement, it rings true that by focusing on Comprehensive Plans, this paper may miss the mark in studying real change in towns. For all towns may include language about sea level rise and their new maps about what is vulnerable and what needs to be preserved as green space, the Comprehensive Plan has no teeth. Instead, the zoning or ordinance document is the law that enforces the Comprehensive Plan, but neither grant organizations nor researchers pay attention to it, according to the state planner to whom I spoke. Further study should address which towns have updated their zoning or ordinance laws and if these laws enforce the sea level rise adaptations the Comprehensive Plan outlined. A 2009 law change in Maryland now forces municipalities to maintain consistency with their comprehensive plan, but how effective this law has been is unsure. There may be significant time lags between when the town includes adaptive provisions in their comprehensive plan and when these changing become effective because of enforcement and the rate of new construction and renovations to previous construction in the town. Additionally, a town may appear adaptive on paper while using grandfather clauses to allow vulnerable construction to persist.

Additionally, this was a case study with supporting data set of Eastern Shore Maryland towns. Unfortunately, only 41 of the 48 towns required to update their Comprehensive Plans did so and could be included, and only four towns agreed to be interviewed for the case study. For any substantial conclusions to be drawn from this research it is necessary to increase the data set by including other coastal towns in other states, although it is unknown if they will have the same update or section requirements that Maryland has. These potential towns may update slower because they do not have the same legal pressure that the Maryland towns did.

Furthermore, citizens were not interviewed, but instead members of the planning commissions were substituted as key informants. A fuller case study would include surveys or interviews of citizens who participated in the process, such as in Cambridge, or who lived in the town during the updating process, such as in the other towns.

While for the purposes of this study the dichotomous dependent variable of sea level rise is sufficient, it does have serious limitations. Adaptation, despite my use of a dichotomous variable, is not a simple yes or no question. Towns can be on a spectrum of adaptation; some may be trying out small changes while others may be entirely committed to adaptation. My dichotomous variable does not capture these nuances and nominally adaptive communities are grouped with those who are fully adaptive. Additional study could create a continuous sea level rise adaptation variable that encompasses varying degrees of adaptation.

Future study should work on developing a larger data set of other United States coastal towns to track the influence of consultants, state governments, and the response of the town to its vulnerability. While Maryland towns appeared to respond appropriately to their level of vulnerability, this might not be the case in other coastal areas. Additionally, regular updates to comprehensive plans could allow a longitudinal study of how the content of plans change with varying degrees of citizen participation. Environmental conflict resolution literature predicts that comprehensive plans created through a participatory process will be more durable (Emerson, Nabatchi, O'Leary, and Stephens, 2003, p. 8). The content of comprehensive plans produced by participatory processes and traditional rule making in different towns could be explored if there are more towns that used a similar process.

Appendix A

Questions for Town Planners

Adaptive Town – Did Not Use CoastSmart

Please describe your town. What is the economic make up of your town? What are the dominant industries? What are the prominent forms of recreation?

Describe the political leanings of your town. (What is your town like politically?) What are the dominant interest groups? How would you describe the relationships between these groups? Are they cooperative? Competitive?

How do you perceive the level of trust in your town? Between people? Between the interest groups? Are there any cleavages? What is this trust based on? What is the level of conflict in the town?

Are there any significant current, or past, contentious issues? Social? Economic? Environmental? How did people resolve them?

Has your town updated its Comprehensive Plan to include the Water Resources Element?

Do you know about the CoastSmart Funding program? If yes, what influenced your town not to use it?

Why did your town choose to include sea level rise in its update to its Comprehensive Plan? How did your town assess its risk? Were their competing interests or was everyone mostly in agreement? Who was involved in driving consideration of sea level rise (local government, state government, county government, local interest)?

Going into talks, how much did those involved know about sea level rise? The rest of the town?

Does your town have any history with flooding? Sea water intrusion? Do you perceive these to being more frequent? If your town has town halls, has this been an issue raised? Does your town have another way of raising issues? Has it been raised there? (Or where do I find this out?)

Are you concerned about sea level rise? Why? Do you perceive it as a real risk to your town? In what ways? (Way of life? Infrastructure? Economy?) Do you think that this concern is shared by your town? Why?

If they had an agency or other determine their risk, how neutral was the projection of risk perceived? What impacted this perception? How did your town deal with the uncertainty of sea

level rise?

How transparent was the process of determining your new Comprehensive Plan? Has your town implemented changes to your Comprehensive Plan? Does it require public input? Ratification? Was there any dissent? (Was transparency important?)

Is there a continuing dialogue? About sea level rise? About other environmental issues brought up during talks?

What type of discussion did your town use? Did you have public forums? How active was the public in shaping the final result?

How different is your final agreement from the recommendations? What are the differences? Why?

Were there any major roadblocks in implementing the changes? What were they? Minor roadblocks? How did your town overcome these blocks?

Has there been any impact on other environmental decision processes?

Is there anything else you would like to mention?

Who else should I talk to about learning more?

Unadaptive Towns – Update to Comprehensive Plan

Please describe your town. What is the economic make up of your town? What are the dominant industries? What are the prominent forms of recreation?

Describe the political leanings of your town. (What is your town like politically?) What are the dominant interest groups? How would you describe the relationships between these groups? Are they cooperative? Competitive?

How do you perceive the level of trust in your town? Between people? Between the interest groups? Are there any cleavages? What is this trust based on? What is the level of conflict in the town?

Are there any significant current, or past, contentious issues? Social? Economic? Environmental? How did people resolve them?

Does your Comprehensive Plan, or an amending document, include provisions for sea level rise? (If yes, move to Adaptive Town – Did Not Use CoastSmart.)

Are you concerned about sea level rise? Why or why not? Do you perceive it as a real risk to your town? In what ways? (Way of life? Infrastructure? Economy?) How do you characterize the concern about sea level rise in the rest of the town?

Does your town have any history with flooding? Sea water intrusion? Infrastructure damage? Do you perceive these to being more frequent? If your town has town halls, has this been an issue raised? Does your town have another way of raising issues? Has it been raised there? (Or where do I find this out?)

How did your town develop its update to its Comprehensive Plan? How transparent was the process of determining your new Comprehensive Plan? Has your town implemented changes to your Comprehensive Plan? Does it require public input? Ratification? Was there any dissent? (Was transparency important?)

Are you aware of the CoastSmart Funding program? If yes, what influenced your town not to use it?

Is there anything else you would like to mention?

Who should I talk to to learn more?

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