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# Role of Dignity in Rural Natural Resource Governance

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**THE ROLE OF DIGNITY IN RURAL NATURAL**

**RESOURCE GOVERNANCE**

By

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A DISSERTATION

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**DISSERTATION ACCEPTANCE STATEMENT**

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Dissertation Advisor: Dr. Jessica Leahy

An Abstract of the Dissertation Presented
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Dignity is "an internal state of peace that comes with the recognition and acceptance of the value and vulnerability of all living things" (Hicks, 2011, p. 1). Dignity is a crucial element in effective governance arrangements. This study applies dignity theory, and related theories of natural resource governance and environmental communication, to understand and overcome barriers to effective governance of common pool resources in rural communities. Chapter 1 reviews relevant literature on natural resource governance and develops a theoretical framework for dignity. Chapter 2 applies dignity theory to a contentious comprehensive planning process in a small Maine town in order to understand dignity is constructed and experienced in a collective governance process. Meeting minutes and newspaper articles were coded for themes related to conflict and decision-making. Results showed parts of the planning process ignored dignity considerations. Newspaper articles reported negative or exclusionary events twice as often as positive or inclusive events. Chapter 3 outlines literature relevant to improving capacity of rural communities to adapt to climate change. It then relates a case study from rural Maine in which best practices gleaned from the literature were implemented in creating climate vulnerability assessments and interactive, web-based storm surge mapping tools for use in adaptation planning. Results suggest best practices can enable proactive adaptation without sparking debate over climate science. The survey study described in Chapter

4 examined patterns of beliefs related to climate change and its impacts among people involved in municipal government in a rural Maine county. Results indicate that one-third of respondents were doubtful or unsure about the reality of climate change, but 87% reported observing phenomena related to the warming climate. The web-based survey presented in Chapter 5 examined involvement (perceived relevance and priority) in climate change and other issues affecting rural communities, as well as perceived self- and community efficacy for addressing local problems. Results indicate climate change, per se, is not a high priority, but some climate-related issues do rank highly, suggesting areas for initiating adaptation efforts. Chapter 6 concludes by placing the results of the preceding studies within the context of the dignity framework and presents recommendations for future research.

**DEDICATION**

To my mother, Zara Kilmurray, and my stepfather,

Steve Sherwood, in honor of their careers in public service.

**ACKNOWLEDGEMENTS**

I have heard it said that the small towns of Washington County, Maine, are held together by "duct tape and bailing wire." In truth, these communities are held together by the passion and effort of people who devote countless hours for little or no compensation. Such people were the subjects of the research presented here. Amidst municipal duties and family demands and lots of snow, many took the time to attend meetings, complete surveys, and provide feedback on maps and reports. I am grateful and humbled by their generosity. I hope my research can help to provide them with more and better tools to do their important work in the future.

Judy East of the Washington County Council of Governments has been a steadfast partner in all of the research presented here. Her unflagging energy, pragmatism, humor, and connections to communities across the region have ensured my research had direct and practical applications in rural communities.

Taking on a doctoral program while serving as a full-time faculty member at University of Maine at Machias was, unsurprisingly, a daunting challenge. It would have been impossible without the support of my colleagues and administrators. They have cheered me on, cut me slack, guided me, and believed in me. Their support has been critical in meeting this challenge, and I am deeply grateful.

Throughout this research, I have had the benefit of extraordinary students and research assistants to help in carrying out this work. Amy Dowley and Chris Federico played critical roles in all of the climate change vulnerability assessment and mapping work presented in Chapter 2, and they kept my lab running when I had to focus on research. Thomas Cochran, Jake Rottersman, Laura Teisl, and Meghan Cranford also contributed to the climate vulnerability assessments and storm surge scenario mapping work. Wolf Mullen served as an able research

assistant for some of the field work, and Izabo Emerson and Ryan Hatt helped with the research presented in Chapter 1.

I have been extremely lucky to have Jessica Leahy as my advisor. She has kept me on track, even when I was flagging and overwhelmed (i.e. throughout the entire process). Her clear-eyed and pragmatic advice always led me back to the path, and she taught me many important lessons about life as an academic and what it means to be a good advisor.

Each member of my dissertation committee has contributed something unique and valuable. I have been inspired by Jim Wilson's work on Maine's fishing communities for many years, and I have been grateful and honored for this chance to study with him. His incisive questions have, again and again, led me to think more deeply about theory and the implications of my work. Lois-Ann Kuntz has been a calm, thoughtful, visionary and supportive force throughout my doctoral work. She led me to the concept of dignity that came to be the central framework of my dissertation, for which I am eternally grateful. Laura Lindenfeld is the most upbeat and supportive teacher I have ever known. She has a unique way of instilling confidence while challenging me to aim higher, and it has buoyed, driven, and inspired me. I am very grateful to John Daigle for his kindness and patience, and for seeing the potential of involvement theory for my work.

Finally, I cannot express how grateful I am to my family. My husband Chris Mullen and my son Wolf Mullen have given me all the support, forbearance, humor, food, and love I could want as I pursued my graduate work. Perhaps the most patient of all was my constant companion Django who patiently waiting for countless hours as I wrote and got me out of the house to walk every day. Every new idea or insight presented here sprouted from a seed planted on those preambles.

This work was supported, in part, by a grant from the U.S. Department of Housing and Urban Development Sustainable Communities Program, part of the Sustainable Communities Partnership with U.S. Environmental Protection Agency and the U.S. Department of Energy. The National Weather Service National Hurricane Center and the Maine Office of GIS provided data and guidance for the storm surge mapping work presented here. Esri, Inc., and Blue Marble Geographics provided substantial technical support for our web-based mapping work.

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## My Path to Research on Dignity in Environmental Governance

In late October, 1998, I paid a visit to Jim Morgan at a marine railway on Martha's Vineyard. Mr. Morgan's trawler was hauled out for paint and repairs, and he graciously took time from his work to grant me an interview. Mr. Morgan, then 74, grew up fishing on the Vineyard, and he related stories about his childhood harpooning swordfish until longlining overtook that fishery in the 1960s. He had owned the hefty 45 foot boat on the ways, *Mary and Verna,* since the 1970s, providing for his family and that of his crew fishing year round for several different species. However, since 1992 when groundfish grew too scarce and many fisheries were shut down, Mr. Morgan had been fishing alone and only for a few fluke. He hoped the National Marine Fisheries Service would raise the quota on fluke, but feared a recent uptick in numbers was yet too tenuous (Johnson, 1998). Later, Mr. Morgan's wife of nearly 50 years told me she worried whenever he was on the water alone, but he was doing what he loved and she wouldn't ask him to stop.

Mr. Morgan was one of many fishermen I met in my capacity as a freelance writer and the marine reporter for *The Martha's Vineyard Times* in the late 1990s. I had returned to my childhood home in southeastern Massachusetts, and my work put me in a position to observe in detail the devastating upheaval caused by the collapse of the North Atlantic groundfisheries. Though the stock declines were long in the making, New England and the Canadian Maritime provinces were utterly unprepared for the change, conflict, and crisis that overtook them in the 1990s. Mr. Morgan seemed wistful and resigned, but many others raged at regulators. Families

and lives fell apart. Mortgages were foreclosed. Young people chose other careers. Once thriving communities became impoverished and grew older.

With my own personal and family connections to fisheries, I was compelled by the widespread conflict I observed, especially between fishers and environmentalists. In 2000, I returned to college to pursue a master's degree and chose to study the bitter conflict over whale entanglement in fishing gear. Federal regulators, scrambling to save the critically endangered North Atlantic right whale, were imposing gear changes and area closures on the remaining fisheries along the Eastern Seaboard in an effort to prevent fatal whale entanglements. Many New England fishermen voiced outrage at the regulations while whale advocates argued for stricter measures. My research on the topic would comprise my thesis, and later, a book (Johnson, 2005).

My research on the whale entanglement issue showed that underlying issues such as past clashes over fisheries regulations and conflicting values among stakeholders were as important as any of the specific provisions in proposed regulations. Also, the spatial and temporal scales of regulatory measures did not match the scales at which fisheries operated or whales moved. I learned that for fishing families, especially in remote areas, their communities were often of central importance, a subtlety that regulators often neglected to consider (Johnson, 2005). Later research would reveal deficient leadership in marine resource management as federal regulators commonly failed to manage participatory governance arrangements in ways that supported effective collective decision-making. This resulted in frequent, wasteful gridlock and undignified behavior among stakeholders that perpetuated conflict (Johnson, 2006).

In 2004, I began to apply geospatial technology in work with communities grappling with change, conflict and crisis. As part of an arts and community development collective in

Charleston, South Carolina, I worked with African-American enclaves settled in the Lowcountry after Reconstruction. These enclaves were now being engulfed by suburban sprawl and threatened by rising taxes due to increased property values. We mapped their communities, documenting their imprint on the land beginning in the 1870s, visualizing the impacts of changes and the links between Gullah culture and the natural world. In this work, I saw the pride and dignity of the landowners, the sacrifices they made to hold onto their land, their long roots in their communities, and their concern as younger generations were unmoored and drifted away. These now suburban enclaves were largely middle class in a state where urban and rural African Americans were predominantly poor, and community leaders credited their relative prosperity to their links with the land.

My work in the Lowcountry led me to a much deeper understanding of the conflict I saw in New England coastal communities. For fishing families of New England like the Morgans, their connection to fisheries provided not only a source of financial support, but also a center for pride, dignity, self-reliance, and the means to maintain the safety and support of a thriving community. From this perspective, losing access to fisheries meant losing much more than the money made from fishing. The seemingly outsized defensiveness and anger I often observed in meetings over fishing regulations was much more understandable in this light.

Since 2005, I have worked with impoverished rural communities in Downeast Maine, another area facing change, conflict, and crisis as multiple resource-based industries decline and demographics shift. Even amidst complex, often overwhelming challenges, communities here endure by leveraging the particular strengths of small communities. Using geospatial technologies and insights from my prior work, I am primarily concerned with building on these existing strengths to help communities address complex vulnerabilities and avoid conflict. Central to my efforts is the emerging understanding that concern for human dignity must

underpin all that we do to support people who courageously engage with others to make complex and daunting decisions in small communities. The research presented in this dissertation explores the role of dignity in rural governance and ways in which dignity can be created, protected, and added to the strengths of rural places.

## Engaged Research and the Participant Researcher

Most of the research presented in this dissertation, like much of the foregoing work, is engaged and applied in communities where I live and work. The term "engaged research" refers to studies that involve collaboration with non-academics. It may include short-term, limited partnerships, such as the survey described in Chapters 4 and 5 where community partners merely provided mailing lists and provided feedback on the survey instrument. Engaged research may involve non-academic partners in every aspect of research: developing research questions, study design, data gathering, analysis, interpretation, and even authorship. The case study presented in Chapter 3 describes a project that involved such a full partnership.

There are many reasons to undertake engaged research. One is to bridge the "theory-practice gap" (Van De Ven & Johnson, 2006; Van de Ven, 2007). If the purpose of theory-based research is to provide knowledge and technologies that can be used, it behooves researchers to make their products useful. Engaged research is a way to close the gap through co-production of knowledge, bridging different ways of knowing, and allowing researchers and practitioners to align goals, methods, and outcomes to meet the needs of both (Van De Ven, 2007).

A key advantage of engaged research is especially germane to work in impoverished rural areas like Downeast Maine: It can provide knowledge, technology and other resources to communities with limited capacity. Also, research done *with* instead of *to* an underserved community is more likely to be of immediate benefit.

Many academics believe what they do is somehow separate from the questions and decisions non-academics grapple with each day. Academics may see their role as creating knowledge and passing it onto the politicians and regulators to use as they see fit. Cash (2006) calls this "the loading dock problem," to be discussed in greater depth in Chapter 3. Academics may believe they can pack knowledge into boxes and place them on the loading dock to be carried away for distribution. Cash points to multiple problems with this view of the academic enterprise. For instance, if academics do not work with those who will use the knowledge they create, they will not know which questions are useful and salient. Cash suggests that when academics and end users produce knowledge together, as they may through engaged research, the information is more likely to be useful and widely credible.

Pielke (2007) notes that the loading dock problem is rooted in the structuralist notion that science should be viewed as unbiased and divorced from values. This view looks to science for facts that erase uncertainty and point clearly to specific policy decisions, assuming uncertainty can be erased in any practical sense. Pielke takes the post-structuralist view that scholarship cannot be separated from values. Indeed, the entire scientific enterprise is based on values: the questions asked, the projects funded, the papers published. Moreover, if a policy decision must be made amidst uncertainty and complexity, the final reckoning will inevitably be based on values.

If we accept the post-structuralist view that research is inherently value-laden and recognize the role of values in decision-making, Pielke argues, the best course of action for a researcher to engage in policy decisions is to become an "honest broker of policy alternatives." The honest broker seeks "to expand (or at least clarify) the scope of choice for decision-making in a way that allows for the decision-maker to [make a] choice based on his or her own preferences and values" (Pielke, 2007, pp. 2–3). Serving as an honest broker, according to Pielke,

requires researchers to know how uncertainty and values will interact in the decision-making process in order to provide policy alternatives. This suggests an important role for engaged research, as co-production of knowledge allows research to be shaped to expand policy options and can foster understanding of relevant value-related questions.

Jasanoff (1996) goes farther in reminding us that science and its epistemological practices are social constructions, and as such, are inherently political and cultural. She argues that researchers must understand and accept the political and cultural nature of the knowledge they produce. Jasanoff adds that research itself is part of the process of constructing culture. In other words, the result of producing knowledge is social change. Jasanoff suggests the researcher (particularly a social scientist) stands to gain insight and perspective by adopting a relativist view, understanding the multiple political and cultural implications of the knowledge she produces.

Jasanoff, Pielke and others (e.g. Grbich, 2007; Van de Ven, 2007) exhort academics to adopt a reflexive attitude about their own values, biases, and beliefs. Reflexivity is a critical element of the practice of qualitative research and is instructive to other researchers seeking to play the roles suggested by Pielke and Jasanoff. Grbich (2007) describes reflexivity as an alternative to the elusive objectivity. Functionally, it is "the constantly reflective and self-critical processes undergone by the researcher at all stages of the research process" (Grbich, 2007, p. 10). Patton (2002) states that all knowledge, perception and judgment are processed through the "reflexive screens" of gender, race, class, values, etc. (Patton, 2002, p. 66).

A reflexive approach also answers some of the particular challenges and drawbacks to engaged research. It may be difficult for the researcher to balance the needs of research with those of the community, and not every academic discipline is supportive of engaged scholarship. Also, the researcher must understand and manage her role in the research carefully with a clear

sense of her own values, assumptions, and biases. A literature review on engaged research by Mikesell, Bromley, and Khodyakov (2013) identified specific challenges in engaged research that can help to guide reflexive considerations for engaged researchers. The most common challenge was insider/ outsider tensions. In the rural communities I study in Downeast Maine, insider/ outsider issues are a constant theme with people from away coming to settle, regulators and service agency workers allocating resources, and state and federal laws imposed from afar. My effort to play the honest broker role has led me to research on the boundary between insiders and outsiders of various types, and it has challenged me to reflect deeply on my own role.

In reflecting on my own position in the community where I live and do research, I believe I occupy a place between insider and outsider. I am "from away," but I am married to a native Mainer who is a commercial fisherman and carpenter. I am relatively wealthy and educated, but I was raised in a working class, single parent household. I have a white collar job in higher education, but I come from a family with several fishermen and have fished and done woods work for a living myself. This positionality has generally afforded me a vantage from which to study boundary work, though it requires constant consideration about the role I play, the related values, and the distance I should maintain. Living and doing research in a rural area, the boundaries between academics and stakeholders may blur. People serve multiple functions in their communities. Children attend the same schools; everyone shops in the same supermarkets. Similar concerns are widely discussed in the qualitative research literature, as well (e.g. Dwyer & Buckle, 2009; Labaree, 2002; Leigh, 2014).

It is critical to recognize that, as a researcher and a participant in the community I study, biases and assumptions are inevitable and must be examined reflexively within the social context. I have encountered in myself several biases related to the topics I study, and I will relate the most relevant here. A primary bias is that I am politically liberal, while most of my

study subjects are moderate or conservative. This has been a central issue in my research throughout my career and has led me to a longstanding process of self-reflection aimed at cultivating a relativist attitude and mode for processing information. Having spent most of my childhood with my working class family on Cape Cod, Massachusetts, a popular destination for wealthy tourists, I have a bias against wealthy seasonal residents and retirees who move to rural areas. Reflecting on my own status as an in-migrant in Maine has helped me to gain a more encompassing perspective, and this bias is the focus of much self-reflection in my current work. I am atheist, while many of my study subjects are religious. Addressing biases related to religious differences has required an accounting of values in my own secular humanist belief system against those within religious belief systems to find commonalities and differences. Where differences arise, I strive to understand the basis for beliefs that conflict with my own and cultivate a position of respect and acceptance. Finally, I have education and a vested interest in science, along with its attendant post-structuralist critiques. Many of my study subjects, however, question the conclusions of science, particularly related to climate change. I must acknowledge a bias against those who dismiss the scientific method and scientific consensus. In many ways, the research presented in this dissertation is motivated by my own effort to gain a relativist understanding of those with an opposing view on the scientific enterprise.

## Introduction

> *[T]he rural experience is the sum of group responses to both political constraints and individual choice. People can make a difference, either through influencing the broader policy agenda that constrains them or through making choices within the policy framework. Individuals are not just victims of society or passive consumers of broader*

*national change. The choices rural residents make affect the direction that change takes in their communities.* - Flora & Flora, 2012, p. 23.

In recent years, rural America has been buffeted by the winds of global change—economic, climatic, demographic, and cultural. Amidst this change, small communities with limited means must make critical decisions and manage scarce resources in an increasingly complex and mobile world. State and federal laws impose mandates on rural municipalities, often without providing the tools, training, or funding to meet these new expectations. Small towns meet these challenges using their particular strengths, such as direct public engagement in governance, a strong vane of self-reliance, ingenuity, and a keen knowledge of their own human and natural resources. Rural communities also face daunting vulnerabilities such as persistent poverty, dearth of information and technical expertise, and dependence on contested and limited resources (Table 1.1). As the decisions they face grow more complex and stakeholders grow more diverse, it is perhaps not surprising that rural governance can often be a contested, messy, sometimes undignified undertaking.

Table 1.1. Strengths and vulnerabilities of rural communities.

**Governance in Small & Rural Communities:**
**How do we support strengths to address vulnerabilities?**

| Vulnerabilities | Strengths |
|---|---|
| • Resource dependence & scarcity | • Knowledge of resources |
| • Contested governance | • Direct engagement in governance |
| • Persistent poverty | • Self-reliance |
| • Poor education | • Ingenuity |
| • Minimal municipal capacity | • Elbow grease & volunteerism |
| • Weak bridging social capital | • Strong bonding social capital |
| • Dearth of fine-scale, relevant data | • Fine-scale observations |

Small-town America has been the setting for a multitude of localized, bitter battles in recent decades as stakeholders conflict over natural resource management in the context of municipal governance, regional planning processes, or local regulatory processes (e.g. Richardson, 2003; Clune, 2006; Jacobs, 2007). Much is at stake in these localized collective decision-making processes in ex-urban areas. Thousands of small municipal governments can decide the fate of the nation's farmlands, forests, open space, fisheries and wild lands, as well as the millions of people who depend on them for their livelihood.

Why is municipal governance often fraught with conflict and intractability, and how can communities avoid inefficient, undignified, and debilitating battles? What can researchers, planners, and government agencies do to support rural communities in making difficult and momentous choices that, as Flora and Flora suggest, "affect the direction that change takes in their communities" (2012, p. 23)? What individual beliefs, practices, priorities and concerns contribute to or detract from functioning, dignified rural governance? This research centers on answering these questions as they pertain to rural communities in conflict and change.

## Conceptual Frameworks

Important frameworks exist for understanding the elements of effective and resilient governance arrangements for natural resources and how they apply to small municipalities (E. Ostrom, 1990 & 2000; E. Ostrom & Ostrom, 2004). Ostrom's work, including substantial empirical testing, built upon prior insights about the importance of information and its relationship to the scale of government arrangements (Hayek, 1945; H. Simon, 1962). Furthermore, related work has also lent key insights into the structure and function of governance mechanisms and their evolution (E. Ostrom & Ostrom, 2004; E. Ostrom, Ostrom, Sabetti, & Aligică, 2014; V. Ostrom, 2014). Many have built upon the Ostroms' work looking at

how knowledge and information are created and feed into governance processes (e.g. Cash et al., 2003; Dietz, Ostrom, & Stern, 2003; Jasanoff, 1996, 2006; D. S. Wilson, Ostrom, & Cox, 2013; J. Wilson et al., 2013). Others have explored the role of trust in the success of governance frameworks (Adger, 2003; Cash et al., 2006; Leahy & Anderson, 2008; Smith, Leahy, Anderson, & Davenport, 2013a, 2013b).

**The Dignity Framework**

We propose adding a new element, dignity, to the broadening understanding of collective choice and governance. In a concept analysis of dignity to refine the definition in the context of medical care for elders, Jacelon, Connelly, Brown, Proulx, and Vo (2004) reviewed a wide range of literature and conducted focus groups with elders. Based on this work, they wrote that dignity is "an inherent characteristic of being human… subjectively felt as an attribute of the self, and is made manifest through behaviour that demonstrates respect."

"Dignity is an internal state of peace that comes with the recognition and acceptance of the value and vulnerability of all living things" (Hicks, 2011, p. 1). Dignity, this sense that oneself and others matter in the most basic sense, is a central human need in and of itself, and it is connected to other needs such as food, water, shelter, economic security, and physical safety.

Dignity is a personal attribute that is either harmed or supported by both internal psychological factors, as well as external factors arising from interactions with others and with their environment in the past or present. Dignity may be injured when one's value is ignored or discounted in personal interactions or by dysfunctional or damaging governance processes. Also, dignity may be injured when other basic needs are threatened or violated, for instance, through the experience of poverty or violence.

According to Hicks (2011), dignity—and injuries to dignity—play a central role in either fueling or diffusing all types of conflict, from domestic disputes to civil war. Hicks asserts that dignity forms a critical element in the context surrounding contentious collective processes, and offers ample evidence from a wide array of relevant literature and her own experience to support this claim. Each individual participating in a collective process, such as a regulatory decision or a peace treaty negotiation, brings a history and level of dignity with them to the table. Since dignity is both an innate human need and a vulnerable one, an individual's dignity colors their actions and thoughts as they engage in governance. If someone feels their dignity is threatened by other people, agencies or organizations, they will be less likely to trust, negotiate, agree, and adhere to collective decisions.

It is important to note that dignity, as defined by Hicks and Jacelon et al., is distinct from the concepts of respect or regard. Dignity does not require agreement in order for one to recognize and accept the value and vulnerability of all living beings. Participants on opposing sides of a conflict over land use regulations, for example, need not agree with or like one another to engage with one another in a dignified manner. The process of resolving conflict and making difficult decisions, according to Hicks, can only proceed in a dignified context.

Indignities cut both ways. One whose dignity has been injured is more likely to act in undignified ways, thereby continuing the cycle of indignity and reinforcing an undignified context. On the other hand, a shared understanding and commitment to dignity can build a dignified milieu and allow collective action. A dignified context, according to Hicks, is a necessary first step toward further collective action.

Hicks (2011) lists the ten elements of dignity, as shown in Table 1.2. It is helpful to note that the elements of dignity, the conditions of a dignified process, arise from either interpersonal interactions or are characteristics of a collective process. Of course, the two

categories are interrelated. To create and sustain a dignified process, each individual must be dignified in their interpersonal relationships and must adhere to the elements of the collective process that support dignity. This research is the first to apply dignity theory to the case of municipal governance.

Table 1.2. The elements of dignity.

(Hicks, 2011; categories added)

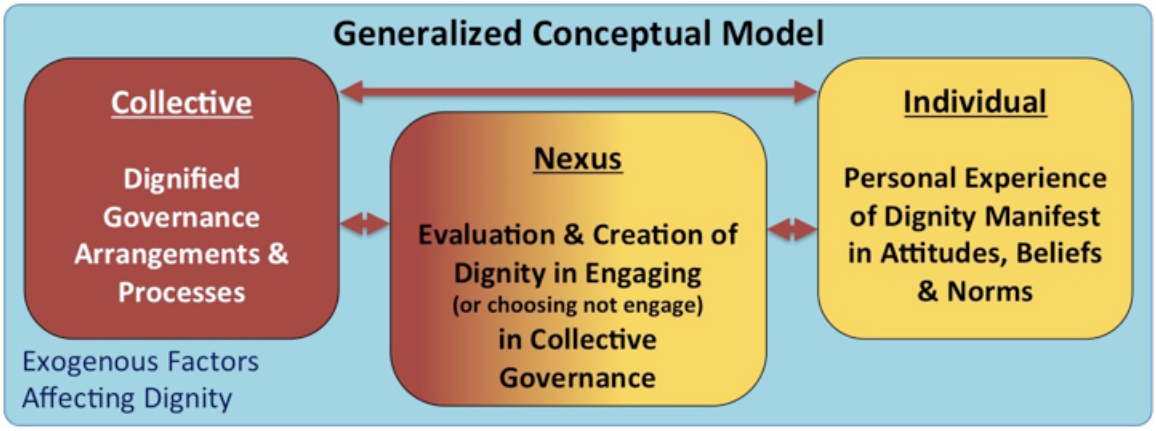
| Interpersonal | Process |
|---|---|
| Acceptance of Identity | Inclusion |
| Acknowledgement | Independence |
| Recognition | Fairness |
| Understanding | Accountability |
| Benefit of the Doubt | |
| Safety | |

**Dignity and Theoretical Frames for Rural Governance of Common Pool Resources**

Much has been written about effective collective governance arrangements for common pool resources, and there is an extensive and body of research regarding the psychosocial factors that determine individual attitudes and behavior. However, the nexus between the individual and the collective spheres lacks a coherent, integrative theoretical framework. The nexus refers to the elements of governance processes in which people act upon individual beliefs and motivations and engage (or choose not to engage) in collective governance arrangements to create, support, contest, influence, learn, share and so on. The nexus encompasses the processes, practices, epistemologies, and products through which individuals influence the collective sphere. The character and structure of the collective process can influence individual beliefs and motivations, as well, in turn influencing how individuals think and behave in relation to collective governance arrangements. All of the spheres—

collective, individual, and nexus—operate within and are influenced by the context of exogenous factors such as socioeconomic pressures, cultural practices, historical conflicts and alliances, and established institutions (Figure 1.1).

Figure 1.1 Generalized conceptual model for dignity in rural governance.



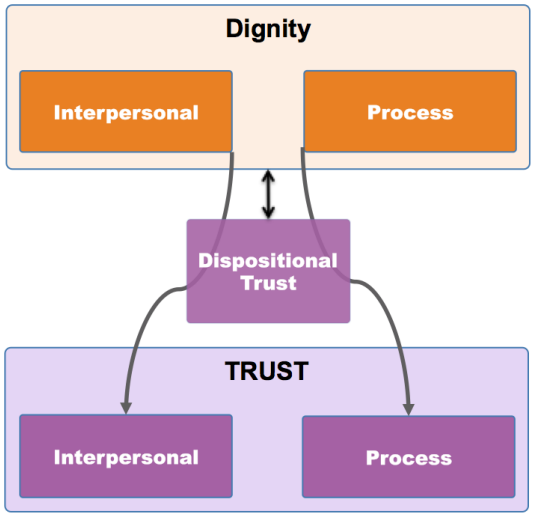

A variety of theoretical frameworks and a growing body of evidence from applied research lend insights to the workings of the nexus, including work in epistemology (e.g. Cash et al., 2003; Cash, 2006; Pahl-Wostl, 2009), resilience (e.g. Folke et al., 2010), communication (e.g. Pielke, 2007), leadership (e.g. Bryson & Anderson, 2000; Straus, 2002), sociology (e.g. Adger, 2003), and more. The construct of dignity offers a framework for tying together each of these insights about the nexus and placing them into the larger context, connecting the individual with the collective sphere, all influenced by exogenous factors.

Each of the chapters of this dissertation explores components of one of the spheres, focusing on those related to dignity, in some cases explicitly and in other cases implicitly. In this introduction, the ways in which dignity relates specifically to the elements of effective governance of common pool resources is explored. That is followed by a summary of each

chapter placing it into the conceptual framework of dignity in governance of common pool resources.

Trust: Before we begin to explore how dignity relates to the functional elements of governance, it is important to say a word about trust. Trust, in the context of an individual in a collective decision-making process, refers to the beliefs of that individual about others involved and the governance process itself, as well as their general disposition or tendency to trust, as shown in (Smith et al., 2013a, 2013b). (Figure 1.2)

Figure 1.2. Dignity and trust.




Drawing upon Hicks' (2011) insights, I suggest that each type of trust is influenced by the dignity of the individual's context, and that dispositional trust plays an especially central role. A person's tendency to trust, their disposition, is affected by the dignity and indignities they experience outside the collective choice process. Their disposition, in turn, mediates trust that may arise from a dignified context within the collective choice process.

It is common sense that a person's experiences color the way they engage with others. So, such an insight is not new. However, it is valuable to consider the specific role of dignity and

its connection to both interpersonal relationships and governance processes. Such affective factors may be central to the success or failure of governance arrangements, even when they have little to do with the subject of the governance process.

An incident from my own prior research on the issue of whale entanglement in fishing gear (Johnson, 2005) serves as an example of the relationship between trust and dignity. In an interview about his participation on the Atlantic Large Whale Take Reduction Team (TRT), a Maine fishermen told me he had attended the first meeting of the TRT believing he and his fellow fishermen were being "accused of murder" by the whale advocates on the TRT. That lack of trust, the fisherman explained, was rooted, in part, in his past experience with other federal fisheries management processes. These prior experiences colored the entire Whale TRT process, though facilitators assiduously kept the group from discussing or processing these past experiences. The facilitators and frustrated regulators failed to understand the importance of prior experiences and the perceived indignities suffered among the fishermen. The fishermen themselves often behaved belligerently toward the whale advocates, who in turn suffered indignities and resorted to the courts to ensure their concerns were addressed.

Not only can the concept of dignity help us to understand why such processes are characterized by intractable conflict, it may help us understand how to move a process forward when it is colored by such mistrust.

The concept of dignity can help us to better understand the role of individual beliefs, norms, and attitudes in governance processes in the collective sphere. To explain, I will examine several of the important elements of effective and resilient governance arrangements outlined by Ostrom (1990) with insights from literature on conflict, collaborative decision-making, information theory, and the structure and evolution of government in the U.S. For each, I will review the most important elements and how they relate to the dignity framework.

Decision-Making and Conflict: Basic principles of conflict resolution and community decision-making provide guidance on constructing a dignified process. Most combative stakeholders frame these problems, goals and solutions in terms of their own interests, assuming that they know best or have the right to define these important things for all others. So, a functional collective decision-making process facilitates the framing of an inclusive definition of the problems, then the goals, and finally the solutions (Straus 2002; Kaufman, Elliott & Shmueli 2003; Lakoff 2009; and others). The process is managed and facilitated to foster commitment to the process and to marginalize bullies and hijackers (Straus 2002). In terms of dignity, the act of re-framing specifically addresses the interpersonal dignity elements of recognition, acknowledgement, and understanding while creating more inclusive milieu, a process element of dignity.

Information Feedback Loops and Bounded Rationality: To be effective, according to Ostrom (1990), governance arrangements must allow information about a managed resource to be gathered, distributed and acted upon locally. Such information may be related to natural variations in the resource due to external factors such as weather, but may also relate to human factors such as compliance and therefore the trustworthiness of agents in the system. In a system with tight feedback loops, all participants in the system can, if not directly observe, at least understand and evaluate information about the resource and their fellow participants. They can consider and act upon only the information that they can perceive, understand and process. Their rational behavior is bounded by the limits of their perception and understanding (Simon, 1962; Simon, 1986). Tight feedback loops also allow for more flexible management strategies, because local information can allow local action in response to local variations in the resource and the behavior of the participants (Ostrom, 1990).

Recall that perception is also central to the concept of dignity and the formation of trust. A person's willingness to trust in the process, and therefore to participate and legitimize the process, will be based on interactions and experiences both within and outside the process. They will determine whether the process and the people involved pose a risk to their dignity and their interests based on information they gather prior to and during their interactions. Further, they will assess the quality of information based on how much they trust the source to protect their dignity.

I suggest that tight feedback loops also allow participants to better observe each other and the process as a whole to evaluate whether they are being treated with dignity. Over-large and ungainly feedback loops not only interfere with adaptable management, they also may make it impossible for a participant to observe and understand the elements of the system that affect her dignity. In a large system, she cannot know whether her concerns have been heard (recognition) or understood (understanding), whether her role is regarded as important (acceptance), whether sacrifices are evenly distributed (fairness), whether the resource managers are enforcing the rules (accountability), and so on.

A participant may also provide information to the system, such as concerns about the resource or behavior of others. They will observe and evaluate the ways in which information is accepted and acted upon to further inform their sense of dignity and trust. Based on their observations, a participant will assess their relationships with the other individuals involved to see if they support the interpersonal elements of dignity such as recognition, understanding and giving the benefit of the doubt. They will observe the process to see whether it is supporting the elements of dignity such as fairness, inclusion and accountability.

From this perspective we can view the press, and increasingly, social media as mechanisms for gathering information about the dignity and trustworthiness of large-scale

governance processes and the people involved in them. The press and social media can serve to tighten feedback loops. And if the press and social media play such a crucial role, the way they frame and select information for the public can have enormous consequences for dignity in the public sphere.

Ostrom's and Simon's recommendations for tight feedback loops are, in part, a practical approach for grappling with incorrect or uncertain information; errors and uncertainties at the local scale can be best addressed locally with agile systems that can adapt. And often, perceived indignities arise from incorrect information. I will explain with an anecdote from one of my own experiences with rural governance: In the Town of East Machias, Maine, state-mandated shoreland zoning has been particularly contentious for a variety of reasons. One reason was a large number of errors in floodplain and wetland maps. While state officials saw the errors as minor technical problems that were easily fixed with a survey, many local people felt their rights were being unfairly violated because of faulty information. A partnership between my university and a regional council of governments provided assistance to rural communities in creating their own shoreland zoning maps and ordinances as an alternative to having state-imposed maps and ordinances. After several contentious rounds of revisions of the East Machias map, the town asked me to attend a public meeting of the planning board with my computer and the digital version of the town's shoreland zoning map. A professional planner familiar with the regulations also attended. At that meeting, each landowner that had a question about the proposed zoning for their property could challenge the designation. During the meeting, we examined each disputed lot on an aerial photo and made a determination about whether an exemption would be acceptable under the state statute. In perhaps half of the cases, a partial or total exemption was warranted or a small correction to the map could be made. In other cases, people were assured that the map was correct and accepted the designation.

This is a prime example of an agile governance mechanism (albeit largely *ad hoc*) that tightened information feedback loops to allow both prompt action and a more dignified process. This solution supported every element of dignity. Each person was recognized, heard, understood, and given the benefit of the doubt. The process ensured everyone was included and could act with autonomy, the outcomes were fair, and the process was accountable. Everyone left, if not entirely satisfied, less disgruntled and convinced that they had been heard. Most importantly, no one sued the town over inaccuracies in the map, as had happened in other towns. Combining Ostrom's elements of effective governance and Hicks' elements of dignity in this way provides a testable framework for describing how individual affective factors influence when and how people engage in collective processes across the nexus.

The process described in the example above would be extremely inefficient and difficult at the state level, which brings us to another of Ostrom's important elements of effective and resilient governance: congruence. The scale of governance arrangements that allocate resources, impose restrictions, gather and disseminate information, etc. must match the scale of the resources and the participants' perceptions. This idea of congruence is compatible with the dignity framework, because dignity relies on participants having a perceptual frame that allows them to gather information and make rational choices related to dignity. For example, the process of creating the East Machias shoreland zoning map began as a contentious struggle with a state-imposed zoning map printed at a coarse scale so small landowners could not see their lots clearly. When disgruntled landowners came to the meeting, they were finally able to see the information at a resolution and scale appropriate to the decisions they were making. Providing data at a congruent scale supported a more dignified process, it was a form of recognition and acknowledgement (interpersonal) that allowed greater inclusion, independence, and accountability (process). Therefore, a fruitful line of research may explore how scale can be

manipulated to tighten information feedback loops and promote autonomy, accountability, and perceived fairness.

Dignity and Inclusion: Stakeholders must be able to participate in rule-making for resource decisions that affect them, according to Ostrom (1990). This aligns with the element of dignity that Hicks terms “inclusion.” It is a tenet that is widely accepted in natural resource management today, given the widespread implementation of collective process arrangements. Dietz et al. (2003) point to collective choice arrangements as a key element in minimizing conflict and inducing compliance. However, not all participatory frameworks are effective, and it's not always clear why. The role of trust is widely recognized as important to the success of participatory processes (Leahy & Anderson, 2008; Sabatier, 2005; Smith et al., 2013a, 2013b). How can a participatory framework be structured to maximize trust? If we understand that trust arises from dignity in interactions among people and governance processes, then trust can be maximized by creating and maintaining a milieu in every part of the process where dignity is considered. Such an insight can then guide research that examines how dignity functions in governance processes.

Dignity and Scale of Governance: If feedback loops must be small, then there must be many small centers or units of governance, rather than one central authority (Andersson & Ostrom, 2008; E. Ostrom, 2009; V. Ostrom, 2014; H. Simon, 1962). If those small units are to govern the use of widely-distributed resources, they must be connected to one another, typically in a polycentric, hierarchical framework. Herein lies one of the fundamental challenges in attending to dignity while governing common pool resources. Many of today's most contentious natural resource management issues are characterized by efforts to manage global or regional resources with local consequences. Researchers in an array of disciplines have spent a great deal of time and effort studying and theorizing about why issues such as climate change

and management of marine fisheries have been so fractious and emotional. While scale issues can explain confusion and frustration among stakeholders, perhaps dignity considerations can play a role in explaining the level of rancor. Table 1.3 lists Ostrom's eight elements of effective governance arrangements (1990, p. 90) noting for each how they support the elements of dignity (Hicks, 2011) by arranging information feedback loops (Ostrom, 1990; Simon, 1986).

What if trust has already been eroded by prior indignities as it had been for the fishermen involved in the Whale TRT? One might argue that in such situations participatory processes are infeasible. Indeed, in interviews several members of the Whale TRT suggested that the process should be dismantled for that reason (Johnson, 2005). However, Hicks' (2011) insights into the role of dignity in conflict implies another avenue toward effective participatory governance. If we recognize that trust is path dependent and that past indignities have engendered distrust, we can design participatory processes to confront and counter the indignities. In this light, when the Whale TRT facilitators decided to quash discussion of prior indignities, they guaranteed the process would be characterized by continued distrust and further indignities. Hicks (2011) offers guidance on promoting reconciliation by confronting lingering concerns in a safe setting in which mutual indignities and vulnerabilities can be acknowledged. She notes that when our dignity is threatened, we tend to lash out in fear and anger and injure the dignity of others. This is the root, she writes, of much rancorous, persistent and harmful conflict. Typically, it is simply acknowledgement, being heard and understood by another, that will plant the seeds of a dignified environment and begin to heal relationships. Again, these insights provide a testable framework that may guide research into effective methods for promoting reconciliation in governance.

Table 1.3. Aligning Ostrom's elements of effective governance with Hicks' elements of dignity.

| | **Elements of Effective Governance** (Ostrom, 1990, p. 90) | **Elements of Dignity** (Hicks, 2011) | **Information Feedback about Dignity** (Ostrom, 1990; Simon, 1986) |
|---|---|---|---|
| 1. | Clearly defined boundaries | Inclusion, independence | Limits extent of needed feedback: bounded rationality |
| 2. | Congruence between appropriation & provision rules and local conditions | Fairness | Retains realistic perceptual scale |
| 3. | Collective-choice arrangements | Inclusion, accountability, independence | Agility in acting on feedback |
| 4. | Monitoring | Accountability, fairness | Provides information on respect of dignity among participants |
| 5. | Graduated sanctions | Accountability, fairness | Provides information on respect of dignity within the governance process |
| 6. | Conflict-resolution mechanisms | Accountability, fairness | Provides information on respect of dignity within the governance process |
| 7. | Minimal recognition of rights to organize | Acceptance, recognition, fairness, independence | Provides information on respect of dignity of hierarchy |
| 8. | Nested Enterprises | Acceptance, recognition, fairness, independence | Scale of governance conducive to feedback, dignified action on feedback |

Dignity and the Authority to Govern: Vincent Ostrom's work on the formation and evolution of democracy added important perspectives to Elinor Ostrom's insights into effective governance arrangements. In his study of *The Federalist Papers* (Hamilton, Madison, Jay, & Shapiro, 2009), Vincent Ostrom recognized that consent to governance arrangements was a central element of a functioning democracy (V. Ostrom, 2014). While democracy as a whole does not necessarily require widespread consensus on most issues, the very existence of democracy rests on a near consensus to consent to be governed by the democracy itself. The Ostroms recognized that public participation processes required a similar consensus, a shared consent to participate and abide by decisions made by the collective process. (E. Ostrom & V. Ostrom, 2004, and V. Ostrom, 2014.)

Democracy requires continued consent of the people. For most Americans who live in large municipalities, governance structures are stable, fixed and formalized. Those who work in government are professionals, and the by-laws and practices for public input are well-established. Conflict and crises may arise, but they rarely disturb the very structure of the governance arrangements. A single citizen's vote is one among many thousands or millions cast in private booths. Equity is assured through standardization, and while interpersonal dignity may be underserved, processes are carefully constructed and maintained to ensure dignity.

By contrast, governing a small municipality is more akin to the conditions faced by those who formed our democracy. A single vote in a town of a few hundred people is more likely cast with a raised hand in an open town meeting. As the example of the East Machias, Maine, shoreland zoning map illustrates, governance at this scale is more agile, personal and adaptable. But there are risks to such an arrangement. When arrangements can be changed so readily, consent to govern must be reconstituted with each change to ensure participants will adhere to the decisions made under the arrangements. Most of those working in small, municipal

governments are non-professionals or quasi-professionals, meaning they may be less able to manage challenges to governance when they arise. In the rural communities of Downeast Maine, for instance, I have observed that it is common for a decision made by a small municipality to be challenged in court because an *ad hoc*, practical solution to a problem runs afoul of state or federal law. So, the form of democracy practiced in small municipalities may better support interpersonal dignity, but it may lack the capacity to support process-related elements of dignity. And when indignities do occur, small municipalities may lack the skills and structures required to address them. The approach used to address the conflict over East Machias's shoreland zoning maps was suggested by a professional planner with the county council of governments, illustrating the important role such organizations can play in capacity building in small communities. Expertise in leadership and strategic planning is an oft-overlooked but invaluable resource for a small community.

Another of Ostrom's elements of effective governance arrangements is relevant to consent to governance in rural communities. External government authorities must recognize the rights of the entity to organize and direct allocation of resources. When state agencies undermine or question legitimate local decisions without accounting for their reasons—or when they *seem* to undermine or question local decisions arbitrarily, they pose a challenge to effective governance. Such was the case with the East Machias shoreland zoning ordinance. For the ordinance to be effective, the state must be seen to recognize and support the right of the town to create its ordinance within the bounds defined by state law. When the state imposed an ordinance using faulty data, they appeared to undermine the town's right to self-governance.

Within the context of dignity, we can understand such undermining or questioning as an affront to the dignity of those involved in local governance. The process can be construed as undignified as it seems unfair, unaccountable, exclusionary, and undermines independence.

Local officials may experience injuries to their dignity if they are unrecognized, unacknowledged, misunderstood, and politically unsafe. Similarly, citizens may feel unrecognized, unacknowledged, and so on. The state-imposed, coarse-scale map seemed to East Machias residents and officials to arbitrarily impose restrictions on their land. Controversy was quelled and trust was restored when a dignified process was undertaken that restored the authority of local leaders and acknowledged and recognized the concerns of the residents. The process was accountable and fair, in addition to shrinking information feedback loops. This raises important questions about how to consistently structure governance hierarchies to support dignity locally.

Dignity and Social Capital: Flora & Flora define social capital as "the networks, norms of reciprocity and mutual trust that exist among and within groups and communities. It contributes to a sense of common identity and shared future" (Flora & Flora, 2013, p. 18). Strong social capital is typically regarded as a source of strength and resilience in rural communities, especially where government does not provide sufficient formal support (Flora & Flora, 2013). For example, in Maine it is common practice for a community to hold bean suppers to raise funds for a family in need due to hardships such as a house fire or serious illness. However, bonding social capital, formed among members within a tight-knit group, can present a barrier to change and growth if it prevents the formation of bridging or networking social capital, that forms between groups (Adger, 2003; Smith, Anderson, & Moore, 2012). Strong bonding social capital can lead members of the group to trust only the members of the group while distrusting outsiders who may be able to assist them in addressing complex challenges such as climate change or natural resource management.

As an example of the problems arising from strong bonding and weak networking capital in contested governance processes, I will draw an example from my prior research. I documented such distrust and lack of bridging capital between groups of New England

stakeholders involved in managing fisheries to minimize entangling collisions between whales and fishing gear in the Gulf of Maine (Johnson, 2005). In that case study, traction on the whale entanglement issue was finally gained when leaders in the various camps (fishermen, animal rights activists and state regulators) began a slow process of bridge building between the camps. In applying the advocacy coalition framework to studies of watershed partnerships, Sabatier (2005, 2007), noted a similar phenomenon of entrenchment of factions.

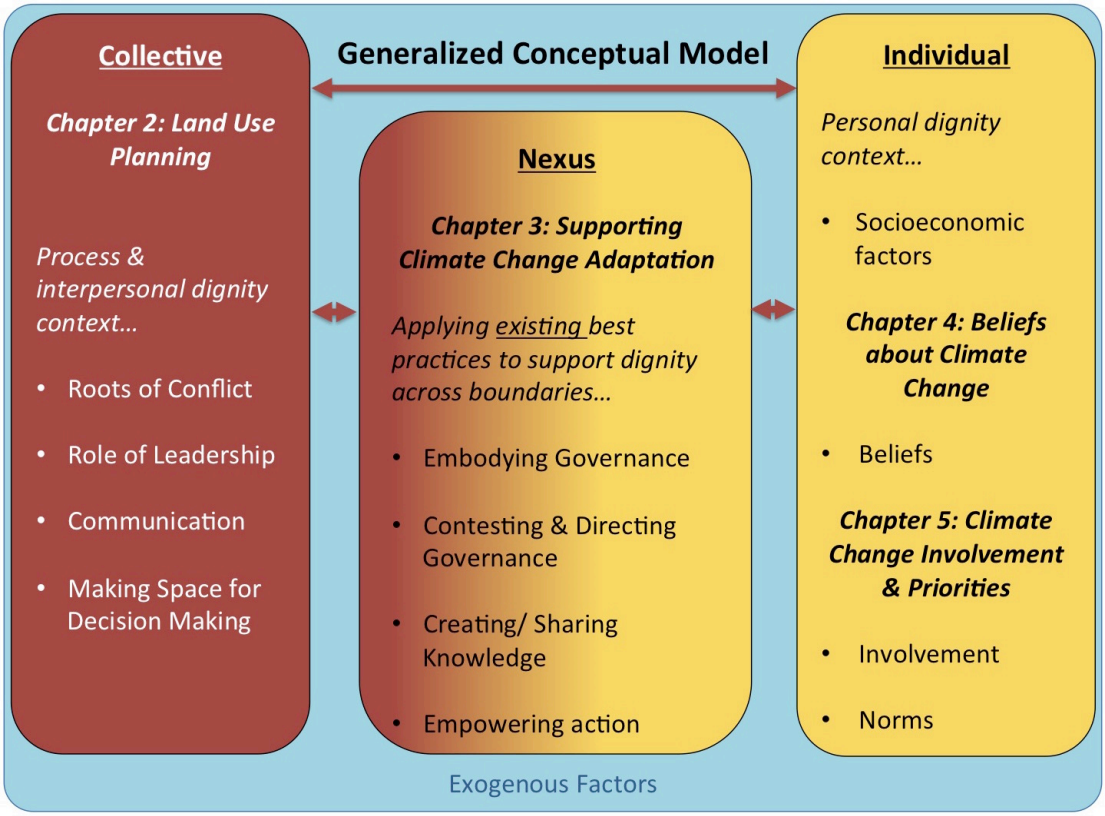
The dignity framework can help to explain this phenomenon of entrenchment within factions amidst contentious governance processes. The entrenchment of opposing sides is often characterized by a "devil-shift," an emerging tendency for each side to view the other as "less trustworthy, more evil, and more powerful than they probably are" (Sabatier, 2005, p. 192). In my studies of the whale entanglement conflict and other contentious issues, I have noted the same phenomenon in which members of each faction conclude that their opponents must be evil, unbalanced, or foolish, and endowed with an unfair advantage (Johnson, 2005). Such characterizations are common in polarized presidential politics in America today.

Sabatier and his colleagues believe the devil-shift arises because participants value past defeats more than victories. That may be, but we may gain a deeper understanding of the extreme rancor inherent in the devil-shift if we also examine it as a response to undignified interactions or an undignified process, past or present, and consequent lack of trust.

**A Conceptual Model for Dignity in Rural Governance**

Building upon the conceptual framework for dignity in natural resource governance (Figure 1.3), each of the studies presented in this dissertation explores one sphere of natural resource governance, examining how dignity is constructed, supported, or influenced by personal, interpersonal, and exogenous factors.

Figure 1.3. Dissertation chapters in the dignity conceptual model




Chapter 2 focuses on the collective sphere, examining the discourse related to an instance of devil-shift in a conflict over a municipal comprehensive plan in the Town of Hampden, Maine. This case study is based on the assumption that discourse—the exchange and framing of ideas, information, and processes—is a means by which groups of people together create the dignity context in the collective sphere. Analyzing the discourse presented in minutes of related municipal meetings and hearings, as well as newspaper coverage of the conflict over the proposed comprehensive plan, the research objective was to determine how the discourse contributed to the dignity context perceived by those involved.

Chapter 3 is a literature review and case study examining the nexus between the individual and the collective spheres in the context of climate change adaptation in rural communities. Rural communities, while disproportionately vulnerable to the effects of climate change, have been slow to adapt, even as the impacts of global warming have become apparent in recent years. Literature related to community resilience, communication about climate change, and the particular challenges faced by rural communities provides an array of best practices that may inspire and support locally-initiated adaptation activities in rural communities. These best practices include the items listed in Table 1.4, which shows their relationship with Hicks' (2011) dignity framework.

Table 1.4. Best practices for rural climate change adaptation and their relationship to dignity.

| **Best Practices for Rural Climate Change Adaptation Efforts** | **Elements of Dignity (Hicks, 2011)** | **Citations** |
|---|---|---|
| An approach to climate adaptation that embraces self-directed change | Acceptance, acknowledgement, recognition, independence | (Scott, 2013; Folke et al., 2010) |
| Framing information about climate change in ways that relate to local priorities and vulnerabilities | Inclusion, acknowledgement, recognition, independence | (Dupuis & Knoepfel, 2013; Wilbanks & Kates, 2010; Nisbet & Mooney, 2007; Cash, 2006; Wilbanks, 2003) |
| Information, resources, and outcomes at scales that are locally discernible and actionable | Recognition, understanding, accountability | (Cash et al., 2006; Dietz, Ostrom, & Stern, 2003; T. J. Wilbanks & Kates, 2010) |
| Building both bridging and bonding social capital | Inclusion, understanding, benefit of the doubt | (Adger, 2003) |
| Co-production of knowledge via iterative learning loops | Acceptance, acknowledgement, recognition, independence | (Pahl-Wostl, 2009; Cash, 2006; Cash et al., 2003) |

Dignity can serve as an underlying framework to knit together each of the best practices. A unifying, guiding principle among them is to recognize, acknowledge, and understand the perspectives and priorities of those involved in the issue at hand. These are interpersonal elements of dignity. Also, effective approaches engage stakeholders in a self-directed process with an inclusive frame, touching on the process elements of dignity of inclusion and independence.

In the case study in Chapter 3, these best practices were applied in a climate vulnerability assessment (CVA) project in rural Washington County, Maine. Focusing on localized priorities and vulnerabilities, the project incorporated methods to promote information feedback loops through a series of public discussions about climate-related concerns for the region with mechanisms for incorporating feedback into the project and to ensure participants could identify their contributions. A centerpiece of the project was downscaling coarse-scale National Weather Service storm surge inundation predictions to create high-resolution maps of storm surge scenarios for the coastal portions of the study area. The final product of the CVA project was a report and web-based, interactive maps incorporating feedback and framing to reflect the priorities and needs of local, rural communities.

Because research shows that prescriptive approaches to promoting climate change adaptation are likely to be less effective than approaches that incorporate the concerns and priorities of rural actors, it is imperative that we understand what those concerns and priorities are. Chapters 4 and 5 examine the individual sphere in an effort to complete a picture of concerns and priorities, also in the context of climate change adaptation. Through a survey, both chapters elucidate the role of individual beliefs, norms and priorities and how they are affected by exogenous factors such as socioeconomic realities, political context, or identity.

Such a detailed account of personal beliefs, interests and concerns is critical to supporting all of the elements of dignity. This includes interpersonal elements: acceptance of identity, as well as recognizing, acknowledging and understanding individual context. With the interpersonal groundwork laid, dignified processes can be developed that are inclusive, fair and accountable to participants and promote their independence in making decisions.

Chapter 4 focuses specifically on beliefs about climate change and how they differ among different groups of rural actors. It is well known that conservatives are more inclined than non-conservatives to doubt the reality of climate change (Pew Research Center, 2014a; Leiserowitz, Maibach, Roser-Renouf, Feinberg, & Rosenthal, 2014; Borick & Rabe, 2010), and rural areas tend to be more conservative. Beliefs about climate change strongly influence whether a community undertakes steps to adapt to climate change (Moser & Ekstrom, 2010). Using a survey of those involved in municipal governance in rural Washington County, Maine, the aim of the study was to produce a detailed understanding of climate change beliefs.

Chapter 5 further examines the survey data to determine specifically which issues were most salient, and which respondents were most likely to act upon. The Theory of Planned Behavior (TPB) is a theoretical and methodological framework for understanding when and how an individual might form an intention and engage in a behavior (Ajzen, 2001, 2002; Fishbein & Ajzen, 2010). TPB is centered on behavioral, normative, and control beliefs. However, TPB has been criticized because it does not substantively address the question of whether the prospective behavior is relevant or interesting, a phenomenon called involvement. The survey of people who participate in Washington County municipal governance asked respondents not only about their involvement in climate change, but also about their involvement in other issues impacting their region to elucidate their priorities. The survey also explored respondents' past

and planned behavior, as well as their sense of self- and community efficacy, their beliefs about their own and their community's ability to accomplish its goals and meet its needs.

The studies presented here aimed to explain why rural environmental governance, especially related to climate change, has failed to engender a strong movement toward adaptation and resilience. However, these studies also provide important insights into building dignified governance processes that facilitate rural communities in becoming more resilient. The conclusion in Chapter 6 offers a discussion integrating the results of the four studies with the dignity framework, offers a summary of prior research on dignity, and concludes with a vision for future research on dignity in natural resources governance.

## CHAPTER 2: DIGNITY THEORY AND DISCOURSE: MAPPING A NEW PATH TO TRACTABILITY IN MUNICIPAL GOVERNANCE

### Introduction

Dignity is something rarely discussed in the context of environmental governance, though it is an element of all human interactions. Dignity is a sense of oneself and of others as having inherent value (Hicks, 2011). It may be created and supported or damaged and undermined by interpersonal interactions, by the makeup of one's environment, or by one's personal psychology (Jacelon et al. 2004). Hicks (2011) asserts that effective decision-making and collaboration can only occur in a dignified context. An undignified context can breed and perpetuate entrenchment and intractability.

Efforts to implement zoning in small and rural U.S. communities often can be derailed by strong opposition. Communities with a large proportion of conservative voters are less likely to adopt zoning ordinances (Locke & Rissman, 2015). Landowners who are deeply concerned about property rights often oppose efforts to implement zoning, commonly expressing distrust in municipal officials and planning processes, and portray zoning ordinances as stripping them of their property rights (Yardley, 2006). Most of these vehement opponents of zoning are themselves opposed to unplanned growth and its inevitable consequences, but they see land use regulation as the larger threat (Peterson and Liu, 2008). This lack of trust and vehement guarding of landowner interests (e.g. Lamb, 2012) suggests that dignity may be an underlying factor in explaining why it is often so difficult for a small community to develop and adopt a zoning ordinance. Even more important, understanding the role of dignity in conflicts over land use may point to ways in which planners and others involved can foster a less conflicted and more efficient planning process.

In the context of governance, discourse—the ways in which people speak or write about and frame ideas, proposals, processes, and each other—is the action of creating the environment in which decision-making takes place. Such discourse is manifested in multiple spheres: in public and closed meetings, in informal conversations, in the press, and more. This is a collective sphere where a dignified (or undignified) context may be created, and it is inextricably tied to consent to governance arrangements. A stakeholder who believes that her dignity is threatened by an undignified context or undignified interactions may be inclined to behave in ways that contribute to an undignified context. Such behaviors—including angry outbursts, disengagement, *ad hominem* attacks, challenges to governance arrangements, and so on—may themselves be perceived by others as undignified, adding to the undignified context (Hicks, 2011). We suggest that in rural communities such dignity feedback mechanisms play an important role in conflicted environmental governance, contributing to a context that is perceived as undignified and to the tendency toward the polarization and entrenchment that Sabatier calls "devil-shift" (2005).

The overall goal of this study is to characterize the discursive context in which indignities might arise in contested land use decision making in order to develop guiding principles and recommendations related to dignity considerations for those leading or communicating about contested land use decisions. Toward that goal, the study addresses the following research objectives:

A) To describe the discursive elements used by public officials, stakeholders, and observers in constructing or deconstructing a dignified context in a contested land use governance process.

B) To describe the discursive frames used in press coverage of contested land use governance in terms of their contribution to constructing or deconstructing a dignified context.

To address our research objectives, we look specifically at textual evidence in a case study from two spheres—public municipal meetings and newspaper reporting—to understand how the dignity context is constructed via discursive feedback mechanisms. This study is centered on a constructivist assumption that discourse is the collective act of creating the dignity context. That is to say that the dignity of the context is an ever-changing social construction profoundly affected by the perceptions, beliefs, fears and experiences of the participants (Hicks, 2011; Jacelon et al. 2004). Because dignity is inherently subjective, understanding how stakeholders subjectively interpret discourse is critical to understanding how the dignity context is constructed (Cresswell and Miller, 2000). This understanding, in turn, can point to practices and principles for fostering a dignified context and preventing intractability.

## Literature Review

Synthesizing a large body of work, Carvalho (2008) articulated a framework for critical discourse analysis, and we apply parts of that framework here to understand how a dignified milieu can be constructed or dismantled through discourse. Critical discourse analysis stresses the importance of power differentials among actors in shaping the way they interact, and the ways in which they seek to influence the discourse. From this perspective, we can understand conflict as a struggle among stakeholders for the power to define problems, goals and solutions in ways that retain or regain dignity for themselves.

Framing, by Carvalho's definition, "is to organize discourse according to a certain point of view or perspective" (Carvalho, 2008, p. 169). It is an active, discursive strategy all participants employ when they communicate about and within governance processes, so it is a primary discursive element in the struggle to define problems, goals and solutions amidst conflict.

When multiple stakeholder groups frame an issue in ways that consider only their own concerns, the issue tends to remain conflicted as it devolves into a discourse about which conflicting frame should be paramount. So, a strategy used by facilitators to gain broad buy-in and traction is to help stakeholder groups to collectively reframe the issue with a broader, more inclusive perspective (Straus, 2002). Therefore, frame analysis can be an effective way to understand how discourse relates to tractability.

Moreover, frames are a primary mechanism used in constructing or deconstructing dignity. Hicks (2011) articulated "ten essential elements of dignity" (p. 25), interpersonal attitudes and actions that signal a dignified environment: acceptance of identity, inclusion, acknowledgement, independence, recognition, fairness, understanding, accountability, benefit of the doubt, and safety. These elements may also be keyed to Senecah's Trinity of Voice (2011), a framework for evaluating participatory arrangements. Access, in Senecah's framework, serves the dignity element of inclusion. Standing addresses multiple dignity elements, including recognition, understanding, and acknowledgement. Influence refers to the ways in which the process must be fair and accountable to the participant.

Each of these elements is, in essence, a frame that supports dignity. For example, sending someone a personal invitation to speak at a meeting is an act of inclusion, signaling a desire to understand that person's concerns or perspectives. The elements of dignity are also reference points that might be mentioned in narratives about the dignity of the environment.

Using Hicks' elements of dignity as a reference, it may be possible to characterize the dignity context around an issue through discourse analysis.

The press has a powerful role to play in the process by both facilitating and shaping discourse because reporters and editors choose what to report and how to frame their reporting. According to Carvalho, "An emotionally charged discourse, with an appeal to readers' emotions, for instance, is often found in the press, and can have an important rhetorical role" (2008, p. 169). The drama of a polarized decision-making process and public challenges to governance often appeal to reporters as engaging stories (Hansen & Cox, 2015). Framing stories around polarized conflicts and protest actions not only draws attention to conflict in the public eye (Lester, 2010), focusing primarily on such stories has the effect of rendering invisible events and governance processes that are tractable because they are not reported (Hutchins, 2006; Hutchins & Lester, 2015; Lester & Hutchins, 2012).

Not only does the press wield a special power in choosing what is visible, they may also have a tacit agreement with protesters to make their frames and concerns visible in exchange for newsworthy, dramatic stories. Challengers to governance arrangements themselves are therefore encouraged to create a dramatic story for the press, which may encourage devil-shift (Hutchins & Lester, 2015; Lester & Hutchins, 2012).

We suggest that press coverage focusing on polarized and stalled governance processes, devil-shift, and power struggles frames governance processes as undignified, which reinforces the perception of an undignified milieu among members of their audience.

While those who challenge governance arrangements may be compelled to use exclusionary frames and to portray the discourse as deeply polarized, pressure on government officials may be normative. Town staff and elected officials may seek to frame the governance process as inclusive and measured, and the consent to governance as assumed. Such discourse

may be explicit (e.g. statements made in meetings and hearings), performative (e.g. a town council arrayed on a raised dais, carefully following Robert's Rules), or implicit (e.g. privileging certain land uses over others using tax incentives or different permitting requirements). We suggest that town officials, even with their normative tendencies and intentions to be inclusive, may be ill-equipped with skills to facilitate and lead a process of reframing, especially once a governance process has been widely characterized as undignified. If so, they could greatly benefit from tools that help them to reframe their own discourse to create a dignified context.

## Case Study

In the spring of 2011, the Town of Hampden, Maine, was in the last stages of completing and approving a new comprehensive plan designed to guide zoning, management of municipal lands, economic development efforts, conservation, and other town functions for the next dozen years. Three public hearings on the plan saw a total attendance of two citizens. In the minutes from these hearings, public officials were said to have lamented the lack of interest and involvement among Hampden citizens. Soon after the last of these public hearings 250 angry residents unexpectedly turned out for a Town Council meeting to protest the plan. Thus began a protracted conflict over the comprehensive plan that would stall progress on the plan and virtually all other town business for nearly a year.

For a time, Hampden became the center of attention for the resurgent landowner rights movement, drawing attention throughout the state and the nation, as the town was unable to implement a comprehensive plan as required under state law. The battle over Hampden's comprehensive plan was covered in state and national news, as Town Council meetings devolved for a time into raucous events with extended public comments that included

conspiracy allegations. Police were called in to maintain order for an especially contentious closed meeting (Gagnon, 2011).

The Town's planning and development committee established a special citizen's committee tasked with resolving the impasse, which undertook several months of intensive work to settle the debate and approve a comprehensive plan in December 2011. For an outline of the events surrounding the Hampden comprehensive plan, see Appendix A.

In this study, we draw on two sources of textual evidence—media reports and meeting minutes—to understand how the dignity context was constructed and reconstructed in the discourse about the Hampden comprehensive plan.

## Methods

Using news articles published about the conflict in Hampden and minutes from public meetings, we compiled data about the ways in which residents and town officials engaged with and described the process, and the ways in which the events and discussions were described to others via the newspaper and in public municipal documents. The data derived from this work allowed me to look at the issue from two different perspectives, 1) the evolution of the conflict and structural and interpersonal elements that affect dignity, and 2) the portrayal in the media of the debate over the comprehensive plan related to dignity.

Town documents were collected from the Town of Hampden website. These included all available minutes for meetings where the comprehensive plan was discussed between December 2010 and November 2011. Minutes included town council meetings (12 meetings between December 2010 and November 2011), comprehensive plan informational meetings (five between April 2010 and March 2011), strategic planning workshop (one in February 2011), and planning and development committee meetings (five between January 2010 and May

2011). Additional documents provided information about the proposed comprehensive plan and the participants in the process but were not included in the discourse analysis. These included drafts of the comprehensive plan as proposed and eventually approved, a list of "comprehensive plan considerations" posted on the website in April 2011, and a list of members of the Citizen's Comprehensive Plan Committee established in April 2011 by the Town Council in response to the concerns expressed by citizens.

News articles were compiled from a targeted search of the ProQuest Newsstand database for articles in the *Bangor Daily News* (BDN), a regional newspaper with a postal circulation of 45,000 to 49,000 at the time of the study period (Diamon, 2012). BDN serves as the primary daily newspaper for the Bangor area and the largely rural areas of northern, eastern and central Maine. Contemporary web traffic figures are unavailable for the study period, but in 2013, the website was estimated to have about 450,000 unique visitors per month (Diamon, 2013). Articles for this study were compiled from the ProQuest Newsstand database by searching the terms "Hampden" and "comprehensive plan." The search was limited to newspaper articles and editorials in the *Bangor Daily News* in 2010, 2011, and 2012 through April. This initial search yielded 37 items. Articles that were irrelevant to the comprehensive plan debate were culled from this list, leaving 29 items. Since elections for town officials were also affected by the conflict over the comprehensive plan, an additional search was conducted using the terms "Hampden" and "election" for *Bangor Daily News* articles and editorials for the same time period, resulting in 31 items, of which four covered town elections and discussed people or events associated with the comprehensive planning debate. These were added to the data set for a total of 32 articles and one editorial related to the Hampden comprehensive plan debate from BDN during the study period. Several letters to the editor related to the

comprehensive plan appeared in the BDN during the study period, but these were beyond the scope of this study that examined and compared only meeting minutes and news articles.

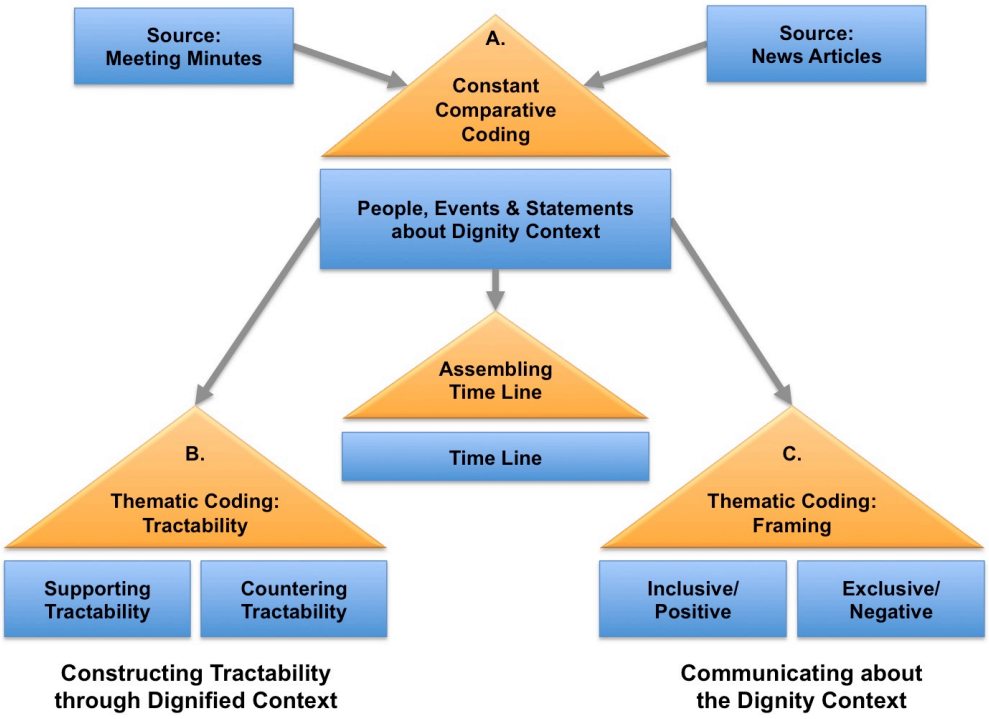
A key practice in critical discourse analysis is to begin analysis with open-ended reading and re-reading of texts with broad questions in mind related to power differentials, discursive strategies, etc. (Carvalho, 2008). The initial stage of analysis employed a method inspired by Glaserian grounded theory using constant comparative coding (Grbich, 2007) for themes emerging from careful and repeated readings to iteratively compile a thorough list of elements that may have played a role in constructing a dignity context (Figure 2.1A). The initial phase of coding also involved noting people and events. This aided in constructing a timeline of critical incidents or "moments" (Carvalho, 2008) and participants in the comprehensive plan issue (Appendix A).

Once the initial set of themes was established through constant comparison, the second stage of analysis used thematic coding to place interpersonal statements, actions and narratives within the discursive framework. This allowed characterization of the discourse as it contributed to the dignity context. First, interpersonal statements, actions and narratives were coded for their relationship to tractability (Figure 2.1B). For example, *ad hominem* attacks and statements emphasizing opposition and polarization were coded as detracting from tractability and promoting an undignified context. Making or offering concessions, statements seeking balance, and giving praise were coded as contributing to a dignified, tractable milieu.

To examine the discursive strategy of framing, reported statements indicating problem definition, goal definition, and proposed solutions were coded by their perspective and frame (Figure 2.1C). Statements attributed to participants that defined problems, goals or solutions in a way that excluded the interests of other stakeholders were coded as having an exclusive frame. Statements were coded as inclusive if problems, goals, or solutions were defined in a way

that included the interests of other stakeholders. Reported interpersonal statements and narratives were coded as having a negative frame if they described the discourse as conflicted or contributed to conflict or polarization (e.g. emphasizing opposition and polarization, threats, and *ad hominem* attacks). By contrast, interpersonal statements and narratives were coded as having a positive frame if they focused on efforts to resolve conflict or contributed to resolving conflict (e.g. seeking balance, making concessions, and giving praise).

Figure 2.1. Schematic diagram of the coding process.




In comparing the accounts presented in press reports and meeting minutes, the exclusive and negative items were aggregated into a single category, exclusive/negative, and the inclusive and positive items were aggregated into a single category, inclusive/positive. The purpose of comparing the meeting minutes and news articles was not to triangulate an objectively truthful account of the debate. Instead it was to understand differences in the ways

in which each of the sources made meaning of the event, determined what should visible, and how they communicated about the conflict over the comprehensive plan.

A test for Inter-rater reliability for first level thematic coding (Figure 2.1B) was conducted with a random selection of sources (7 meeting minutes and 10 articles) with two advanced undergraduate social science students. Bivariate correlation between raters' code counts per source were highly significant (R = 0.534 to 0.818, $p < 0.01$), and comparison of a binary variable (presence/ absence for each theme) showed 79% agreement. Intra-rater reliability tests on the same subsample for second level thematic coding (Figure 2.1C) showed 91% agreement. Validity of the coding was also assessed through identification of disconfirming evidence, careful researcher reflection throughout the coding and analysis process, and comparisons between the two sources of textual evidence.

## Results

Research Objective A) To describe the discursive elements used by public officials, stakeholders, and observers in constructing or deconstructing a dignified context in a contested land use governance process.

There was significant evidence in the minutes and press reports that during the time of most intense conflict over Hampden's comprehensive plan, perceived threats to dignity contributed to a cycle of discourse that reinforced the polarized context. The comprehensive plan process broke down, and for a time, most Town business came to a halt. Those opposing the comprehensive plan mounted challenges to the plan and its authors on the Town Council and the Planning and Development Committee. The Town was unable to move forward with work on several major initiatives while the issue simmered.

Opponents to the plan founded a non-profit group called Hampden Association of Land Owners (HALO) in the spring of 2011. HALO began to make a series of *ad hominem* accusations in which representatives of HALO accused three members of the town government of conspiring with environmental groups and a group from California to undermine landowner rights. This conspiracy allegation was centered on Penobscot Valley Greenprint (PVG), a regional land use planning and conservation initiative led by the non-profit environmental group Trust for Public Land and involving 12 communities in the Penobscot River Valley, including Hampden. The PVG project was aimed at identifying priority areas for growth and land conservation. The PVG process culminated in a final report in 2009 listing recommended actions for the participating towns. The report lists four Hampden officials as participants in the process ("Penobscot Valley Community Greenprint," n.d.). The comprehensive plan, HALO charged, was aimed at "forcing your Greenprint agenda on the citizens to the point of throwing out all ethics" (Town Council Minutes 5/16/2011).

Members of HALO put forward multiple candidates in Town Council elections in an attempt to oust Town Council members who supported the comprehensive plan, and they challenged the Town Council on procedural issues with the elections.

In one case, a member of the state legislature addressed the Town Council in a 25-minute speech, reported in both the minutes and the newspaper. The Town Council had decided to reject applications from volunteer poll workers that had been submitted after the published deadline. The minutes do not quote the speaker, giving only a summary. However, the newspaper included these quotes from the legislator's comments:

> *"I've never heard of a municipality, never heard of a municipal officer, turning down a list of volunteers to participate in the election process" […] "This is unbelievable, the fact there is even any debate or dissension as to accepting volunteers to help with a*

*democratic election process." […] "I am ashamed I even have to deal with this. It's time to buck up, put on your big boy pants, and do the council business -- business without regard to your personal feelings."*

- Neff, A. (2012, Apr 27). "Spat erupts at Hampden council meeting despite unanimous vote." *Bangor Daily News.*

One HALO candidate succeeded in unseating the incumbent. For the other races, members of HALO presented evidence of irregularities to state election officials, forcing a recount that did not change the outcomes of any races.

Notably, during the spring of 2011 when discussions in Town Council meetings were most heated, very few of the comments by plan opponents, as reported in both minutes and articles, involved specific concerns with the content of the comprehensive plan. Instead, they focused primarily on the lack of public engagement and the motives, past actions, and trustworthiness of the council members and town staff. In other words, they were centered on concerns and fears related to dignity and trust. Opponents to the plan believed it would prevent all development and timber harvesting on their land, while members of the Town Council and the Planning and Development Board insisted that the plan would not prevent such activities.

The opponents to the comprehensive plan mounted a significant challenge to the town's governance arrangements. In several instances, the minutes note proposals to repeal the plan and all zoning, and some citizens believed they could simply attend at a town council meeting and vote to repeal enacted plans and zoning, which was untrue. HALO's attorney combed the town by-laws and discovered a procedural oversight that rendered the 2010 comprehensive plan invalid. This was confirmed by the town's attorney, effectively repealing the new comprehensive plan and reinstating the prior plan enacted in 2001. The town was now at risk of

running afoul of state law if they failed to enact a new plan within the year. HALO members followed by unsuccessfully challenging the previous comprehensive plan enacted in 2001. Opponents to the plan consistently framed the comprehensive plan as a power play to usurp their rights as landowners, but some insisted that they were not entirely opposed to zoning.

When the Town Council approved the formation of a citizen's comprehensive planning committee, many HALO members applied to serve on the committee. Some erstwhile opponents to the plan later reported that they regarded the committee's work as legitimate and important. Two main elements contributed to creating a context of greater dignity, allowing the eventual completion of the plan, according to both press reports and minutes. First, the governor had removed some state requirements, allowing the town to relax some of the more stringent conservation rules under the proposed plan. More notably, the committee was able to agree on clearer language so the plan would not be misinterpreted as a land grab or an infringement of landowner rights.

The plan that was finally approved by the committee and later adopted by the town had just two substantive differences from the original version. Traction was gained by the creation of a dignified context within the citizen's comprehensive plan committee in which they could reframe the issue and create a more dignified context.

The minutes of the citizen's comprehensive plan committee were not publicly available, and the Bangor Daily News did not report on the process. It was clear from their reports to the Town Council that the citizen's committee, with the help of the facilitator, was able to find traction and move the process forward. This progress is evident in a spate of inclusive and positive comments in the minutes of meetings when the Town Council was asked to consider extending the deadline for the committee to complete its work. Note that these comments are from people who had originally occupied both sides of the debate. Here are two entries in the

minutes of the Town Council meeting, April 19, 2011, regarding comments from residents who had earlier engaged in less productive forms of discourse:

> "Mr. XXXX is pleased with the progress of the committee and appreciates working with members who were on the original comp plan committee. He believes that the work is helping to heal the community. He has not missed a meeting and supports the request for a time extension."
>
> *"Mrs. YYYY indicated that she enjoyed the diverse group of people who made up the committee and considered that the correct wording of the plan was as critical as its components and that the Council would be doing the community a disservice if it disregarded the Committee request for a time extension."*

Note the tenor and word choices in these quotes indicate a dignified context within the citizen's committee was supported. Both Mr. XXXX and Mrs. YYYY recognized and appreciated the contributions of the other members group. They felt their own contributions were worthwhile and leading the community toward reconciliation.

On the other hand, in this item from the minutes, an early advocate for the comprehensive plan speaks of his discontent with the process to argue against extending the deadline:

> *"Mr. ZZZZ indicated that he was frustrated with the process. He was part of the original Comprehensive Plan Committee that spent many hours creating and reviewing the plan – and that it was not possible at that time to get people to participate in the process. He felt that this was a duplication of effort that might come out differently – and then have*

*another group of people want to overturn that. He indicated that he had resigned from the Conservation Commission because he felt that he was just wasting his time."*

This was the only public comment opposing the extension, and Mr. ZZZZ's argument rested on his flagging hope for an inclusive and robust process. He felt that his investments in the process were unrecognized and unacknowledged, both related to dignity.

The Town Council did not effectively engage the town's residents earlier in the process, and they admitted this multiple times in public meetings in response to complaints from citizens. After the town's Planning and Development Committee spent more than two years developing the plan with limited public involvement, the Town Council held three public hearings in the spring and summer of 2010 prior to implementing the plan. No one attended one of the meetings, and only one person attended each of the other two. The minutes of these meetings imply that the councilors ascribe poor attendance to apathy among the town's residents. However, when over 250 angry residents attended a March 2011 Town Council meeting most said they had been unaware of the comprehensive planning process. This lack of effective outreach and engagement in the years-long planning process, though it was probably unintentional, contributed to the perception among plan opponents that the process was exclusionary. They felt that their interests and needs were not understood or recognized, and therefore they perceived the process as unfair. Thus the process had violated several of the elements of dignity: inclusion, understanding, recognition and fairness.

Then, once angry citizens entered the process, leaders on both sides consistently failed to frame the issue in ways that would help to gain traction. Moreover, they allowed meetings to be dominated by unruly attendees leveling *ad hominem* attacks, undermining dignity and

precluding traction. This sudden polarization of the issue suggests a classic example of devil-shift, particularly among the opponents to the plan.

In spite of well-intentioned efforts by several of the active participants, re-framing of the issue and facilitation didn't happen in Town Council meetings. The decision to create the special citizen's committee was ultimately effective in creating a venue in which the process could foster trust and dignity in order to move forward.

Research Objective B) To describe the discursive frames used in press coverage of contested land use governance in terms of their contribution to constructing or deconstructing a dignified context.

The press and the town's meeting minutes document and make sense of the process and conflict in different ways, and each may help or hinder traction in the issue in its own way. News articles are necessarily more brief and selective than minutes, but they spend a great deal of text on characterizing and describing the conflict, which is a synthetic process. Meetings were, at times, raucous and dramatic, so this may have spurred the writers to shape the narratives to catch the reader's eye.

Meeting minutes, on the other hand, are meant to be complete and non-synthetic. They are meant to be a sort of textual video camera, stationary, recording facts and not interpreting anything for the reader. Indeed, the minutes published for the Hampden meetings are remarkably neutral and dispassionate by comparison to the news reports, while still apparently capturing the essence of phenomena such as anger, conflict and accusation.

News reports tended to report negative or exclusionary references three times more often than they reported positive or inclusive references (Table 2.1). In the meeting minutes positive/inclusive and negative/exclusive references were reported at approximately the same rate. Indeed, news reports commonly refer to conflict and divisive discourse in their titles or

opening sentences, such as this one which ran just after the meeting where 250 angry residents vented their frustration:

"They kept walking through the doors of the town office, dozens of them, and they were angry. Angry with town councilors; angry with municipal staff; some were downright rude. They wanted answers." The article goes on to state, "The only action that came out of Tuesday's meeting was a vote by town councilors that they would not implement any recommendations of the comprehensive plan until some of the concerns are addressed." (Russell, E. 2011, Mar 02. "Planning discussion gets ugly in Hampden: Residents say plan infringes on their rights. *Bangor Daily News*, pp. 1.)

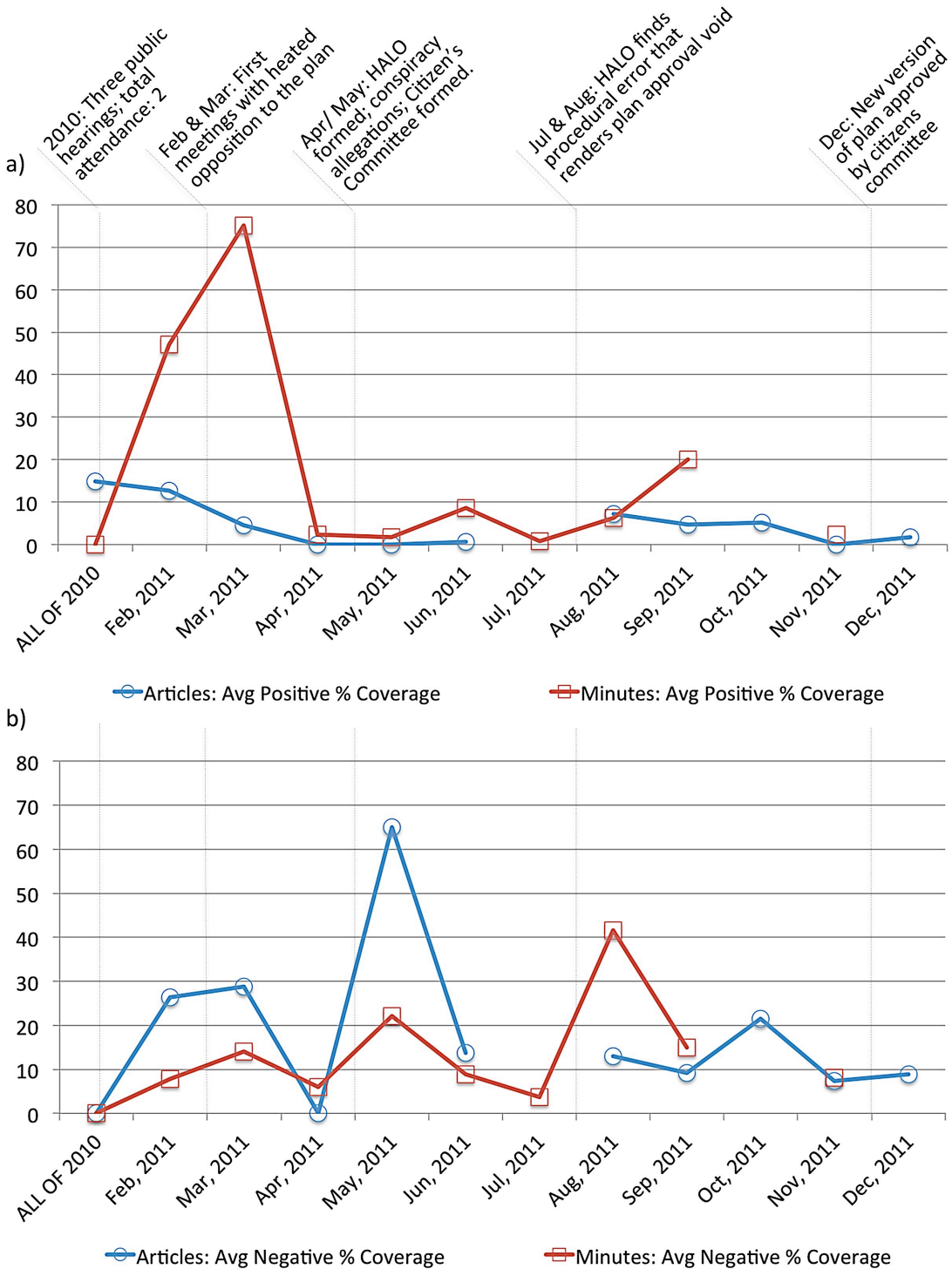
Table 2.1. Negative and exclusionary references versus positive and inclusive references per source.

| **Comparing News Reporting with Minutes of Meetings** | **Sources** | **Total Sources** | **References** | **Avg Refs Per Source** |
|---|---|---|---|---|
| Negative & Exclusionary in Articles | 25 | 33 | 90 | 2.7 |
| Negative & Exclusionary in Minutes | 11 | 23 | 44 | 1.9 |
| Positive & Inclusive in Articles | 13 | 33 | 26 | 0.8 |
| Positive & Inclusive in Minutes | 11 | 23 | 41 | 1.8 |

On the contrary, there were several motions made and voted upon in response to the residents' concerns, including this one: "Motion by Councilor XXXX, seconded by Councilor YYYY to suspend implementation of the 2010 Comprehensive Plan until a new Comprehensive Plan committee can be formed from citizens of the community - unanimous vote in favor" (From minutes of special meeting of the Hampden Town Council was held on Tuesday, March 1, 2011).

The *Bangor Daily News* consistently reported on the Hampden comprehensive plan debate as the citizen's committee resolved the specific issues in the comprehensive plan. However, the more harmonious meetings appeared in brief articles on back pages with little coverage devoted to statements or interpersonal interactions (Figure 2.2.).

Figure 2.2. Positive/ inclusive (a) versus negative/ exclusionary (b) coverage over time.



By contrast, meeting minutes recorded when the debate over the comprehensive planning process first became heated included far more coverage of positive or inclusive items than negative or exclusionary items. This may have been due to a normative effort to show the council as seeking balance and inclusion.

## Discussion

The version of the comprehensive plan adopted by Hampden on December 1, 2011, after the citizen's committee process had only two substantive changes from the version that had been at the center of such conflict. This points to the overarching importance of a dignified process that fosters trust. The problem with the earlier version was apparently not in its content—indeed the content of the plan itself was rarely discussed. The problem was that the earlier planning process did not attend to key elements of dignity, particularly inclusion.

It was clear from the frames presented by opponents to the plan that they regarded the threat to their property rights to be greater than the threat of unregulated land use. Peterson and Liu (2008) found similar ordering of priorities among landowner rights activists in prior studies. However, once the citizen's committee gained traction, the comprehensive plan enjoyed broad (if not unanimous) buy-in among the erstwhile opponents. It may be that the more inclusive process in which their concerns could be acknowledged and understood--two of Hicks' (2011) elements of dignity, and in which they had standing and influence (Senecah, 2011), caused them to adjust their assessment of the risk to their property rights. However, further study would be required to determine if this was the case.

It would be easy to dismiss the hostile behavior and *ad hominem* attacks by the plan's opponents after the devil-shift (Sabatier, 2005) as unreasonable and cruel. However, Hicks

(2011) notes that when our dignity is threatened, we often react angrily, lashing out and injuring the dignity of others. From this perspective, we can understand their combative behavior as the understandable, albeit unhelpful, consequence of neglecting their dignity earlier in the planning process. Therefore, such conflict is usually (if not always) avoidable if we attend to considerations of dignity. When we fail to do so, according to Hicks, such problems may be solved with conscientious efforts at dignified reconciliation, though at greater cost.

Hampden's battle over their comprehensive plan also shows both the advantages and the perils of small units of government. Because of its small size and lack of resources, Hampden was vulnerable to challenges to the consent to govern. A professional planner on staff may have been more effective at engaging community members in the planning process, for instance, and may have averted the procedural error that invalidated the plan. While the members of HALO did not comprise a majority of the population or voters, they could mount a formidable challenge by dominating Town Council meetings. A professional facilitator (like the one used later with the citizen's committee) might have managed the meetings more effectively, bringing to bear training in leading groups to build more inclusive frames (Straus, 2002).

On the other hand, the citizen's committee was eventually successful at fostering dignity and traction. This points to the advantages of small units of government. Since a small municipal government has the agility to easily form *ad hoc* committees and quickly make procedural changes, it can adapt to new information, changing conditions and emerging challenges. Committees formed by any volunteers who step up may lack professional training and may not be representative, but they are easy to create and likely to involve people who care about the issue. If such *ad hoc* arrangements can be made without ultimately excluding or otherwise harming the dignity of others, it can offer a way through a morass of intractability. It appeared that the process may have been perilously close to this over-balance point, given the testimony

of the person who spoke against extending the deadline for the citizen's committee. His statement suggested that he felt his prior effort and contributions to the plan were unrecognized, constituting an injury to his dignity.

Once the debate erupted, members of the Town Council themselves recognized their oversight and admitted to it publicly. That and their willingness to establish the citizen's committee helped to reframe the debate as inclusive and accountable. However, the protracted battle over Hampden's comprehensive plan might have been averted or at least lessened if the Town Council and municipal staff had focused on addressing elements of dignity more thoroughly early in the process.

Clearly, the Bangor Daily News coverage was centered on the conflict, in at least one case reporting erroneously that no town business was accomplished at a Town Council meeting. As the debate waned and the citizen's committee gained traction late in the process, news coverage became more balanced but remained focused primarily on indignities. This corroborates the observations of Hutchins and Lester (Hutchins & Lester, 2015; Lester & Hutchins, 2012). By focusing more on the conflict and relating accounts of dignity violations such as *ad hominem* attacks, it is possible that the press coverage added to the intensity of the devil-shift and intractability. Also, it may be that the vehemence and rancor of the opponents to the plan were goaded by the presence of the press. However, additional study would be required to determine how residents' attitudes or actions were influenced by the press coverage.

## Conclusion

This study suggests that the dignity construct has potential as a framework for understanding conflict over land use planning and other contested environmental issues. This

study focused primarily on the social construction of the dignity milieu, but further research will be required to understand individuals' experience of dignity in this or similar debates. However, the results of this study can provide some guidance for those leading complex decision-making processes in municipal governance.

Inclusion was the most critical element of dignity in the case of the Hampden comprehensive plan. The conflict arose largely because the Planning Board and the Town Council proceeded with the plan under the assumption that few in Hampden wanted to be involved. The conflict may have been avoided or minimized if they had been more proactive in engaging citizens in the process, not only at the public hearings that took place in the spring of 2011, but throughout the planning process. Once inclusion is addressed and citizens are engaged, each stage of the process can be structured to recognize, understand and act upon the concerns and interests of a wide array of stakeholders, signaling a milieu in which dignity is supported.

The finding that the press focuses on conflict more than success is neither surprising nor groundbreaking. This study adds to evidence that conflict-centered journalism may contribute directly to public perceptions regarding the dignity of the context. Further study will be required to understand how such reporting affects individuals' attitudes and beliefs about an issue, but this study suggests that further study is warranted.

If reporting does indeed contribute substantially to the dignity context in contested issues, some important questions arise. Is it the responsibility of the press to consider dignity in their reporting? How else might they cover such issues while still appealing to their readership? We will leave the question of press responsibilities to others, but we will suggest that there are alternative ways to frame conflict in reporting. For example, there were many opportunities for the reporting on the Hampden comprehensive plan to frame the debate in a more complete

narrative arc that encompassed, along with indignities, movements toward traction, courageous efforts to work with foes, and effort expended on municipal governance. While it would require a few more column inches, it would contribute a broader truth to the discourse.

## CHAPTER 3: APPLICATION OF BEST PRACTICES TO SUPPORT LOCAL CLIMATE ADAPTATION PLANNING IN RURAL COMMUNITIES

### Introduction

In 2010, rural sociologist Joseph Molnar outlined the particular challenges facing rural communities in an age of global change. He observed, “the first line of resistance and participation will be the rural community" (Molnar, 2010 p. 13). Rural communities are more dependent than their urban counterparts on natural resources and typically have fewer resources to help them cope with change (Hales, D. et al., 2014). They can also be risk averse and reluctant to embrace change (Coles & Scott, 2009; Marshall, Gordon, & Ash, 2011). So, even as the effects of a changing climate become more apparent to rural people, their communities and resource-dependent industries have been slow to take action to adapt (Hales, D. et al., 2014).

Resilience, increasingly held as a central concept in rural studies (Scott, 2013), is the ultimate aim of climate change adaptation. However, the definition of resilience is different for every rural community, so it follows that the path to resilience will be different for each, as well. This points to crucial roles for planners and rural social scientists in developing methods for supporting localized adaptation actions, addressing structural barriers to adaptation, exchange of information and creation of local knowledge, and collective and local definition of resilience.

Several recent high-profile researchers have called for a renewed focus on adaptation to climate change (Pielke, 2007; T. Wilbanks, 2003; T. J. Wilbanks & Kates, 2010). Since developing nations are most vulnerable to the effects of climate change and least able to adapt, the authors argue that adaptation is a matter of environmental justice. We would posit that rural poor areas

of the US with resource-dependent economies and extremely small governmental units are also disproportionately vulnerable. The impacts of climate change are being felt now and will increase, the authors argue, but mitigation will take decades or more to have any effect. Waiting to adapt will only expose these already-vulnerable regions to greater peril. Each of the authors suggests that there are complicating factors that can exacerbate the impacts of climate change in certain regions. These include poverty, poor and aging infrastructure, resource-dependent industries already declining because of declining resources or depressed prices.

Wilbanks (2003) argues that local-scale research, planning and action will be both the most tractable politically, but also the most effective approach to adaptation. Moreover, adaptive activities with local, tangible effects can be linked to existing challenges and be adaptive in other ways, as well. For instance, a municipal authority can implement adaptive measures such as land use regulations to manage growth or they can implement improvements to wastewater systems to improve treatment. Both measures will have local, discernible effects and can simultaneously address problems arising from sea level rise or storm surges. However, mitigation measures such as reducing carbon emissions are part of a global-scale response and can have no discernible effect at the local level. Wilbanks & Kates (2010) and Wilbanks (2003) assert that the relevance and tangibility of these adaptation measures, their links with existing issues, make them more acceptable and compelling for local leaders and citizens.

In this context, Molnar (2010) called for a focus on climate change adaptation in rural sociology studies, and in current and future sustainable development work, particularly in rural areas of the developing world. Dunlap (2010) called for a broader rural sociology research agenda than that proposed by Molnar, insisting that rural social scientists must focus on more critical and forward-looking approaches to rural climate change research, such as deconstructing the ways in which climate knowledge is produced and communicated, finding paths to effective

local governance in the context of global change, and using emerging technologies such as geographic information systems (GIS) to help communities produce knowledge and make decisions related to climate impacts.

The goal of the study presented here is to compile and evaluate best practices arising from rural studies and related research. We outline literature relevant to governance and knowledge creation for rural climate change adaptation to glean best practices for rural planners and social scientists. Then we discuss a case study of a regional climate change adaptation project in rural eastern Maine that applied these best practices gleaned. Finally, we offer recommendations for future adaptation efforts and research.

## Literature Review

### Best Practice 1: Promote Bounce-Forward (not Bounce-Back) Resilience

Scott (2013) observes that the definition and connotation of the concept of resilience is problematic in the context of a system undergoing change. If resilience is the ability to "bounce back" to some state of equilibrium, then to be resilient is, in essence, to resist change. Scott calls this capacity to resist change and return to a prior state "bounce-back" or "equilibrium resilience" (2013, p. 600). To understand why "bounce-back" resilience can be a problem, Molnar (2010) offers the example of flood insurance that supports resilience by cushioning homeowners against losses due to storms or sea level rise. Offering flood insurance gives the community and the homeowners the capacity to rebuild in a flood-prone area. Bounce-back resilience can prevent a community from changing to adapt to increasing flood risk by emphasizing the return to "normal" even when conditions are changing. As an alternative, Scott proposes the concept of "bounce-forward" or "evolutionary resilience" (Scott, 2013, p. 601; others call it "transformational," e.g. Folke et al., 2010). An evolutionary approach allows a

community to change and transform while retaining its core identity. Thus the community can adapt to climate change over time as the impacts of climate change become apparent. The challenge in building resilience, then, is helping the community to understand and buy into an approach that embraces change rather than entrenching maladaptive practices. There is significant evidence that people in rural communities often resist change to avoid perceived risk (Coles & Scott, 2009; Marshall, Gordon, & Ash, 2011; Flora & Flora, 2013). In the context of resilience studies, we can understand this resistance to change as a tendency toward bounce-back resilience.

Walker et al., discussing the origins of the concept, offer a definition of resilience that incorporates the concept of change. They define resilience as "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" (Walker, Holling, Carpenter, & Kinzig, 2004, p. 2). According to Walker et al., the ability to manage and influence resilience is adaptability. Since communities will need to embrace change and direct the mode of their resilience in order to endure through the perturbations of climate change, then they will need to be adaptable.

**Best Practice 2: Align Scales of Action, Information, and Feedback**

Scale—spatial, demographic, temporal—is a critical consideration in implementing climate adaptation in rural communities. Because climate change is a global problem that disregards state and national borders, adaptation plans are often made on a statewide, national or even international level, while impacts are felt and actions are taken are on a local level. Climate reports come from an international body, and treaties aimed at curbing climate change are negotiated across international borders. However, floods and pests and failed fisheries are experienced locally. Decisions about how to adapt will ultimately need to be made by a

community or an individual.

Cash et al. (2006) stress the importance of scale in framing for political tractability in managing human/ ecological systems. They observe that there are multiple scales bearing on tractability: spatial, temporal, and institutional, to name a few that are germane to the discussion of climate adaptation. A common source of conflict is a mismatch between the scale of one group's perspective and that of another, or the scale of management decisions and that of the consequences of those decisions. Ostrom (1990) refers to such mismatches as problems of congruence. A mismatch of scale is particularly apparent in management of fisheries, for example. In one of many instances, Johnson (2005) demonstrated that fisheries closures to protect whales from colliding with fishing gear did not match the scale of the whales' movements. Closure polygons 75 miles on a side were implemented to protect whales that commonly traveled farther than that in two days. Not only was the management strategy ineffective in protecting the whales, it also angered fishermen and contributed to years of entrenched conflict over the issue. To foster tractability, Cash et al. call for management frames that encompass multiple scales and help stakeholders to understand the scalar complexities.

Similarly, mismatched frames regarding institutional scale can be problematic, as well, according to Cash et al.. Reframing to link multiple scales of governance structures can lead to greater tractability. They state,

> *From a management perspective, evidence is accumulating that supports the hypothesis that those systems that more consciously address scale issues and the dynamic linkages across levels are more successful at (1) assessing problems and (2) finding solutions that are more politically and ecologically sustainable. Whether the model is one of institutional interplay, co-management, boundary/ bridging organizations, or an integration of all three, a core proposition is that in a world increasingly recognized as*

*being multilevel, solutions must be as well.* (Cash et al., 2006, p. 9)

Building on this idea of congruence of scale, the literature on collaborative decision-making can offer guidance on structuring the decision-making process to encompass appropriate scales and frames. Effective facilitation for collaborative decision-making or planning typically begins with a process in which a group of decision-makers collectively defines the problem, goal, and potential solutions (Bryson & Anderson, 2000; Straus, 2002). While such a process can be time-consuming, especially for a large group or one entrenched in conflict, this groundwork is essential to gaining traction and moving forward. Success depends upon the group coming to a mutual understanding, a collective frame on the issue at hand. A multifaceted, scale- and place-dependent issue like climate change presents a special challenge for finding shared frames for defining problems, goals and solutions.

Addressing mismatched or incongruence between of scale is critical to gaining traction for climate adaptation in rural areas (Cash et al., 2006; E. Ostrom, 1990). There are important consequences to addressing climate change only at coarse scales. For instance, framing climate change solely from a national or global perspective often means that a local audience may dismiss climate change information as irrelevant to their local agenda (Cash et al., 2006; Dietz, Ostrom, & Stern, 2003; T. J. Wilbanks & Kates, 2010). Also, when important matters such as climate change are addressed at a broader scale, the concerns and needs of rural areas are often left out in favor of serving the more numerous urban residents of the region.

Benson (2010) argues, by contrast, that an effective scale for climate-related action is multi-state and cross-national-border regional climate mitigation and adaptation initiatives. One example Benson offers is the Regional Greenhouse Gas Initiative, a mitigation arrangement. These regional initiatives arose out of an absence of federal leadership in addressing climate

change. Benson says that such initiatives offer greater flexibility and encompass groups of entities with similar climate challenges, offering advantages over national initiatives. However, compared to national policy, Benson argues, such regional initiatives lack economies of scale and cannot contribute to creating and complying with international agreements. There are additional weaknesses to both national- or large regional-scale approaches. As we have seen in many realms of environmental governance, rural areas that lack political clout and fiscal means are often ignored in larger scale initiatives. Rural communities have few resources to understand address the challenges of climate change on a local level (Hales, D. et al., 2014), while urban government agencies have funds to hire consultants, wield clout in lobbying state and national legislatures, and receive better resources such as higher resolution data for assessing climate vulnerability.

Adapting to climate change and supporting sustainable communities must be managed at multiple scales, from the global to the local, so organizations and people are needed who can bridge the gap between scales and serve as conduits for information and resources (Cash et al., 2006; Dietz et al., 2003; Folke et al., 2010). For instance, it is critical for local decision-makers to have salient information about climate predictions for their region, and national decision-makers need to know the potential local consequences of proposed actions.

**Best Practice 3: Avoid Conflicted Frames about the Causes of Climate Change**

The concept of framing is used in many disciplines, but its applications in communication and in conflict management are relevant to the discussion of climate adaptation. In general terms for the social sciences, a frame is a socially constructed perspective on an issue, problem or idea. The debates in the media over climate change can largely be understood as a struggle to define the frame or perspective in which to view the issue, the narrative framework with which

one might make sense of the information presented. In many spheres, according to Nisbet & Mooney (2007), scientists have failed to earn the lay public's ear because they have ignored the importance of framing while those who question science have expertly engaged in the practice. They point to climate science, in particular, where some Republican and conservative leaders have successfully framed climate change as a case of "scientific uncertainty" or as an "unfair economic burden" (Nisbet & Mooney, 2007, p. 56). Democrats have framed the climate issue as a "'Pandora's box' of catastrophe" (p. 56), further polarizing the issue.

Given the polarized political climate and the sensitivity of the climate change issue in conservative rural communities (McCright & Dunlap, 2011; McCright & Dunlap, 2011a; "Mississippi, Alabama and Louisiana Most Conservative States," n.d.; Hamilton & Keim, 2009), the concept of framing is particularly important in considering rural climate adaptation if for no other reason than avoiding unproductive wrangling over the causes of climate change. Instead, local vulnerabilities and priorities, the focus of the next best practice, provide a more tractable frame for discussing proposed climate change adaptation.

**Best Practice 4: Frame Discussion around Existing Vulnerabilities and Priorities**

Dupuis and Knoepfel (2013) conducted a comparative study of municipalities in India and Switzerland on the framing of climate change adaptation policies and their tractability based on three framings:

1) Adaptation focused on problems specifically produced by climate change.
2) Climate variability adaptation focused on disaster planning
3) Vulnerability-centered adaptation integrated with existing challenges and stressors

Differences emerged in the way the frames influenced problem definition, goal

definition, and subsequent solutions in the municipalities that they compared. The communities they examined differed in many ways, but they included rural areas suffering from persistent poverty in which capacity for regional development efforts and disaster preparation varied from high to low. Their findings offer guidance on ways to frame problems related to climate change.

In the Dupuis & Knoepfel study, efforts where the frame focused on adaptation for specific climate change problems, there was very little tractability in the study areas. It was perceived by stakeholders as highly uncertain, it was unrelated to existing issues, and produced changes that were largely intangible to stakeholders. Focusing on climate variability and disaster planning gained more traction but had incomplete implementation.

The most tractability was gained with frames focused on vulnerability-centered adaption. There were several reasons for this higher tractability. First, climate vulnerabilities are easily linked with existing challenges and stressors, as discussed by Wilbanks and Kates (2010). Supporting sustainable agricultural practices, for example, is a current, on-going challenge and a sphere of vulnerability. Unlike major disaster planning, solutions to vulnerabilities in agriculture can happen through building human capital and small structural changes to land use regulations and property tax laws. These are areas in which local people can have agency and see tangible outcomes locally. Vulnerability-centered efforts were not a panacea (indeed, there are no panaceas for climate change: E. Ostrom, Janssen, & Anderies, 2007), but among all adaptation efforts examined, they were the most tractable in the rural communities they studied.

**Best Practice 5: Identify Local Vulnerabilities and Priorities**

If vulnerability-centered frames are most effective, then it is crucial to understand rural vulnerabilities, as well as strengths that might be leveraged to counter vulnerabilities. Many have observed that rural communities face particular challenges with regard to climate change that

are unknown or less prevalent among their non-rural counterparts (Hales, D. et al., 2014; Dunlap, 2010; Molnar 2010). Rural communities also have particular opportunities, however. Most of these challenges and opportunities relate specifically to their rurality and its attendant realities.

Rural communities may be more vulnerable to the effects of climate change than suburban and urban areas because they are more directly dependent on natural resources (Molnar, 2010, Hales, D. et al., 2014). Such dependence and lack of economic diversity raises the stakes for climate adaptation as all of the region's major economic drivers are likely to undergo significant change in coming decades.

Dependence on natural resources may also be an impediment to residents accepting adaptations to climate change. Marshall, Fenton, Marshall, & Sutton (2007) found that when Australian fishing families were more dependent on the resource in multiple dimensions, they were less adaptable to changes attributed to climate change and tended to de-emphasize the risk. A later study with Australian grazing families (Marshall, Gordon, & Ash, 2011) showed that grazers were reluctant to change their behavior based on climate predictions because they did not have sufficient skills or information to adapt their farming practices and had “limited social capital through which to learn” (p. 524) the necessary skills or information.

Tuler, Agyeman, da Silva, LoRusso, and Kay (2008) summarize the vulnerabilities faced by New England fishermen and their communities in the current regulatory climate with stringent regulations enforced to manage scarce fisheries resources. Tuler et al. assert that federal fisheries regulators could better understand the impacts of regulations on communities by focusing on multiple vulnerabilities (exogenous and endogenous) and encompassing structural, economic, demographic, and socio-cultural factors. This work is relevant to our discussion of rural climate vulnerability in three respects. First, it is important to remember that climate-

related vulnerabilities are among many others that rural communities must address and may not be a top priority. So any efforts at adaptation must occur in context. Second, many top-priority vulnerabilities—such as stressors on fish stocks or economic strain on already-strapped communities—can be exacerbated by the effects of climate change. Finally, the governance mechanisms in place for fisheries and other commercially-important natural resources are highly contested, and as Tuler et al. indicate, a significant element of the controversy is the way in which regulators consider the needs and challenges of small communities. So, in cases where communities feel marginalized and disenfranchised, discussions of adaptation, especially involving new regulations, are likely to be met with skepticism and distrust.

**Best Practice 6: Bridge the Digital Divide**

The scale of rural governance structures for natural resources also limits capacity for gathering, understanding, and acting upon climate change information. Many town officials in rural municipalities are volunteers, often holding multiple official titles at once: planning board member, selectman, fire fighter, assessor. It is common for municipalities to have only a single employee, a town manager who works a few hours per week, sometimes out of their own home. Such a small government entity has minimal capacity to grapple with thorny decisions such as land use planning related to storm surge and river flooding. Kates et al. (2001) point to the "digital divide," specifically lack of computers and internet infrastructure, leading to a lack of capacity for both science and applications of science for sustainability in less developed areas of the world. Without such capacity, less developed areas are ill-equipped to understand and address complex problems. Kates et al. were referring to less-developed nations, but a similar divide exists between urban and rural America. Many rural areas of the U.S. still lack broadband Internet service (“Broadband Map - Speed/Availability,” n.d.), and even where service is

available, many families cannot afford it. Therefore, cost-effective ways to bridge the digital divide for rural communities in terms of infrastructure and skills is essential to inspiring and supporting climate change adaptation.

**Best Practice 7: Support Co-Production of Knowledge in Learning Loops**

An emerging insight in linking science to applications specifically emphasizes co-production of knowledge (Cash, 2006; Cash et al., 2003), commonly through iterative learning loops (Pahl-Wostl, 2009), matching the scale of information to the scale of governance (Cash et al., 2006; Kates et al., 2001), and fostering bridging social capital and institutional networks (Adger, 2003).

In pointing to a critical problem in the way science has traditionally been communicated to non-academic actors, Cash (2006) described the “loading-dock problem.” According to an informant in Cash's study, the "National Weather Services, in general, have . . . the loading-dock approach to forecasting. You take it out there, and you leave it on the loading dock and you say, there it is. And then you walk away and go back inside" (Cash, 2006, p. 484). In the “loading dock” view of the world, “science” happens in a silo without input from the outside world. Science produces knowledge and packages it up for public consumption and places it on the loading dock to be delivered and used by the rest of society.

Cash recognized that in the real world, there is more to creating knowledge than the isolated scientific inquiry and one-way dissemination of the loading-dock model. Scientists must have input from the intended audience to know what questions are most relevant and how they must be answered. According to a synthesis of studies on the topic by Cash et al. (2003), "scientific information is likely to be effective in influencing the evolution of social responses to public issues to the extent that the information is perceived by relevant stakeholders to be not

only credible, but also salient and legitimate" (Cash et al., 2003, p. 8088). Also, information is more likely to be used if it is apparent how the information might be useful and practical (Pulwarty & Redmond, 1997). To produce knowledge that will be used, scientists must know what would be regarded by stakeholders as credible, salient, legitimate and practical. They must listen and learn from stakeholders in an iterative, shared learning process (Pahl-Wostl, 2009).

Public discourse can grapple with questions of relative values and risk that always lie at the edges of important environmental decisions, and these are often questions that science cannot answer alone. Also, applying science relies on certain practical considerations such as access to technology, temporal or spatial scales, political realities, and relative priorities. People outside the science silo can bring different kinds of relevant knowledge to the table such as local biophysical information or an understanding of the larger political or social context (Cash et al., 2006).

There is another reason for focusing on co-production of knowledge: the process itself builds trust and bridging social capital. As scientists and stakeholders work together to understand a problem and learn from each other, they build connections across boundaries that can later serve as the basis for further understanding and collaboration. From this perspective, the *process* of creating knowledge is just as important as the knowledge itself. Not only does a collaborative co-production process create salient knowledge by incorporating stakeholders' concerns, when stakeholders are involved in knowledge creation, they are more likely to regard it as credible and legitimate and to act upon it (Cash et al., 2006). Such buy-in can help to avoid conflict when communities are faced with difficult trade-offs, as is so often the case with climate-related issues (Adger, 2003; Bryson & Anderson, 2000; Straus, 2002).

**Best Practice 8: Build Bridging and Bonding Social Capital**

Social science research suggests that social capital can be a strength in adapting to climate change, or it can hinder the emergence of bounce-forward resilience. Flora and Flora (2013) define social capital as "the networks, norms of reciprocity and mutual trust that exist among and within groups and communities. It contributes to a sense of common identity and shared future" (p. 18). Strong social capital is typically regarded as a source of strength and resilience in rural communities, especially where government does not provide sufficient formal support (Flora & Flora, 2013). For example, in Maine it is common practice for a community to hold bean suppers to raise funds for a family in need due to events such as a house fire or serious illness. However, bonding social capital, formed among members within a tight-knit group, can present a barrier to climate change education and adaptation if it prevents the formation of bridging or networking social capital between groups (Adger, 2003; Smith, Anderson, & Moore, 2012). Strong bonding social capital can lead members of the group to trust only the members of the group while distrusting outsiders who may be climate scientists or regional planners.

Adger (2003) argues that state institutions that foster networking or bridging social capital build resilience and adaptive capacity, especially when the institutions are linked with legitimized agencies that are able to foster agency among stakeholders. On the other hand, according to Adger, where the state is absent or provides little support, social capital, both networking and bonding can replace the functions of the state in times of crisis. A community with both strong networking and bonding connections is more likely to accept help and trust information from outsiders while supporting members of the community through close personal relationships. Adger suggests that the key to building adaptive communities is to create social capital, both bonding and networking, that fosters agency, collective action and information

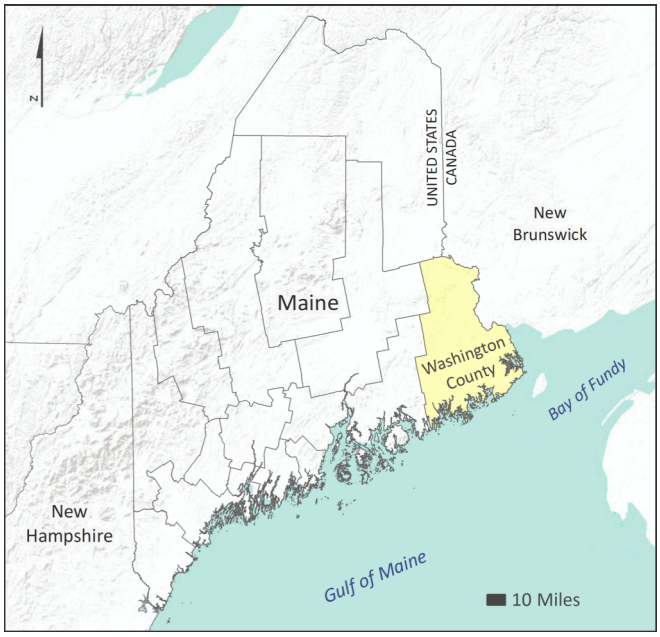
exchange, rather than entrenching institutions in non-adaptive modes.

## Case Study

Washington County, Maine, is in the Downeast Region, bordered to the east by New Brunswick, Canada, and to the south by the Gulf of Maine (Figure 3.1.). It is deeply rural and highly dependent on natural resources to support the main industries: fisheries, forestry, agriculture and tourism. The economy is chronically depressed with a median household income in 2013 of $38,387, compared with $56,142 for Maine and $59,580 for the US (U.S. Census Bureau, 2011). In 2012, the poverty rate in Washington County was 19.4%, compared with 14.4% for the State of Maine and 15.9% for the US.

Figure 3.1. Washington County, Maine.

Data sources: Maine GIS Data Catalog, Esri, USGS, NOAA



A longstanding partnership between the Washington County Council of Governments (WCCOG) and the University of Maine at Machias (UMM) has yielded several regional environmental planning projects that have received widespread support and practical use, including a regional strategic conservation plan, an inventory of scenic resources ("Downeast Scenic Inventory," 2010), low-cost shoreland zoning maps and ordinances for small municipalities ("Shoreland Zoning," 2013), and digitizing tax parcel maps for use in land use planning. The project described in this case study is a continuation of this partnership.

**Changing Attitudes**

Several recent climate-related events have had significant and tangible impacts on rural Maine and other rural areas of New England. Scientists believe global warming trends are behind such problems as the northward migration of a lobster shell disease and changing lobster movement patterns, declines in moose populations due to infestations of winter ticks no longer killed by winter temperatures, and most recently, the collapse of Maine's shrimp fishery. Also, New England has seen devastating impacts from powerful hurricanes, including Hurricane Irene, which brought 11 inches of rain in a single day to the rural valleys of Vermont in 2011. Hurricane Sandy caused enormous damage in southern New England.

**The Grow Washington Aroostook Project**

The Grow Washington-Aroostook (GroWA) Project, funded by the Sustainable Communities Program at the US Department of Housing and Urban Development, was "a regional planning process focused on job creation, modern infrastructure, and healthy, affordable communities in the counties of Aroostook and Washington," Maine ("GROWashington-Aroostook," n.d.). Begun in 2010 and concluded in 2014, the project included

myriad initiatives aimed at supporting sustainable economic prosperity throughout this rural region. Among these initiatives was the Climate Change and Infrastructure Resilience component, and WCCOG and the UMM Geographic Information Systems Service Center partnered to address this initiative in Washington County.

The GroWA project work in Washington County was widely regarded as innovative and successful, earning Project of the Year Awards from the Maine Association of Planners and the Northern New England Chapter of the American Planning Association. Also, it will be featured in an upcoming article in *Planning* magazine on sea level rise (Bodin, In Press).

In the GroWA project, researchers and students from UMM worked closely with planners at WCCOG to develop a county-wide climate vulnerability assessment (CVA) to support planning for disaster preparedness, disaster response, conservation, economic development, and land use planning. The CVA project focused specifically on local adaptation to the effects of climate change. The Gro-WA project also included regional initiatives aimed at mitigating climate change, such as renewable energy development, but the adaptation and mitigation efforts were addressed separately for reasons that will be explained below.

The CVA project had three main objectives:

- Use geospatial models and best available science and data (local to global) to understand and map vulnerable resources (natural, built, human, etc.), as well as elements of potential resilience.
- Create local (town-, river- and bay-specific) and regional (county-wide) climate vulnerability assessments based on input from municipal and regional officials and aimed at providing information in accessible, comprehensible, and useful forms to best support decision-making at the local and regional level. These include written documentation, static and web-based maps, outlines of available actions, and compiled

resources.

- Craft a process and mechanism for developing the CVA that applies best practices for fostering traction, communicating climate science, and supporting decision-making to ensure local decision-makers understand, trust, and ultimately, use the information in the assessment to take proactive action to prepare their towns and regions for the effects of climate change.

The process involved a) preliminary mapping and spatial modeling and initial compiling of relevant resources, b) meetings with municipal officials to review, discuss and receive feedback on preliminary results of the geospatial and scientific work embedded in a carefully framed presentation, c) revision and adaptation of the CVA and related web-based maps based on feedback, priorities and local knowledge provided by municipal and county officials, d) creation of a customized report with static and web-based, interactive maps for the county, and d) commitments from the university and WCCOG to support long-term and real-time decision making related to climate vulnerability.

## Methods

Based upon the best practices identified in the literature (Table 3.1.), the GroWA project was designed to address each best practice (BP). Drawing from the findings from two state-funded reports (Jacobson, Fernandez, Mayewski & Schmitt, 2009; Maine Department of Environmental Protection, 2010), WCCOG staff and UMM researchers and students compiled data sets for potentially vulnerable infrastructure, resources and populations. We focused on areas of greatest concern to local decision-makers that were related to climate change (BP 3, 4 and 5), based on past experience collaborating with municipal and regional officials. The areas

of concern included: emergency planning/ disaster response for increasingly frequent and stronger storms; planning to adapt to storms and sea level rise; utilities and transportation infrastructure vulnerable to flooding and sea level rise; natural resources supporting key industries in the region, including agriculture, fisheries, tourism, and forestry; and public health and safety, including vulnerable populations and looming health risks.

Table 3.1. Best practices for climate change adaptation efforts in rural communities.

| | |
|---|---|
| 1. Promote Bounce-Forward (not Bounce-Back) Resilience | (Scott, 2013; Walker et al., 2004) |
| 2. Align Scales of Action, Information, and Feedback | (Wilbanks & Kates, 2010; Cash et al., 2006; Ostrom 1990) |
| 3. Avoid Conflicted Frames about the Causes of Climate Change | (Nisbet & Mooney, 2007) |
| 4. Frame Discussion around Existing Vulnerabilities and Priorities | (Dupuis and Knoepfel, 2013; Wilbanks and Kates, 2010) |
| 5. Identify Local Vulnerabilities and Priorities | (Hales, D. et al., 2014; Dunlap, 2010; Molnar 2010) |
| 6. Bridge the Digital Divide | (Kates et al., 2001) |
| 7. Support Co-Production of Knowledge in Learning Loops | (Pahl-Wostl, 2009; Cash, 2006; Cash et al., 2003) |
| 8. Build Bridging and Bonding Social Capital | (Smith, Anderson, & Moore, 2012; Adger, 2003) |

To address the emergency planning and vulnerable infrastructure concerns, we used spatial models to create high-resolution maps of hurricane storm surge scenarios by downscaling coarse-resolution data provided by national agencies and combining it with high resolution localized data (BP 2). For the hurricane prediction modeling, we used the Maximum of the

Maximum (MOM) Envelope of Water predictions from the National Weather Service (NWS) Sea, Lake, and Overland Surges from Hurricanes (SLOSH) Model. The predictions for Downeast Maine were derived from a computer model of a hurricane, composited from measured storm track and tide gauge data for historic storms. The track of the modeled storm would make landfall over Penobscot Bay, which drains a large watershed to the east of Washington County. The model estimated surges for mean and high tide landfall for storm categories 1 through 4. According to the NWS, the surge height predictions from the SLOSH model are accurate to within +/-20% for storms that follow the track and force patterns within the model[1] ("Sea, Lake, and Overland Surges from Hurricanes (SLOSH)," 2013). Data layers for storm surge scenarios and vulnerable resources are hosted on the UMM GIS Service Center's ArcGIS server, and maps were created using ArcGIS Online. These are free, publicly accessible, easy to use, and may be used with other layers, as needed, for myriad planning tasks.

[1] For a more in-depth discussion of this work, and to view maps and the CVA report, see the GroWA Climate Change and Infrastructure Resilience page: http://gro-wa.org/washington-county-climate-change-response.htm.

The path to making a decision based on this information must be apparent, tangible and salient (Cash et al. 2003), so in preparing maps and assessments, scale was a primary consideration (BP 2). Maps showing climate prediction information at a coarse scale may lack sufficient detail to provide actionable information for local decision-making. A key component of the preliminary work was downscaling the storm surge inundation predictions provided by the National Weather Service to make them useful at a local level. The NWS prediction data showed inundation estimates in grid squares averaging one square mile, without reference to the fine-scale contours of the coastline. When overlaid on local maps, the grid squares appeared as large blocks, as shown in Figure 3.2a. To make more detailed predictions, we used estimated inundation depths to virtually flood digital elevation models with a one-meter resolution of the coast to show specifically which areas were vulnerable to flooding under each scenario (Figure 3.2b). This allowed local officials to identify and prioritize areas needing protection.

Figure 3.2. An example of downscaling.

a) b)


In the GroWA project, we developed the climate vulnerability assessment for Washington County through co-production of knowledge (Cash, 2006) in iterative cycles of

learning (Pahl-Wostl, 2009) (BP 7). We regarded the GroWA project itself as a boundary organization, intended to be deeply engaged with the communities on both sides of the boundary between science and local municipal officials (Guston, 2001). The CVA was developed as a boundary object designed to be useful for the purposes of those on either side of the boundaries between regional planners, local stakeholders and academics engaged in efforts to understand climate impacts and adapt to them (BP 8).

**Stage 1) Preliminary analysis**

This phase included spatial modeling of storm surge inundation and sea level rise scenarios, and gathering and interpreting science and predictions that are relevant specifically to areas where municipal officials can have practical agency and relate to issues about which they are already concerned (BP 3, 4 and 5). For instance, local planning boards are charged with land use planning; fire and emergency officials work with emergency response and planning; the town is responsible for maintaining its roads and culverts; and many towns maintain infrastructure for fisheries. The CVA process focused on vulnerabilities related to each of these existing concerns. There are also property tax relief mechanisms related to resource-dependent industries such as fisheries, forestry and agriculture. The preliminary assessments looked at vulnerabilities related to these economically-important, resource dependent industries. The content of the preliminary assessments was informed by discussions with some municipal officials and needs identified in prior collaborations with local municipal officials. We chose mid-range estimates of climate impacts such as future storm risk and sea level rise for initial mapping and discussions. This was done to minimize the likelihood that the message would seem unrealistic and alarmist, thereby rendering it uncredible.

**Stage 2) CVA Meetings**

A series of five CVA meetings were held during the fall of 2013, one for each major bay or estuary in Washington County. The meetings were open to the public and announced in the local newspapers, but personal invitations were sent to municipal and county emergency responders and managers, municipal and county staff and board members, and public safety officials. At the meetings, we presented preliminary findings from storm surge modeling and compiled research about climate impacts. The CVA meeting process was structured to foster multiple-loop learning, in which successive iterations of learning led, ideally, to increased "out-of-the-box" thinking and broader consideration of adaptive actions (Pahl-Wostl, 2009. To do this, we arranged for two-hour meetings, long enough to allow substantive discussion. A UMM researcher and a WCCOG planner, made the presentation and facilitated the discussion. An intern who grew up in the area and had participated in the preliminary mapping and modeling research took notes and provided technical support.

The presentation was carefully framed to ensure that participants understood that, not only was their input welcome, it was needed and expected (BP 7: Co-producing knowledge via learning loops). Specific slides in the presentation posed questions to the participants, asking for their concerns related to climate issues, the most useful temporal and spatial scale for information and scenarios, local knowledge such as specific storm events in their history or particularly vulnerable infrastructure or people. At each of these slides, the presentation was paused for audience discussion and feedback.

Instead of showing static maps with results of storm and sea level scenarios, the participants were presented with live, interactive maps of the participants' towns and were asked which locations and which scenarios they wished to view. Presenters zoomed, panned, and queried the map to answer their requests during the meeting.

Washington County has a strong conservative vane, as well as a vocal and active contingent of "climate change doubters." Therefore, a critical consideration in framing was how to address debate about the reality of climate change and its causes. Presentations at the CVA meetings did not mention or invite debate about whether climate change was occurring, nor did they discuss its causes in any way (BP 3). Presenters focused very little on effects of climate change that were distant spatially or temporally (BP 2). Instead, presenters discussed current or recent, widely-known phenomena affecting Maine or other New England states which scientists had said were either caused or exacerbated by climate change. The phenomena chosen for this discussion specifically included those with important economic consequences such as changes affecting commercial fisheries or moose hunting, flooding that damages homes and infrastructure, and pests and diseases affecting agriculture, forestry or public health (BP 4).

The primary focus of the presentation and discussion was on current impacts, but also addressed the fact that changes seen now would be long term, permanent, and increasing over time, thus encouraging bounce-forward resilience (BP 1). Presenters discussed long-term consequences of climate change by first pointing to recent, local extreme weather events and then discussed the predicted increase in severity and frequency in over the long term. For instance, beginning with recent extreme precipitation events and the damage these caused to roads and bridges, the presenters guided discussion to considering long term gradual change as increased precipitation and flood risk as it is exacerbated by warming seas and sea level rise. In this way, participants were encouraged to think of the adaptation options as long-term and permanent, requiring ongoing adaptation.

The meetings were structured specifically to build both bonding and networking or bridging social capital (BP 8). Each meeting brought officials from several neighboring towns together to review preliminary results of the analysis, discuss their own concerns, and provide

input for further analysis. At each meeting, participants were provided with the feedback received from all previous meetings, and presenters informed the participants in each meeting how prior feedback was being incorporated into the CVAs as the project progressed.

To build bridging social capital (BP 8) and incorporate a broader perspective, the GroWA project also invited speakers from outside the area to present to meetings of town officials. This included someone from Vermont state government discussing the impacts of Hurricane Irene on the state and the lessons learned about rural community resilience. Scientists from Maine state government made presentations about sea level rise and shellfish conservation.

To ensure the scientific information was seen as credible, the presentation avoided emphasizing extreme but improbable potential scenarios such as a category 4 hurricane making landfall at high tide. Such an event would be devastating and is remotely possible, but in Maine it would be exceedingly unlikely to occur in the foreseeable future. Presenting it as a plausible scenario worth significant focus would have risked over-stating the risk and seeming alarmist. Instead, we focused on more plausible but potentially damaging storm scenarios and discussed the related uncertainties and caveats openly. This aided in avoiding conflicted frames about the causes of climate change (BP 3). Similarly, in the demonstrations of sea level rise scenarios, visualization began with a mid-range estimate of a one-meter rise in sea level in 100 years.

To help participants assess relative risks as part of learning loops (BP 7), we openly discussed the range of possible scenarios and the scientific estimates of the likelihood of each scenario. In discussing risks and maps of areas of concern, we were careful to include information about the quality of the data on which the maps and risk estimates were based. For example, we discussed in detail the NWS estimates of the range of error in storm surge predictions, instances in which they had been able to field test the predictions in storm situations, and the factors that contribute to surges for any given storm. Importantly, we asked

municipal and county officials which scenarios and which time frames for estimated impacts would be most useful and incorporated this feedback into the CVA reports.

We took careful notes and surveyed the participants at the end of each meeting to glean additional feedback (BP 7). We also gave out business cards and encouraged participants to follow up with questions and ideas. We acted on the feedback we received whenever possible. After the first CVA meeting, we provided the participants in all subsequent meetings with an outline of issues raised in prior meetings. At each meeting, we also made sure to explain changes to the CVA process and content made as a result of feedback from prior meetings. This served to communicate which ideas had already been raised and to demonstrate that we were serious about incorporating feedback.

**Stage 3) Countywide CVA Report**

The countywide CVA report was published on the GROWashington Aroostook website (Johnson & East, 2014). It included a comprehensive written report regarding the main topics of concern for the region, as well as interactive, web-based maps of flooding and sea level rise scenarios (BP 6). Each section of the written CVA report includes a list of options for adaptation, as opposed to specific recommended actions. Interactive maps allow the users to create the scenarios that are best suited to their task at hand.

**Stage 4) Follow-up**

Since the release of the CVA report and associated scenario maps, we conducted a series of six workshops held in the spring of 2015 for municipal officials on using the online storm surge and sea level rise maps for municipal and regional decision making (BP 6).

A web-based survey of Washington County residents involved in municipal governance

allowed us to assess whether participation in the CVA process incorporating best practices was successful in engaging climate change doubters and whether it led to changes in actual or intended behavior (Appendix C). The survey was conducted in the spring of 2015, approximately one year after the release of the CVA report and maps. A panel of 708 email addresses was compiled from a WCCOG mailing list and websites for Washington County municipalities. All 708 in the panel were invited to participate. Six standard items queried respondents about their beliefs related to climate change on a five-point Likert scale. A mean of all six items was calculated to yield a climate belief score for each respondent. A t-test was performed to compare the means of global warming belief scores of those who had attended a CVA meeting and those who had not.

One set of survey questions asked respondents about past and planned advocacy for 1) upgrades to roads, bridges and culverts in my community, 2) emergency planning for extreme weather events, and 3) climate change adaptation. The latter refers explicitly to climate change, while the two former items were current municipal priorities related to but not explicitly linked to climate change. This provided the opportunity to use a t-test comparison between past and intended climate adaptation actions of those who attended CVA meetings and those who did not. We also used a t-test to compare the past and planned behavior based on political beliefs.

Table 3.2. outlines the project activities that implemented best practices in the GroWA project.

Table 3.2. Case Study Implementation of Best Practices.

BP 1. Promote Bounce-Forward (not Bounce-Back) Resilience

- Focusing on current, observable changes
- Recognizing observable changes as permanent, ongoing, & increasing over time
- Discussing & assessing proximal near-term & long-term change

BP 2. Align Scales of Action, Information, & Feedback

- Downscaling storm surge maps
- Interpreting scientific studies for local scale
- Sharing feedback from others at each CVA meeting

BP 3. Avoid Conflicted Frames about the Causes of Climate Change

- Centering discussion & CVA report on local concerns, not global change
- Focusing on climate change adaptation, rather than mitigation
- Taking care to avoid overstating risk
- Asking which type of scenarios are most useful, worst case, most probable, etc
- Providing interactive scenario tools

BP 4. Frame Discussion around Existing Vulnerabilities & Priorities

- Focusing on storm water, emergency response, infrastructure
- Identifying linkages between local concerns & environmental issues, e.g. culverts & salmon habitat; storm surges & wetland conservation

BP 5. Identify Local Vulnerabilities & Priorities

- CVA meeting discussions, straw polls & surveys
- Ad hoc meetings with local groups & county officials

BP 6. Bridge the Digital Divide

- Free, easily accessible, web-based map products
- Workshops & instruction materials for use of web-based maps

BP 7. Co-Production of Knowledge/ Learning Loops

- CVA meetings with built-in feedback mechanisms
- Open sharing of feedback among participants
- Adapting process to address new ideas

BP 8. Bridging and Bonding Social Capital

- Engaging diverse people: local officials, regional planners, county & state officials, academics & students
- Speakers from other areas of New England who had experienced major storm events

## Results

A total of 79 people attended CVA meetings. Of these, 29 (37%) were emergency first responders, police, harbormasters, or were otherwise involved in public safety, either as paid staff or volunteers. Twenty-five (32%) of the 79 were involved as staff or volunteers in committed roles in municipal government. Thirteen (17%) signed in as interested citizens (Table 3.3.).

Table 3.3. CVA meeting attendance.

| | n | % |
|---|---|---|
| Emergency First Responders/ Mgrs | 22 | 27.8 |
| Select Board or Planning Board Members | 13 | 16.5 |
| Interested Citizens | 13 | 16.5 |
| Municipal Staff | 12 | 15.2 |
| Regional Planning Org. Staff/ Board | 4 | 5.1 |
| Environmental Non-Profit Representatives | 3 | 3.8 |
| Customs/ Border Patrol Officers | 3 | 3.8 |
| Students | 3 | 3.8 |
| Police | 2 | 2.5 |
| Harbormasters | 2 | 2.5 |
| News Reporters | 2 | 2.5 |
| Total Attendance | 79 | 100 |

### Promoting Bounce-Forward Resilience

Several outcomes of the CVA process are instructive in implementing best practices for encouraging and supporting climate adaptation. The primary products of the CVA process are the boundary objects, specifically the report and associated interactive maps of storm surge and sea level rise scenarios, which were published on the GroWA website (Johnson & East, 2014). The CVA report was, in essence, a written version of the presentations given at the CVA meetings, incorporating feedback and finalizing preliminary results of analysis. It reviewed basic science and vocabulary of climate, weather, storm scenarios, and related issues in clear and

direct language. Then it outlined impacts directly relevant to Washington County communities related to severe weather and flooding, sea level rise, transportation infrastructure, public health, fisheries, agriculture, and forestry. Examples used throughout were as local and relevant as possible, and particular focus was on near-term or current challenges. Uncertainties about risks were included, along with the reasoning that led to choices about which scenarios to use.

The CVA report subtly stressed the importance of embracing change and developing bounce-forward resilience (BP 1) in order to overcome localized inertia. The CVA report provided examples and outlooks for key resources and industries affected by climate change in the region, but did not offer recommendations or prescriptions for adaptation. It offered instead a wide array of options for adaptations that were realistic, addressed near- mid- and long-term issues, and were local in scope (BP 2). In most cases, the recommendations aligned with existing priorities such as improving transportation infrastructure or protecting water quality (BP 4 & 5).

**Aligning Scales**

The process of downscaling the NWS surge predictions and combining them with other data such as lidar elevation models, building footprints, and road networks produced maps with more detail than would have been possible with the raw surge prediction layers provided by NWS alone (BP 2). Municipal planners, emergency managers and others needed to see potential impacts in detail to determine which structures, businesses, people, and infrastructure would be vulnerable in a storm event. Prior to receiving these maps, neither the county emergency managers nor the local emergency responders possessed the information they needed to position emergency resources appropriately. The director of the county emergency management agency told project leaders he had been provided the NWS storm surge estimates previously, but had been unable to use them because of the scale mismatch. County and many town officials

are now using the new maps to position assets such as fire trucks and ambulances during storm events to ensure areas cut off during a flood can receive emergency services, if needed.

**Focusing on Existing, Climate-Related Priorities and Vulnerabilities**

An important frame for the CVA process was to link conservation concerns—often low priority for municipal officials—with related, higher-priority concerns (BP 4 & 5). For example, sea level rise and increased storm force and frequency pose a significant risk to the region's wetlands in the coming decades. Rather than focus on wetland conservation, per se, the report and discussions at CVA meetings focused on the ways in which wetlands related to high-priority concerns for municipal officials: wetlands can absorb the energy of surging sea water and overland flow of storm water to decrease damage to shorelines and infrastructure. Wetlands also serve as nurseries for commercially important fisheries.

In another example of linkages between conservation and municipal concerns, habitat for critically endangered Atlantic salmon is an important environmental concern in the region. Many waterways in the area have lost salmon habitat because small, poorly-installed culverts impede fish passage and degrade water quality. The same inadequate culverts impede drainage and endanger roadways, an increasing problem with a recent increase in severe precipitation events flooding and damaging roads and culverts across the region. Upgrading culverts serves both purposes of restoring salmon habitat and safeguarding roadways. As a result of this insight, WCCOG, certain local towns, and salmon conservation groups have begun working together to develop collaborative proposals aimed at addressing problematic culverts across the region.

**Learning Loops and Web-Based Maps to Support Knowledge Creation**

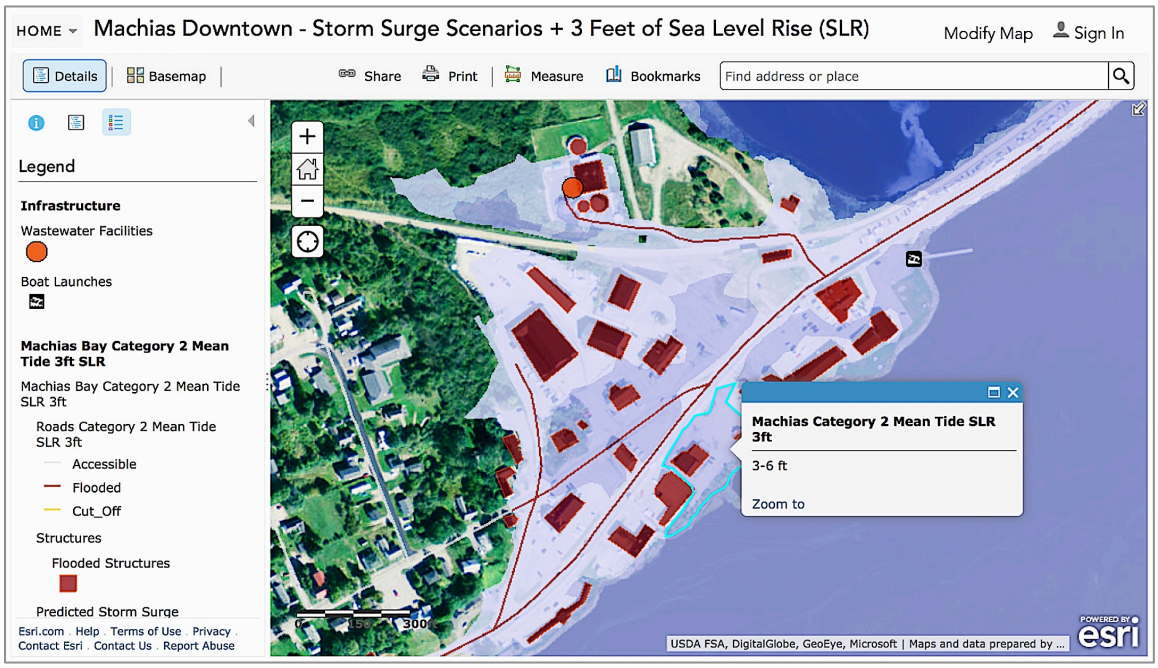
The culvert problem also provides an example of how learning loops (BP 7) and web-based solutions (BP 6) were applied in the project. In the first CVA meeting, participants noted that towns lacked a way to map and inventory the culverts under their roadways. They saw the culverts as a critical element of vulnerability, but were unable to predict which culverts were most prone to failure for planning and prioritizing limited funding. As a result of this feedback, project leaders began developing a web-based map of all existing culvert data and a free, web-based form that towns can use to add culverts to the inventory database and map.

Figure 3.3. is a screen capture of a web-based, interactive storm surge scenario map of the downtown area of Machias, Maine. The depicted scenario is a category 2 hurricane making landfall at the time of mean tide and includes three feet of sea level rise. The map depicts worst-case flooding which is equivalent to a 1% probability flood event (colloquially know as a 100-year storm), though this scenario is expected to become increasingly frequent over the coming decades. Data in the map layers are hosted by the UMM GIS Laboratory, and the maps themselves are hosted by Esri, Inc., through an ArcGIS Online account. Map users have free access to the maps and are able to change the basemap, zoom and pan, access attribute data, turn additional layers on and off, annotate the map, add their own layers, and save their adapted versions of the maps to an online account or as images (BP 6). The interface includes a search function and measuring tools. The maps can also be accessed on a mobile device and used with GPS-enabled location functions. In this way, local officials can generate the scenarios and therefore the knowledge most relevant to their own needs (BP 7).

Data on visitors to online storm surge scenario maps shows consistent and increasing usage since they were launched in 2014, and each map has been viewed between 40 and 100 times. For comparison, this is a similar usage rate and rate of increase as seen on web-based

town parcel maps also produced by the GroWA project. In the spring of 2015, WCCOG and UMM offered a series of six workshops for municipal staff and volunteers on using the storm surge scenario maps, as well as other online, interactive maps produced in other initiatives of the GroWA project. Two dozen municipal officials, mostly from coastal towns, participated. Since these workshops, the maps have seen a slight increase in usage. Advanced workshops are planned for the future.

Figure 3.3. Screen capture of web-based storm surge scenario map of Machias, Maine. Depicts predicted worst-case storm surge for a category 2 hurricane making landfall at a mean tide with three feet of sea level rise.




**Avoiding Conflicted Frames about Climate Change**

Averting unproductive and divisive debate about climate change (BP 3) was critical to the success of the project. Washington County has a vocal and active contingent of "climate change doubters," some of whom challenged the GroWA project when it first began. In emails to

project leaders and speaking at early public meetings prior to the start of the climate change adaptation portion of the project, opponents to the GroWA project pointed to the word "sustainable" in the name of the project's funding program and said it indicated the United Nations was involved. The goal of the U.N., they said, was to impose provisions of Agenda 21, the 1992 non-binding Rio Agreement on the environment ("Agenda 21," n.d., p. 21). Opponents were particularly concerned with the project's climate change initiative. Project leaders responded briefly and respectfully, both in a public meeting and via email, stating that there was no connection between the project and the United Nations (indeed some project leaders had never heard of Agenda 21). They asked for input from those concerned to help define what sustainability meant for Washington County. Notably, as the CVA project proceeded, objections ceased and were never raised in the CVA meetings, though according to results of the follow-up survey, several people who doubted the reality of climate change attended the meetings.

Many participants in the CVA meetings asked whether the storm surge analysis had used the Federal Emergency Management Agency (FEMA) flood insurance rate maps (FIRMs) in creating the flood scenarios for storm surges. The storm surge models had not incorporated FEMA FIRMs, and from prior projects, we knew the FEMA flood maps were often extremely inaccurate and widely denounced in the region. Incorporating the FEMA maps into models or the maps would have detracted from the credibility of the maps in the eyes of many in the region. Therefore, after the topic came up in the first CVA meeting, presenters were careful to assure participants at subsequent meetings that the FEMA maps were not used in flood estimates. Addressing the question of the FEMA data not only contributed to the credibility of the project and allowed project leaders to show they were attending to participants' concerns (BP 5) and incorporating their knowledge (BP 7), it also helped to avoid other unhelpful frames that had not been specifically such as mistrust arising from past conflict.

**Do Best Practices Lead to Adaptation Action?**

Anecdotally, we can report many activities in Washington County that arose from the CVA process, in addition to the activities mentioned above. For example, the county's emergency management director began the process of changing evacuation routes even before the storm surge scenario maps were finalized. He continues to work with GroWA project leaders on these changes, and has begun to promote projects to improve resilience for transportation infrastructure. Multiple grant proposals were written using information from the CVA to request funding for harbor management plans and vulnerability assessments for working waterfront infrastructure. At least two were funded. The GroWA maps and CVA results are informing several municipal comprehensive plans under development as of this writing. The CVA will also be central to transportation and comprehensive plans currently under development for all unincorporated townships, comprising over half the area of the county.

The follow-up survey offers additional insights into the effects of the CVA process and best practices. The 708 invitations to participate in the survey yielded 203 (29%) valid responses to the item asking if respondents had attended a CVA meeting. Of the 203, a total of 43 respondents (21%) reported that they had attended at least one CVA meeting. This comprised 54% of all who had attended the CVA meetings. Of the survey respondents who said they had attended a CVA meeting, nine (21% of attendees) served in public safety roles, while 37% of all who attended CVA meetings served in public safety roles. By contrast, on the survey, 25 (58% of attendees) said they had attended a CVA meeting and served in committed municipal roles, while these comprised less than one-third of CVA meeting attendees. Therefore, the survey under-sampled those in public safety roles and over-sampled those in municipal roles in comparison to all CVA meeting attendees.

The ratio of climate change beliefs among CVA meeting attendees (Figure 3.4.) was not significantly different from those of non-attendees, based on an independent samples t-test (Table 3.4.). Twenty-seven (63%) of the 43 survey respondents who had attended a CVA meeting had global warming belief scores in the "Agree" or "Strongly Agree" categories, meaning a mean of their ratings on the six standard climate change questions indicated that they believe global warming is occurring and that humans are a primary cause. Nine (21%) were in the "Neither" category, and seven (17%) were in the "Disagree" or "Strongly Disagree" category. Therefore, more than one-third of respondents engaged in the CVA process were unsure or doubtful about the reality of climate change, though questions about the causes and reality of climate change were never discussed or debated in CVA meetings. This lends support to the notion that the best practices used in the GroWA project helped to overcome barriers to climate action arising from divisive debates about the science of global warming.

Figure 3.4. Global warming belief scores for survey respondents who attended CVA meetings.

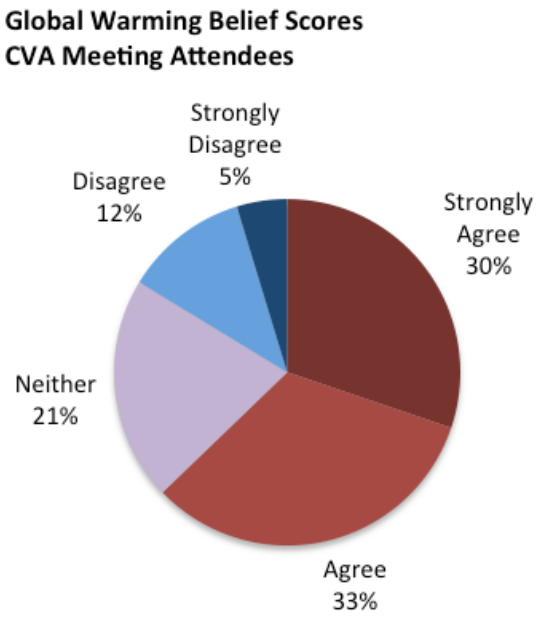


Table 3.4. Results of t-test comparison of climate beliefs.

| | | | | T-Test | |
|---|---|---|---|---|---|
| **Climate Belief Score** | **n** | **Mean** | **Std. Dev.** | **t (df)** | **Sig.** |
| Attended CVA Meeting | 43 | 3.640 | 1.169 | -0.008 (200) | 0.993 |
| Did Not Attend | 159 | 3.641 | 1.085 | | |

* $p < 0.05$

An independent samples t-test showed that survey respondents who reported attending a CVA meeting were significantly more likely than other respondents to report both past and planned advocacy for infrastructure upgrades, emergency planning, and climate change adaptation (Table 3.5). The survey, administered a year after the CVA process concluded, cannot determine whether existing motivation caused participants to engage in the process or whether the CVA process motivated them. In either case, however, the results suggest that using best practices may be a fertile approach by either providing focus and direction for already-motivated actors or by providing motivation by making information accessible, trustworthy, and salient.

Table 3.5. Results of t-test comparison of past and planned advocacy actions.

| **Advocacy** | | **CVA Meeting** | **n** | **Mean** | **Std. Dev.** | **t (df)** | **Sig. (2-tailed)** |
|---|---|---|---|---|---|---|---|
| Past: | Upgrades to Infrastructure | Attended | 37 | 0.70 | 0.463 | 3.842 | 0.00* |
| | | Did Not Attend | 138 | 0.36 | 0.482 | (173) | |
| Planned: | Upgrades to Infrastructure | Attended | 37 | 0.65 | 0.484 | 3.095 | 0.002* |
| | | Did Not Attend | 135 | 0.37 | 0.485 | (170) | |
| Past: | Emergency Planning | Attended | 35 | 0.43 | 0.502 | 3.211a | 0.003* |
| | | Did Not Attend | 136 | 0.14 | 0.348 | (43) | |
| Planned: | Emergency Planning | Attended | 36 | 0.56 | 0.504 | 3.694a | 0.001* |
| | | Did Not Attend | 133 | 0.22 | 0.414 | (49) | |
| Past: | Climate Change Adaptation | Attended | 35 | 0.43 | 0.502 | 2.215a | 0.032* |
| | | Did Not Attend | 138 | 0.22 | 0.419 | (47) | |
| Planned: | Climate Change Adaptation | Attended | 35 | 0.54 | 0.505 | 3.181a | 0.003* |
| | | Did Not Attend | 134 | 0.25 | 0.432 | -48 | |

* $p < 0.05$

a Equal variances not assumed

Parsing the past and planned behavior items based on responses about political beliefs revealed significant variation. Conservatives and libertarians who had attended a CVA meeting were significantly more likely than conservative and libertarian non-attendees to plan to advocate for infrastructure upgrades ($t = 2.20$, $df = 61$, $p = 0.032$) and emergency planning ($t = 2.22$, $df = 61$, $p = 0.030$). There was no significant difference in past behavior for conservatives and libertarians, and the difference in planned advocacy for climate change adaptation was not significant, though $p$ was only slightly higher than the threshold for significance ($t = 2.07$, $df = 19$, $p = 0.052$). There were no significant differences in past or planned behavior among liberals and moderates in t-tests based on CVA meeting attendance. While these results cannot demonstrate causation directly, the CVA process incorporating best practices may have been successful in influencing conservatives and libertarians to act on climate-related issues, even as their attitude toward climate change adaptation, framed explicitly, remained unchanged.

## Discussion

Given rural proclivities toward conservatism, resistance to change, and pressing economic problems, developing an effective way of promoting climate change adaptation in rural areas is especially important but especially daunting. The Washington County CVA process was a practical implementation of best practices to meet this important, daunting challenge.

### Promoting Bounce-Forward Adaptation while Avoiding Conflicted Frames

There is an inherent tension in the task of promoting bounce-forward resilience while avoiding discussion of long-term global change. This case study points to important strategies for striking that balance, particularly by avoiding discussion of causes and attending to issues of

scale and relevance. It is not necessary, and may even be counterproductive, to begin a discussion about global warming by focusing on the global scale of the problem. Recall that objections to the CVA process waned, even as people who doubted climate science participated. It may be that the best practices used in the GroWA project offer a powerful way of working with climate change doubters without engaging in counterproductive wrangling over scientific consensus. The structure of the process may have blunted unproductive challenges to the process, though further study will be required to be certain that this is the case.

**Aligning Scales to Create Knowledge**

The CVA process involved compiling and processing information that already existed from myriad sources. It created no new climate science. Instead, the new knowledge created by the CVA process was an understanding of how, specifically, changes in climate would affect the region locally and what could realistically be done to adapt. Consider the documented resistance to change among rural actors (Marshall, Gordon, & Ash, 2011; Marshall et al., 2007). This resistance to change may be, in part, related to conservatism and aversion to risk among rural people. However, there is another potential explanation arising from the case study. As the tools and materials were developed for Washington County's CVA, surprisingly little impetus was required to prompt action. It may be that downscaling and sorting the information achieved what Ostrom (1990) called congruence between the scale of the information and the scale of local conditions. Through downscaling and parsing data, the process may have lowered uncertainty sufficiently to overcome the inherent rural aversion to change in at least some motivated people who participated, giving them what they needed to understand vulnerabilities, allocate limited resources, and implement change. If so, the fundamental question of rural climate communication need not be, "how do we convince them to adapt?"

Instead, it can become, “what kinds of information, in what forms, and at what scales do they need in order to understand and address vulnerabilities for themselves?”

**Learning Loops and Existing, Climate-Related Priorities and Vulnerabilities**

A principal innovation of the GroWA project was the mechanisms for capturing stakeholder ideas, knowledge, and concerns. This included not only collecting the information from participants, it also involved maintaining this information as part of discussion and assessment throughout the process. For example, once the idea for addressing problems related to culverts arose in the first CVA meeting, the topic was discussed and expanded at all subsequent meetings and was addressed in the CVA report. Participants not only knew they had been heard, GroWA leaders were careful to make it apparent how their ideas and concerns were being incorporated, a critical element of effective governance frameworks (Ostrom, 1990).

Dupuis and Knoepfel (2013) showed that a vulnerability-centered frame is the most tractable approach to promoting climate change adaptation. The results of this case study corroborate their observation that climate-related vulnerabilities could be linked to existing vulnerabilities to produce change with tangible results. The results of the survey lend further support to that premise. Perhaps the most compelling evidence from the survey are results showing conservatives and libertarians who had participated in CVA meetings were more likely to plan to advocate for transportation infrastructure upgrades and emergency planning, though their past behavior on these items did not differ from the rest of the survey respondents. It would be premature to say with certainty that the CVA process prompted these conservatives and libertarians toward their interest in these adaptation measures, since the sample size was small and much could have happened in the time between the CVA meetings and the survey. However, it may be an insight into a route to tractability among conservatives.

### Web-Based Maps to Support Knowledge Creation

The results from the interactive mapping work are, necessarily, preliminary. Spanning the digital divide will involve more than merely making interactive maps; people need skills to use them, an on-going challenge in rural communities. The number of web-based mapping tools has expanded rapidly in recent years, and this emerging technology is poised to penetrate rural areas as broadband expands in rural America. Web-based maps have great potential to span the digital divide and allow rural users the flexibility to ask novel questions and devise novel solutions that relate specifically to the issues and priorities most relevant to their situation.

## Conclusion

Many of the best practices applied in the case study are already used among professional planners seeking to support open, collaborative, empowering, participant-directed processes. The innovation of the project was applying these practices to gain traction on a highly contested issue in rural communities, demonstrating a deeply engaged role for academics in planning, devising ways to align scales and link to local concerns, and bridging the digital divide with web-based mapping. It was beyond the scope of this study, however, to demonstrate causal links between the best practices and outcomes. As a localized case study, the project was limited in scope, geographically and temporally, and did not consider important exogenous factors such as aging rural populations, unemployment, or historical trauma related to race or generational poverty. These limitations point to crucial directions for future study.

### Recommendations for Rural Social Scientists

The Washington County CVA process only engaged a motivated set of actors. What would be required to motivate others to participate in taking steps toward climate change

adaptation? If the best strategy is identifying and framing around existing vulnerabilities and priorities linked to climate change, what are the vulnerabilities and priorities of those less engaged and motivated? Answers to these questions likely relate to socioeconomic factors such as those listed above. The CVA process provided little insight into how such factors impact whether and how stakeholders participate in environmental governance. Exploring these issues and ways to overcome barriers to involvement are important topics for future research.

Another question is perhaps more germane to this study: what was the purpose of the best practices if they engaged only individuals who are already motivated to act? The case study itself suggests an answer and directions for future research. If, as Cash et al. (2003) suggest, a lack of "credible, salient and legitimate" information is a primary barrier to action toward resilience, then filling that gap may offer what is needed when actors are already motivated and in a position to act. There may be great value in simply removing barriers so motivated people can act. Research examining quantitatively and in detail the effects of "credible, salient and legitimate" information would be a critical step forward.

There is significant evidence that climate change adaptation efforts are most effective if they are linked to existing vulnerabilities and priorities for rural actors. Further research is needed to understand what those vulnerabilities and priorities are, how they vary from place to place, and how to frame linkages to climate vulnerabilities. Further research is also needed to understand in greater detail the patterns of climate change beliefs in rural America, as well as how beliefs relate to the priorities and motivations of rural actors.

Geospatial technology can play a vital role in supporting rural climate change adaptation, but it will take time before the emerging web-based mapping tools are ideally suited to that purpose. In most cases, emerging technologies provide greatest benefit to urban areas first, and only much later are adopted in rural areas. Lightweight, web-based mapping tools

could be revolutionary in raising the capacity of rural communities to assess vulnerabilities and plan for their own futures. Such great potential justifies significant investment in rural applications of web-based, interactive mapping. Scholars can help to drive this innovation by working closely with rural planners and communities to ensure mapping tools work at appropriate scales, are accessible, and sufficiently flexible for rural purposes.

**Recommendations for Planners**

Framing around local, near-term priorities and vulnerabilities may engage even those who doubt the science of climate change, regardless of disagreement over the causes of vulnerabilities. Such framing requires a clear understanding of local vulnerabilities and priorities, as well as potential climate change impacts. Rural planners are uniquely situated to comprehend and articulate connections between local concerns and climate impacts. They can also facilitate learning loops and build trust across boundaries while ensuring local control.

Congruence of scale must be central to planning for climate change adaptation in rural communities. Downscaling may require significant technical measures such as the GIS modeling needed to apply NWS storm surge predictions to high-resolution elevation models. However, without downscaling and overlaying with local-scale spatial data, the NWS predictions were unusable for rural communities. In the GroWA project the collaboration between the WCCOG, a regional planning agency, and the university was key to addressing this technical challenge. WCCOG planners had the skills required to understand which scales and data were required, and UMM researchers could perform the necessary analysis and map design. The collaboration had the added benefit of providing local students with technical skills and experience.

The advent of accessible web-based mapping technology presents an important (and long-awaited) opportunity to provide rural communities with powerful mapping resources that

had previously been available only in non-rural communities with more financial and technical resources. Rural planners should explore the potential of this emerging technology while ensuring mapping resources adhere to best practices such as congruence of scale, adaptability to local needs and priorities, and accessibility. Finally, part of making mapping resources useable for rural communities will be providing the necessary training and support for users and advocating for upgrades to broadband access upon which web-based maps depend.

Anecdotally, rural planners have confided that they avoid addressing climate change in their work because of the political volatility of the issue. Avoiding these issues and postponing adaptation merely increases the vulnerability of already-vulnerable communities. Planners need approaches that help them navigate these stormy waters while helping rural communities become more resilient. An important lesson of this case study for planners is that there are ways to work on adaptation without engaging in public debate about the science of climate change.

Finally, the Washington County CVA process was an example of the power of partnerships between scholars, technologists, planners, and community members. If one sector of government is most prone to the phenomenon Cash (2006) described as the "loading-dock problem," it is rural municipalities. Individually, they often lack the financial, structural and technical capacity to gather, sift, and process the vast array of climate change data available. Rural actors are less likely to seek out and apply knowledge from the scientific "loading dock." However, multi-disciplinary teams incorporating best planning practices can bridge that gap, providing real-world applications for academic research and emerging technologies while supporting rural communities as they plan for a changing world.

# CHAPTER 4: CLIMATE CHANGE BELIEFS AMONG RURAL GOVERNMENT OFFICIALS

## Introduction

Rural communities are already experiencing the effects of climate change, according to the 2014 U.S. National Climate Assessment. With economic dependence on natural resources, poor and aging populations, and other structural challenges, rural areas are disproportionately vulnerable as the earth warms in coming decades. The capacity of small-scale rural governance institutions will likely be stretched to its limits as communities are forced to adapt to a changing climate while managing the nation's vital food, water, forests, energy, and recreational resources (Hales, D. et al., 2014).

In a review of relevant literature, Moser and Ekstrom (2010) developed a framework for assessing barriers to climate change adaptation. They identified beliefs about climate change as a crosscutting and fundamental factor in determining whether communities will undertake actions to adapt. Dunlap (2010) has called for social science research on patterns of belief about climate change in rural regions as a crucial step toward empowering rural communities to face a changing climate. Among rural actors, specifically, beliefs about climate change likely play a significant role in determining whether and how they support action adapt to climate change (Arbuckle et al., 2013; Arbuckle, Morton, & Hobbs, 2013; Dietz, Dan, & Shwom, 2007), but the picture of rural climate beliefs is still incomplete, especially with regard to adaptation.

## Literature Review

While the majority of Americans believe climate change is occurring, a sizable minority—about one-third—says there is insufficient evidence to determine whether it is

occurring (Pew Research Center, 2014a; Leiserowitz, et al., 2014). Republicans, particularly conservative Republicans, are much more likely than Democrats or Independents to deny that humans are a cause of climate change, and public opinion is growing more polarized on the issue (Pew Research Center, 2014a; McCright & Dunlap, 2011; Dunlap & York, 2008; Pew Research Center, 2007). More than three-quarters of liberals and other left-leaning citizens believe that global warming is occurring and that it is caused by human activities; nearly three-quarters of conservatives, by contrast, believe that global warming is not occurring or that there is insufficient evidence to say whether it is occurring (Pew Research Center, 2014a; Leiserowitz, et al., 2014; Borick & Rabe, 2010). Rural areas are increasingly more conservative than non-rural areas (Pew Research Center, 2014c). Climate denial is likely more prevalent in rural areas, though studies in the rural U.S. have yielded an incomplete picture. Examining rural climate beliefs at a coarse scale can yield only generalized insights that fail to match the scale at which rural decisions and actions happen.

Attempting to gain a finer scale picture of rural climate beliefs, Hamilton and Keim (2009) compared climate perceptions among survey respondents in rural counties in nine US states. When respondents were asked whether they perceived local effects of climate change, between 40% and 52% of respondents from southern and western states said they perceived no effects at all. In New Hampshire, just 30% of respondents said they perceived no effect; 70% both believed that climate change was occurring and attributed observed events to its effects. Notably, in Hamilton and Keim's 2009 study, Maine in northern New England fell between its less rural neighbor New Hampshire and the other rural states with 37% of respondents saying they perceive no effect at all—indicating that Maine has more climate change doubters than neighboring New Hampshire but fewer than southern and western states. Hamilton and Keim found a significant, positive correlation between colder average temperatures and perception of

global warming. They suggest that recent warmer northern winters had led to increasing acceptance of climate change. The results of Hamilton and Keim's study point to much more fine-grained patterns in rural climate beliefs but fail to elucidate them.

In another attempt to achieve more fine-grained results, Howe, Mildenberger, Marlon, and Leiserowitz (2015) estimated climate beliefs for US counties statistically using large data sets from national studies. They found that estimates of climate change belief for rural counties were significantly lower than those for urban counties. Forty-one percent of the rural county estimates in the Howe et al. study were based entirely on statistical profiles because the counties had no respondents in the survey data. As a result, the estimates for rural counties may be more prone to error. Recognizing the need for finer-grained and statistically meaningful data about rural climate beliefs, the authors call for more surveying in rural communities.

The study presented here examines rural climate change belief patterns among key actors in much finer detail than in previous studies, building an understanding of these patterns at a scale that matches that of rural governance. While such fine-scale assessment is necessarily limited in geographic extent, our study builds a framework for assessing climate beliefs locally to yield knowledge that is more applicable on the local level.

A critical question in assessing belief patterns at a fine scale is how beliefs vary related to demographic sociopolitical trends. Multiple studies have shown a divergent trend related to party affiliation, for example. Republicans with higher educational attainment are significantly less likely to believe that climate change is occurring; conversely, for Democrats, increasing education is related to increasing belief in climate change (Pew Research Center, 2008; Gallup, 2015). Hamilton and Keim (2009) found a similar trend among rural counties in nine U.S. states. Hamilton (2011), however, found a more complex pattern in surveys on climate beliefs in the states of Michigan (25% rural population) and New Hampshire (40% rural population), both

northern states with significant rural populations (US Census Bureau, n.d.). Michigan respondents exhibited the divergent pattern between Republicans and Democrats in the relationship between education and climate change beliefs. However, in New Hampshire, increasing education was correlated with increasing belief in climate change; there was no significant difference in the pattern between Republicans and Democrats. Again, these studies show that there are fine-scale patterns of belief about climate change, but are not sufficiently detailed to point to ways to tailor climate change discussions for individual local communities.

Several researchers have aimed to build a detailed picture of climate beliefs and related behavior among people in rural, resource-dependent industries such as agriculture. For example, Arbuckle et al. (2013) surveyed 5,000 farmers in the Midwestern U.S. on their beliefs about climate change. They found that two-thirds of participants believed that climate change was real, and those who accepted the reality of climate change were more likely to express support for both mitigation and adaptation than more skeptical farmers. Arbuckle et al. compared the past and planned actions related to predicted drought conditions among the three groups. They determined that those who accepted the reality of climate change were more likely to undertake adaptation actions to adapt to the drier conditions. This suggest beliefs about global warming may play a particularly important role in determining whether and how agricultural communities take action to adapt to climate change. These trends among U.S. farmers were consistent with a study in Australia where Raymond and Spoehr (2013) surveyed Australian farmers about their climate change beliefs and their past and planned behavior. Approximately one-third of their respondents believed climate change was a reality, one-third did not believed it was real, and one-third was unsure. Many studies focus on specific resource-dependent industries such as those above that address beliefs and attitudes of farmers. A critical gap in our understanding of climate change beliefs in rural America relates to participants and leaders in local governance.

Research on farmers will certainly be relevant to climate adaptation in many rural areas. However, each of the thousands of rural towns in America makes a multitude of decisions that can incorporate climate change adaptation and mitigation. Each one plans for its future, creates zoning ordinances, supports economic development, implements emergency response mechanisms, develops contingency plans for natural disasters, and more. Though they wield such great influence on local climate-related actions, little attention has been paid to understanding the patterns of their climate beliefs. This study aims to fill that gap.

Since small, rural municipalities commonly rely on volunteers and staff with minimal training to address many climate-related functions (Flora & Flora, 2013), personal beliefs about climate change may play a disproportionately larger role in rural decision making than in non-rural places. Beliefs among rural actors may not be tempered by training, informed by experts, or coordinated by institutional structure or skilled leadership, as they might be in larger-scale governance institutions. Instead, personal normative and behavioral beliefs may be a primary guide for rural actors grappling with complex and controversial issues. Also, different groups of rural actors may have different belief patterns. Those who actively participate in committed roles in local rural government, for example, have been shown to have different views from those who do not substantively engage in local governance (Luloff & Hodges, 1992; Matarrita-Cascante & Luloff, 2008). Seasonal and year-round residents often have different attitudes, beliefs and values (Clendenning, Field, & Kapp, 2005; Stedman & Hammer, 2006; Matarrita-Cascante, Stedman, & Luloff, 2010). Newcomers, commonly amenity migrants, may also have different attitudes and beliefs from natives (Smith & Krannich, 2000). Gender may also play a role, as found in prior research on climate change beliefs (McCright, 2010; Davidson & Haan, 2012). So, characterizing climate change beliefs among municipal actors will be crucial to effectively supporting adaptation in rural municipalities.

This study contributes to efforts many planners, researchers and community residents are pursuing to support climate change adaptation among municipal actors in rural areas. Understanding fine-scale variations in climate beliefs among rural populations will be crucial to this goal.

The first objective in this study was to measure rural actors' beliefs about climate change, and to determine how beliefs differ among groups of rural actors. Building on past work, we surveyed rural actors' beliefs about climate change and its effects. Prior research found that demographic factors were related to climate change beliefs, so we determined how beliefs differed among groups of rural actors based on exogenous and demographic factors such as political beliefs, party affiliation, education, residency status and other characteristics of individual respondents. Such a detailed understanding of climate change beliefs among rural actors will help to identify those rural actors who are most likely to be open to adaptation efforts and to tailor education efforts.

Our second objective in this study was to characterize how climate beliefs vary among those who participate substantively in rural municipal governance and those who do not. This study characterizes the climate beliefs of those substantively involved in rural governance activities and compares them to those who reside in the same communities but do not participate substantively in governance activities. As key decision-makers in rural communities, the beliefs of those serving in committed municipal service are particularly important to adaptation efforts.

## Methods

### Study Site

Washington County is in Downeast Maine and shares a border with New Brunswick, Canada. Its southern border is a rugged, rocky coastline along the Gulf of Maine. Washington County is very rural. Of the 42 incorporated municipalities in the county, 18 have populations under 500 people, and the largest town, Machias, has just 2,221 (Maine Census State Data Center, n.d.). Most municipalities rely on volunteers and part-time employees who receive assistance from a variety of county, regional and state programs in order to conduct town functions and comply with state and federal laws. Town planning and select boards often have a mix of native residents, retirees and other in-migrants. Seasonal residents also often participate in town governance as volunteers. Votes on important municipal matters typically take place at town meetings.

Resource dependent industries comprise the primary economic activity in the region. The forest products and fishing industries have declined significantly in recent decades, though agriculture and tourism have been expanding in the area. Employment in the agricultural sector in Washington County increased by 30% between 2003 and 2013 (Maine Center for Workforce Research and Information, 2014), and the value of agricultural products sold in the county increased almost four-fold between 2002 and 2012 (US Department of Agriculture, 2015). The number of farms hasn't changed significantly in this period, but the increase in profitability and employment arose with a burgeoning industrial blueberry crop and an increasing number of small, diversified farms operated by younger in-migrants and supported by a vibrant local foods movement in the state.

Poverty, often generational, and unemployment are persistent problems in the region, and educational attainment and incomes are persistently low. In 2012, the poverty rate in Washington County was 19.4%, compared with 14.4% for the State of Maine and 15.9% for the U.S. (US Census Bureau, n.d.).

Howe et al. (2015) estimated that 60% of Washington County residents believe "global warming is happening." The estimate for the state of Maine was 64%, slightly higher than the national estimate of 63%. Only one other Maine county, Piscataquis, had a lower estimate with 57%. Two-thirds of Maine residents sampled in a recent study agreed or strongly agreed that they were concerned about the effects of global warming on the state. Another 16.7% of participants disagreed or strongly disagreed (Anderson, Noblet, & Teisl, 2012).

**Survey Instrument**

Data were collected through Internet survey. Adults who had been involved in any capacity with local governance Washington County formed the sample frame. Through town websites and mailing lists provided by the county council of governments, we compiled a panel of 708 names and email addresses. The survey was administered in the Qualtrics online survey system, which managed invitations and two reminders, each five days apart (Dillman, Smyth, & Christian, 2009).

Survey items addressed perceptions and beliefs about climate change and were modeled on prior work to enable comparison (e.g. Pew Research Center, 2014a & 2014b; Arbuckle et al., 2013; Raymond and Spoehr, 2013; Hamilton and Keim, 2009; and Leiserowitz, et al., 2014). Participants were presented with a list of environmental problems related and asked to rate the effect of each on their community. Another survey question asked respondents to indicate how much they agreed or disagreed with a variety of statements about global warming (Appendix C).

Voters who are independent (unaffiliated with any party) now make up the largest proportion of the American electorate (Pew Research Center, 2015; Jones, 2014) and more than one-third of Maine's registered voters (Maine Bureau of Corporations, Elections & Commissions, 2014). Therefore, it is common practice in polls and surveys to query respondents on their party leanings, in addition to party affiliation (e.g. Pew Research Center, 2014; Hamilton, 2011; Hamilton & Keim, 2009). In this way, party affiliation can be modeled as a continuous rather than binary variable. In our survey, party affiliation was recoded as an ordinal variable ranging from Republican (1); to Independent, leaning Republican (2); Independent, neutral (3); Independent, leaning Democrat (4); and Democrat (5). This approach can help to distinguish among moderate voters who may be registered independent but tend to identify with an ideological framework.

**Analysis**

Analysis was performed using SPSS Statistical Software using a 95% confidence interval, except where otherwise noted. To assess inter-item reliability, we calculated Cronbach's alpha for all of the climate change belief items, as well as the climate change observation items.

An unweighted mean of all six belief items was calculated to comprise a composite global warming belief score. For the observed climate change-related phenomena items, we calculated means for each item for ranking, as well as an unweighted mean of all items to create a climate change observation score. Pearson correlation coefficients were calculated to determine the relationship between climate observation score and both the climate belief score and the single climate belief item regarding observation: *I have personally observed the effects of global warming*. A linear regression was used to determine whether there was a significant relationship between global warming belief score and climate change observation score.

Our first objective was to develop a detailed understanding of climate change belief patterns among all respondents. We performed a K-means cluster analysis on key demographic and behavioral variables to identify distinct segments among the respondents. To determine the appropriate number of clusters, we used ANOVA comparisons among the clusters for each input variable to determine which number of clusters yielded the most significant differences and therefore the most distinct groupings that converged after 15 iterations or fewer while still providing clusters large enough to use for statistical comparison. Using demographic and behavioral variables, we performed chi square tests to characterize difference among the clusters.

Once clusters were identified and characterized, using an ANOVA we compared mean global warming belief scores and mean climate change observation scores between clusters to determine whether there were significant differences in beliefs.

Following the example of Hamilton and Keim (2009) and Hamilton (2011), we tested for the divergent pattern related to climate change beliefs, education, and party affiliation observed in prior studies. An interaction variable was calculated as a composite of party affiliation and education. To center the ordinal party affiliation and education variables, the mean of each was subtracted from the rating for each case, and the centered variables were multiplied to create the PartyXEducation interaction variable. Using linear regression, the relationship between the PartyXEducation interaction variable (independent variable) and global warming belief score (dependent variable) was measured.

Our second objective was to understand differences in beliefs between those who are engaged in committed service to their municipalities and those who are not. T-tests comparing means of global warming belief score and climate change observation score were conducted based on type of municipal service (committed as staff, EMS or board volunteer vs. merely

attending meetings). The cluster analysis described above also provided insights into differences between the two groups.

**Sampling Error and Non-Response Bias**

We calculated margins of error for the total county population, as well as key segments of the population, including those participating in municipal governance. We compared relevant variables to contemporary census data and prior studies and estimates of climate beliefs to detect non-response bias in our sample. In another test for non-response bias, we compared demographic responses between the three waves of responses corresponding to the first invitation and the reminders (Lankford, Buxton, Hetzler, & Little, 1995). Statistical analysis was conducted using SPSS Statistics software using a 95% confidence interval, unless otherwise noted. Assuming normal response distributions, we estimate the margin of error to be +/- 7% at a 95% confidence interval. One-way ANOVAs were conducted comparing the three waves of respondents for global warming belief score, political beliefs, education, and income. The analysis showed no significant differences between waves.

## Results

From the panel of 708, there were 293 (41%) survey responses initiated. We removed 47 invalid cases from the data set from respondents who did not reside within the study area, either seasonally or year-round. In total, there were 214 valid or partially valid responses on the climate change belief and observation items (30% of the panel; 73% of initiated surveys).

**Respondent Demographics**

The median age category of respondents was 50 to 59 years, while the median age for Washington County was 46.1 years (US Census Bureau, 2015). So the sample was, on average, older than the county at large. The survey respondents also had higher educational attainment than the county as a whole. More than 58% of respondents hold a bachelor's degree or higher, while just 20% of the adults in the county have a bachelor's degrees or higher (US Census Bureau, 2015). The median household income category among survey respondents was $40,000 to $55,000, comparable to the U.S. median household income, but much higher than the county median income of $37,236. Fifteen respondents (8%) reported their primary occupation as fisheries, forestry or farming. This figure is higher than the Maine Department of Labor's estimate of 3.3% for Washington County (Maine Center for Workforce Research and Information, 2015). An additional 19 (11%) reported fishing, farming or forestry as their secondary occupation. (Table 4.1)

Table 4.1. Demographic characteristics of survey respondents.

| Demographic Characteristics | n | % | Census |
|---|---|---|---|
| *Gender* | | | |
| Female | 104 | 52.3 | |
| Male | 88 | 44.2 | |
| Prefer not to answer | 7 | 3.5 | |
| *Age* | | | |
| 18 to 29 years | 5 | 2.3 | |
| 30 to 39 years | 14 | 6.6 | Median |
| 40 to 49 years | 34 | 16.0 | 46.1 a |
| 50 to 59 years* | 57 | 26.8 | |
| 60 to 69 years | 73 | 34.3 | |
| 70 years or more | 30 | 14.0 | |
| *Household Income* | | | |
| Less than $25,000 | 28 | 14.6 | Median |
| $25,000 to $40,000 | 36 | 18.8 | $37,236 b |
| $40,000 to $55,000* | 25 | 13.0 | |
| $55,000 to $70,000 | 31 | 16.1 | |
| $70,000 to $85,000 | 18 | 9.4 | |
| More than $85,000 | 54 | 28.1 | |
| *Education* | | | |
| High School Diploma | 12 | 5.9 | |
| Some College | 73 | 35.9 | % |
| Bachelor's Degree or Higher | 118 | 58.2 | 20.0 b |
| *Resource-Dependent Occupation* | | | |
| Not Resource-Dependent | 146 | 81.1 | % |
| Resource-Dependent Secondary | 19 | 10.6 | |
| Resource-Dependent Primary | 15 | 8.3 | 3.3 c |

* Median category

a Maine Census State Data Center, n.d.

b US Census Bureau, 2015

c Maine Center for Workforce Research and Information, 2015

One hundred respondents (47%) reported committed service to their communities. Those in committed service include paid staff (e.g. code enforcement officer, assessor or town clerk) and volunteers (e.g. member of a planning board or select board or volunteer firefighter).

Of remaining 114 respondents (53%), 96 (45% of all respondents) indicated that they had attended and/or voted at town meetings. Eighteen respondents (8% of all respondents) reported no participation in municipal governance, though five of these reported volunteering with local non-governmental organizations. There were 189 (88%) year-round residents, and 25 (12%) seasonal residents in the sample. (Table 4.2)

Table 4.2. Survey respondents reporting committed service to their municipality and residency status.

| **Service & Residency** | n | % |
|---|---|---|
| *Committed Service to Municipality* | | |
| None or Mtg & Voting Only | 114 | 53.3 |
| Committed Service | 100 | 46.7 |
| | | |
| *Residency Status* | | |
| Year-Round | 189 | 88.3 |
| Seasonal | 25 | 11.7 |

Cluster analysis using a K means method identified five clusters based on six ordinal demographic and behavioral variables with 13 iterations. Inputs for the cluster analysis included only cases that had valid responses for all input variables, and the input variables were standardized prior to analysis. The five resulting clusters showed significant differences for all six variables based on ANOVA comparisons ($p < 0.01$). (Table 4.3.)

Table 4.3. Results of K-means cluster analysis.

| | Cluster Centers of Standardized Variables | | | | |
|---|---|---|---|---|---|
| | ***Municipal Committed*** | ***Engaged & Wealthy Conservatives*** | ***Older & Making Ends Meet*** | ***Older, Highly Educated Liberals*** | ***Young, Educated Liberals*** |
| *Cases in Cluster* | *22* | *27* | *43* | *41* | *32* |
| Years at Primary Residence | -0.169 | 0.447 | 0.589 | -0.140 | -0.873 |
| Age | -0.149 | 0.293 | 0.353 | 0.587 | -1.372 |
| Household Income | 0.218 | 0.662 | -0.747 | 0.385 | -0.198 |
| Educational Attainment | -0.677 | 0.569 | -0.913 | 0.880 | 0.086 |
| Municipal Service Level of Commitment | 1.859 | 0.153 | -0.120 | -0.541 | -0.553 |
| Party Affiliation a | -0.500 | -1.386 | 0.308 | 0.611 | 0.316 |

a Ordinal; excludes "other"

| | Cluster ANOVA | | |
|---|---|---|---|
| **Input Variable** | **F** | **Sig.** | |
| Years at Primary Residence | 15.67 | 0.000* | |
| Age | 40.52 | 0.000* | |
| Household Income | 14.76 | 0.000* | |
| Educational Attainment | 44.82 | 0.000* | |
| Municipal Service Level of Commitment | 61.01 | 0.000* | |
| Party Affiliation a | 38.04 | 0.000* | |

* $p < 0.05$

In one cluster we have named *Municipal Committed* (n = 22) 100% of respondents reported committed service to their municipalities, and further analysis revealed that 91% of the *Municipal Committed* cluster served in municipal staff roles. Just over half (55%) of the *Municipal Committed* were Republican or Independent/ Leaning Republican, 59% identified as conservative, and just over a quarter (27%) had a four-year college degree or higher. Half (48%) were female (Table 4.4).

More than two-thirds of the *Engaged & Wealthy Conservatives* cluster (n = 27) were Republican or Independent/ Leaning Republican, and nearly two-thirds identified as conservative (63%). They were well-educated with 78% holding a four-year degree, and 41%

were retired. More than three-quarters were male. The *Engaged & Wealthy Conservatives* cluster had the highest income, and 89% report committed volunteer service on either municipal boards, community non-governmental organizations (NGO), or both (Table 4.4).

The group with the least educational attainment and lowest income was the largest cluster: *Older & Making Ends Meet* (n = 43). This cluster was largely Democrat or Independent/ Leaning Democrat (60%), but most regarded themselves as moderates (44%) or conservatives (33%). More than two-thirds (37%) of those in the *Older & Making Ends Meet* cluster are retired, and 83% report committed service to their municipality or a community NGO. About one-quarter listed farming, fishing or forestry as either a primary or secondary occupation. Sixty percent were female (Table 4.4).

Ninety-eight percent of those in the *Older & Highly Educated Liberals* cluster (n = 41) held four-year degrees or higher. They were the oldest cluster and most likely to identify with the Democratic Party, though 46% identify as politically moderate. The *Older & Making Ends Meet* cluster was far less likely to report committed municipal service, but three-quarters report volunteer service to a community NGO. Fifty four percent were female (Table 4.4).

The youngest cluster, all under 50 years old, was the *Young, Educated & Independent* cluster (n = 32). Almost two-thirds (63%) of this group were female. Forty-seven percent regard themselves as liberal, but more than two-thirds (69%) listed their party affiliation as independent. Notably, more than one-third of those in the *Young, Educated & Independent* cluster (38%) reported fishing, farming or forestry as their primary or secondary occupation. About one-third worked in education or for local NGOs. Seventy-two percent of the *Young, Educated & Independent* cluster held a bachelor's degree or higher (Table 4.4).

There were no significant differences between clusters in their service to community NGOs. Sixty-four percent of all respondents and more than half of respondents in all clusters reported volunteer work for a community organization (Table 4.4).

Table 4.4. Selected demographics of k-means clusters and results of chi square comparisons.

| Demographic | Municipal Comm. | Engaged & Wealthy Conserv. | Older & Making Ends Meet | Older, Educated Liberals | Young, Educated & Indep. | Chi Square χ2 | Chi Square Sig. |
|---|---|---|---|---|---|---|---|
| Years at Primary Residence in >10 (excl. seasonal residents) | 60% | 80% | 89% | 66% | 27% | 31.717 | 0.000* |
| Seasonal Residents b | 9% | 7% | 14% | 15% | 6% | a | |
| Age over 50 Yrs | 45% | 63% | 60% | 80% | 0% | 50.919 | 0.000* |
| Household income < $25K | 0% | 0% | 30% | 2% | 19% | 24.929 | 0.000* |
| Household Income > $70k | 41% | 67% | 12% | 51% | 28% | 26.661 | 0.000* |
| 4 year Degree or Higher | 27% | 78% | 16% | 98% | 72% | 72.812 | 0.000* |
| Republican or Leaning Republican | 55% | 100% | 19% | 5% | 13% | 85.340 | 0.000* |
| Democrat or Leaning Democrat | 27% | 0% | 60% | 71% | 66% | 43.598 | 0.000* |
| Committed Service to Municipality | 100% | 70% | 53% | 22% | 22% | 49.612 | 0.000* |
| Service to Community Non-Profit b | 55% | 63% | 55% | 75% | 72% | 5.399a | 0.249 |
| Gender: Female b | 48% | 23% | 60% | 54% | 63% | 11.323 | 0.023* |
| Fishing, Farming or Forestry Occupation b | 6% | 19% | 24% | 10% | 38% | 10.958 | 0.027* |
| Retired b | 0% | 41% | 37% | 32% | 6% | 21.033 | 0.000* |

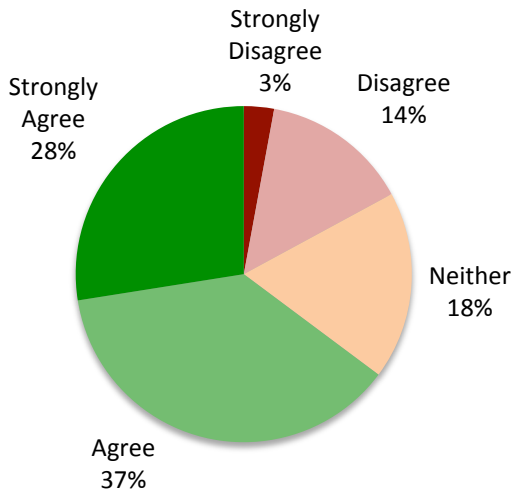
* $p < 0.05$
a Sample size or distribution insufficient to calculate χ2
b Variable not used in cluster analysis

**Climate Change Beliefs & Observations**

Respondents exhibited widespread belief that global warming is occurring, though a large minority remains uncertain or doubtful. Figure 4.1 shows the distribution of global

warming belief scores, the mean of ratings on all six global warming belief items. Nearly two-thirds of all respondents are in the "Agree" or "Strongly Agree" category, meaning they believe or strongly believe that global warming is occurring. Seventeen percent of the means were in the "Disagree" or "Strongly Disagree" category. One in six respondents remained skeptical or deeply skeptical about climate change. The mean belief score for a slightly larger proportion—18%—fell into the "Neither" category. Cronbach's alpha for all of the global warming belief items was 0.932, suggesting that the items closely measure the same construct and are appropriate to aggregate into a composite belief score.

Figure 4.1. Percentages of all respondents in global warming belief categories based on mean belief scores.



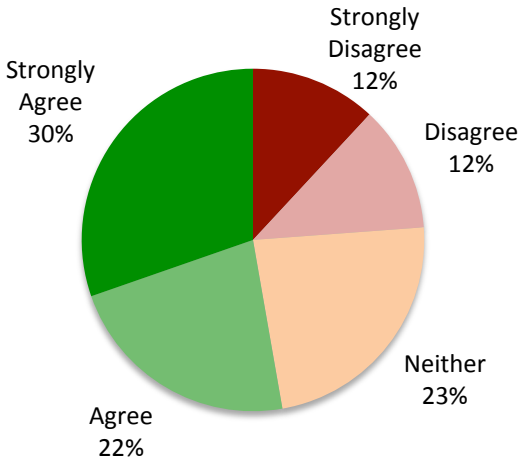

Educational attainment was also positively and significantly correlated with climate belief score ($r$ = 0.248; $p$ = <0.01), and exhibited significant differences among categories of educational attainment in an ANOVA ($p$ = 0.022) with a smaller effect size (ω = 0.216). The regression between the PartyXEducation interaction variable and the global warming belief score

revealed no significant relationship (B = -0.015; standard error = 0.028; $p$ = 0.596).

When asked whether they had “personally observed the effects of global warming,” just over half of respondents (52.6%) agreed or strongly agreed. (Figure 4.2)

A t-test comparison between global warming belief scores of year-round residents and those of seasonal residents showed no significant difference (t = -0.498, df = 202, $p$ < 0.619).

Figure 4.2. Percentages of responses to the statement "I have personally observed the effects of global warming."




Similarly, a t-test comparing the global warming belief scores of those in fisheries, farming and forestry and those in other occupations found no statistically significant difference (t = 1.089, df = 177, $p$ = 0.278). However, the belief scores were significantly higher among females than males (t = 4.112, df = 171, $p$ < 0.01). (Table 4.5)

Table 4.5. T-tests comparing global warming belief scores with demographic variables.

| **Global Warming Belief Score** | | | | **T Test** | |
|---|---|---|---|---|---|
| **Residence Status** | **n** | **Mean** | **Std. Dev.** | **t (df)** | **Sig.** |
| Year-Round Residents | 180 | 3.64 | 1.11 | -0.498 | 0.619 |
| Seasonal Residents | 24 | 3.76 | 1.02 | -202 | |
| **Resource-Dependence** | | | | | |
| Fishing, Farming, Forestry | 34 | 3.86 | 1.12 | 1.089 | 0.278 |
| Other Occupations | 145 | 3.63 | 1.08 | -177 | |
| **Gender** | | | | | |
| Female | 103 | 3.9472 | 0.97125 | 4.112 | 0.00* |
| Male | 88 | 3.3091 | 1.14594 | (171) | |

* $p > 0.01$

The scale for the climate observation items ranged from 0 (no effect) to 1 (minor effect) to 2 (major effect). Cronbach's alpha for all of the climate observation items was 0.869. Computing a correlation matrix revealed a very close, positive correlation (r = 0.826) between two of the climate observation items regarding changing location (mean = 1.22) and changing abundance (mean = 1.12) of plants and animals. These two items also had the highest mean ratings among the climate observation items, indicating that respondents were more likely to report observing a major effect on these than on other items. With these two items composited into a single variable by calculating their mean, Cronbach's alpha was 0.846. The correlation matrix of the climate change observation items also revealed that responses on the flooding of rivers and streams item had non-significant correlations with four of the other climate observation items. (Table 4.6)

Table 4.6. Correlation matrix for climate change observation items.

| | Coastal flood | River/ stream flood | Warm sum | Abund | Loc/ mvts | High rainfall | Agric Pests | Forest pests | Lyme disease |
|---|---|---|---|---|---|---|---|---|---|
| River/ stream flooding | .278** | | | | | | | | |
| Warm summers | .256** | .258** | | | | | | | |
| Abundance | .375** | 0.126 | .387** | | | | | | |
| Locations/ movements | .385** | .176* | .352** | .806** | | | | | |
| High rainfall | .265** | .287** | .360** | .407** | .434** | | | | |
| Agric. Pests/ diseases | .309** | 0.084 | .362** | .474** | .425** | .331** | | | |
| Forest pests/ diseases | .220** | .162* | .401** | .493** | .501** | .457** | .701** | | |
| Lyme disease | .218** | 0.052 | .286** | .306** | .360** | .376** | .423** | .374** | |
| Loss of habitat | .175* | 0.08 | .390** | .476** | .512** | .336** | .527** | .495** | .544** |

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 4.7 shows the ranking of climate observation items by mean effect. Respondents reported seeing the greatest effect in the changes in abundance of animals and plants (mean 1.22 on a scale of 0 to 2), and this impact was observed by 82%. The flooding item had the highest percentage of respondents (81.9%) reporting that they had observed this phenomenon, though it ranked 7$^{th}$ by mean, indicating a large majority of respondents have observed the phenomenon, but they are less likely to regard it as having a major effect.

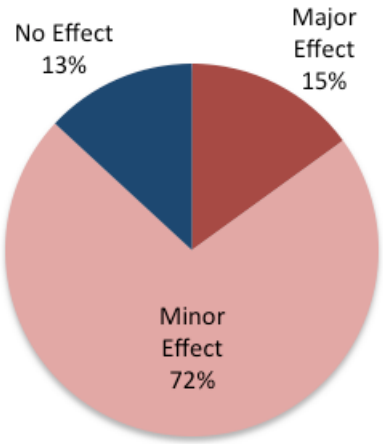
Table 4.7. Ranked means of climate observation items.

| Climate Observation Items | n | % See Effect | Mean | Std. Dev. |
|---|---|---|---|---|
| Changes in abundance of animals or plants | 197 | 81.7 | 1.22 | 0.734 |
| Changes in locations/ movements of animals or plants | 195 | 80 | 1.12 | 0.712 |
| Lyme disease | 184 | 81.5 | 1.11 | 0.688 |
| Loss of habitat for animals or plants | 186 | 75.2 | 1.07 | 0.750 |
| Unusually high amounts of rainfall | 196 | 78.1 | 1.07 | 0.709 |
| Forest pests or diseases | 182 | 79.1 | 1.02 | 0.664 |
| River or stream flooding | 198 | 81.9 | 0.98 | 0.587 |
| Agricultural pests or diseases | 182 | 75.8 | 0.93 | 0.645 |
| Coastal flooding | 198 | 66.1 | 0.80 | 0.666 |
| Unusually warm summers | 198 | 59.1 | 0.70 | 0.658 |
| **Mean** | **198** | **75.85** | **1.02** | **0.442** |

0 = No Effect, 1 = Minor Effect, 2 = Major Effect
Excludes "Unsure"

The mean climate observation score for all observation items for all respondents was 1.02, roughly equivalent to “minor effect.” Figure 4.3. shows the frequency distribution of climate change observation scores. Eighty-seven percent of respondents’ scores were in either the minor effect or major effect category. Recall that the climate observation items did not refer to climate change explicitly and instead asked respondents if they had observed specific phenomena that scientists say are linked to climate change and are occurring in Maine.

Figure 4.3. Percentages of all respondents in climate change observation score categories



An ANOVA comparison of means on climate observation items by party affiliation indicated a significant difference ($p < 0.05$, $\omega = 0.672$). A multiple comparisons table using a 99% confidence interval indicated significant differences between Democratic-leaning independents and both Republicans ($p = 0.001$) and Republican-leaning independents ($p = 0.007$).

The climate change observation score was significantly and positively correlated with climate belief score and with responses to the item asking respondents to indicate their agreement/ disagreement with the statement: "I have personally observed the effects of global warming." However, a t-test found a significant difference ($t = 5.26$, $df = 201$, $p < 0.01$) in global warming belief scores between those with climate change observation scores of 0.49 or lower (on average seeing no effect) and those with scores of 0.50 or higher (on average seeing a minor or major effect). A linear regression showed that climate observation score predicted just 16.2% of the variation in global warming belief score, though the relationship was significant ($F = 38.82$, $p < 0.01$). (Table 4.8)

Table 4.8. Results of bivariate correlation with climate change observation score and global warming belief and global warming observation item.

| Correlation with Climate Change Observation Score | | | |
|---|---|---|---|
| | **n** | **r** | **Sig.** |
| Global Warming Belief Score | 203 | 0.402** | 0.00 |
| "I have personally observed the effects of global warming." | 200 | 0.354** | 0.00 |

** Correlation is significant at the 0.01 level (1-tailed).

**Cluster Analysis of Beliefs & Observations**

ANOVA comparisons of mean global warming belief scores between the clusters revealed significant differences ( $F = 12.9$, $p < 0.05$, $\omega = 0.473$; Table 4.9.). The *Municipal*

*Committed* cluster had the lowest mean score and the only mean score below the "Uncertain" category (mean = 2.9 out of 5) and the largest percentage (46%) in the "Disagree" category. However, none of the members in the *Municipal Committed* cluster had a global warming belief score in the "Strongly Disagree" range, and more than one-third had scores in the "Agree/ Strongly Agree" range. The *Engaged & Wealthy Conservatives* had global warming belief scores normally distributed around the "Uncertain" category, which was their mean score. Two-thirds of the *Older & Making Ends Meet* cluster had mean global warming belief scores in the "Agree/ Strongly Agree" range, but one-third remained uncertain or doubtful. Of the *Older, Highly Educated Liberals* cluster, 80% were in the "Agree/ Strongly Agree" range.

Those in the *Young, Educated and Independent* cluster had the highest global warming belief scores with the least variability. Not only was the youngest cluster most likely to believe global warming is occurring, they had the greatest certainty in their beliefs. None in this cluster had belief scores in the "Disagree" or "Strongly Disagree" category, and just two (7%) were in the "Uncertain" range.

Table 4.9 Global warming belief scores among clusters.

| **Cluster** | **n** | **Mean** | **Std. Dev.** |
|---|---|---|---|
| Municipal Committed | 22 | 2.9 | 1.07 |
| Engaged & Wealthy Conservatives | 27 | 3.0 | 1.08 |
| Older & Making Ends Meet | 43 | 3.6 | 0.93 |
| Older, Highly Educated Liberals | 41 | 4.1 | 1.11 |
| Young, Educated & Independent | 32 | 4.4 | 0.58 |
| **Total** | **165** | **3.7** | **1.10** |

| | **F** | **Sig.** | **Effect Size** |
|---|---|---|---|
| **ANOVA Between Clusters** | 12.9 | 0.000* | 0.473 |

* $p < 0.05$

There was no significant difference in climate change observation scores between the clusters, with more than two-thirds of all mean scores in the "Minor Effects" range. (Table 4.10.)

Table 4.10. Climate change observation scores among clusters.

| **Climate Change Observation Scores** | **N** | **Mean** | **Std. Dev.** |
|---|---|---|---|
| Municipal Committed | 22 | 0.881 | 0.42 |
| Engaged & Wealthy Conservatives | 27 | 0.872 | 0.44 |
| Older & Making Ends Meet | 43 | 1.063 | 0.42 |
| Older, Highly Educated Liberals | 41 | 1.078 | 0.48 |
| Young, Educated & Independent | 32 | 1.136 | 0.40 |
| **Total** | **165** | **1.03** | **0.44** |

| | **F** | **Sig.** |
|---|---|---|
| **ANOVA Between Clusters** | 2.2 | 0.075 |

**Climate Change Beliefs and Committed Municipal Service**

The results of the cluster analysis showed that municipal staff are a demographically distinct group from those who serve in volunteer roles or non-committed roles in municipal governance. As we have shown, clusters with the greatest committed involvement in municipal government had the lowest global warming belief scores. Comparing belief scores of all respondents, those reporting committed service in their municipality did indeed have lower mean global warming belief scores (mean = 3.41; st. dev. = 1.097) than those reporting no committed service (mean = 4.00; st. dev. = 1.037). A t-test comparison indicated that the difference was highly significant (t = 3.92, degrees of freedom = 197, $p < 0.01$). (Table 4.11.)

Table 4.11. Results of t-test comparison of global warming belief scores between respondents with and without committed service in their municipality.

| | | | | T Test | |
|---|---|---|---|---|---|
| **Service** | **n** | **Mean** | **Std. Dev.** | **t (df)** | **Sig.** |
| Committed Service | 97 | 3.41 | 1.1 | 3.92 | 0.000* |
| No Committed Service | 107 | 4 | 1.04 | (197) | |

* $p < 0.01$

While cluster analysis showed no statistically significant difference in climate change observation score between clusters, a direct comparison between those with and without committed service showed a significant difference. As with the global warming belief score, those who reported committed service to their municipality had significantly lower climate observation scores than those who did not (t = 2.882, df = 211, $p = 0.004$). (Table 4.12.)

Table 4.12. Results of t-test comparison of global warming belief scores between respondents with and without committed service in their municipality.

| | | | | T Test | |
|---|---|---|---|---|---|
| **Service** | **n** | **Mean** | **Std. Dev.** | **t (df)** | **Sig.** |
| Committed Service | 100 | 0.93 | 0.45 | 2.882 | 0.004* |
| No Committed Service | 113 | 1.10 | 0.42 | (211) | |

* $p > 0.01$

## Discussion

In our sample, two-thirds of all respondents believed global warming was occurring, though a sizeable minority—about a third—either did not believe global warming was occurring or were unsure. Overall, these proportions are similar to those found in the recent Pew Research Center

poll (2014a), the Arbuckle et al. (2013) survey of Midwestern farmers, and the survey of Maine residents by Anderson, Noblet, and Teisl (2012). The findings are also consistent with current national estimates that show declining belief in global warming in the U.S. (Pew Research Center, 2014a; Leiserowitz, et al., 2014). Over half of respondents said they had personally observed the effects of global warming. This was a lower proportion of rural Maine residents in than reported in Hamilton and Keim's study in 2009 (63%). Without more detail about how data were collected in the 2009 study, it is difficult to determine whether the difference is due to declining climate belief or differences in measurement or both.

The results of the cluster analysis and more detailed demographic and behavioral data provide a far more nuanced understanding of the patterns of climate beliefs among the respondents. For example, there was no significant difference in global warming belief scores between those directly engaged in resource-dependent occupations such as farming, fishing and forestry and those in other occupations. This likely relates, in part, to the changes in the agricultural sector in Washington County. In this study, 38% of those in the *Young, Educated & Independent* cluster were in fishing, farming or forestry, the vast majority of these were in farming. It's likely that most of these agrarians owned or worked at small, diversified farms, a growing sector in the region. The *Engaged & Wealthy Conservatives* and *Older & Making Ends Meet* clusters also had significant numbers in fishing, farming or forestry occupations (19% and 24% respectively), also mostly in farming. Farmers in these clusters may represent either the industrial blueberry sector, those farming in their retirement, or other sectors of the industry. Farmers involved in different sectors and residing in different demographic segments likely have differing views and beliefs related to climate change. So they will not appear as a statistically distinct group, and may behave differently when engaged with local governance arrangements. Our survey was not designed to sample farmers specifically, so the sample is too small and

unrepresentative to make definitive conclusions. However, the results point to potential diversity that may otherwise have been obscure, and they suggest avenues for future research.

Similarly, there were no significant differences in mean belief or observation scores between seasonal and year-round residents, and the cluster analysis provides a potential explanation. There were a few seasonal residents in each of the clusters, suggesting they may be demographically diverse. However, the sample of seasonal residents was small, so further, more focused study may be required to definitively characterize their belief patterns.

Notably, this study did not find a significant divergent effect of education on global warming beliefs related to party affiliation. This pattern has been noted in multiple studies (Hamilton, 2011; Hamilton and Keim, 2009). However, Hamilton (2011) found that it did not hold true in New Hampshire, Maine's northern New England neighbor. There, as in Maine, education and belief in global warming were positively correlated, regardless of party affiliation. This implies that educational institutions may play a larger role in promoting climate adaptation in northern New England than in other areas of the nation.

When respondents were asked explicitly about climate change, their responses varied significantly with party affiliation. However, respondents were far more inclined to report observing climate change-related phenomena that were not explicitly related to climate change on survey items, and their responses varied less along party lines. This suggests that respondents were observing or hearing about impacts, but may not always have attributed them to climate change and invoking its attendant controversy. If so, then discussing specific impacts and vulnerabilities without invoking climate per se, may be a politically viable strategy for promoting climate change adaptation among rural communities with strong vanes of climate change skepticism. In the case of our study area, potential areas of focus might be on changing

abundance, location, or movements of plants and animals (observed to have the highest impact) or flooding (observed by the largest number of respondents).

In much prior work, party affiliation and political ideology have been shown to be overriding factors in determining climate change beliefs (Pew Research Center, 2015; Leiserowitz, et al., 2014). Other variables such as gender and education play a significant but subordinate role (Hamilton & Keim, 2009). An important outcome of the cluster analysis is that it showed multiple factors in addition to party affiliation or ideology that have a significant but subtle and interrelated relationship with climate change beliefs. This was particularly informative with regard to our second objective to understand the climate change beliefs of those reporting committed service to their municipalities.

Those who reported committed service to their municipalities were more conservative, skeptical about global warming, and less likely to report observing climate change-related phenomena. However, the cluster analysis distinguished those serving as municipal staff as a distinct cluster from those serving in volunteer municipal roles, the *Municipal Committed*, that exhibited significantly lower global warming belief scores than all other clusters. Those serving as volunteers on municipal boards were scattered among all other clusters, but the greatest number were in the most conservative cluster, the *Engaged & Wealthy Conservatives* (48%), and the most moderate cluster, *Older & Making Ends Meet* (42%). The vast majority in all clusters engaged in community service behavior, but the more liberal and Democratic respondents focused their volunteer work on community NGOs. Far fewer (22%) of the respondents in the *Older, Highly Educated Liberals* and *Young, Educated & Independent* clusters engaged in committed service to their municipalities, while three-quarters of those in both clusters report service to NGOs. This self-segregation with regard to types of service helps to explain the belief patterns observed in greater detail and could be crucial in formulating strategies to promote

adaptation in rural communities.

The youngest cluster (*Young, Educated & Independent*) and not the most liberal cluster (*Highly Educated Liberals*) had the highest global warming belief scores and were among the least likely to report committed service to their municipality. This points to potential generational factors and demographic changes at work among the respondents. The *Young, Educated & Independent* cluster was predominantly composed of relatively young farmers, educators, and social service workers, and nearly three-quarters of that cluster had lived in their primary residence for less than 10 years. The *Young, Educated & Independent* cluster was also slightly more moderate than the *Highly Educated Liberals*, but were largely devoid of doubts about climate change, exhibiting little variability in their global warming belief scores (mean = 4.4, std. dev. = 0.58). Further study will be needed to fully characterize these trends, but this pattern suggests potential strategies for promoting climate change adaptation. For example, actively engaging members of the *Young, Educated & Independent* demographic in committed municipal service may be a way to diversify climate beliefs and energize local efforts. Given that 72% of those in the *Young, Educated & Independent* cluster report attending and voting at town meetings, engaging them may be an achievable goal. Also, the debate over climate change may diminish over time in the region if younger people tend to be more accepting of climate science.

## Conclusion

The landscape of climate beliefs is more diverse than national and statewide polls and studies might suggest. This is especially true with regard to rural areas where sparse populations can be statistically overwhelmed by larger neighboring populations. Our study has elucidated

important, fine-scale insights about the climate beliefs among rural actors that have significant implications for efforts to promote climate change adaptation and mitigation locally.

The results of this study point to strategies for planners, applied researchers and others that may help in promoting climate change adaptation in rural communities. Climate belief patterns may vary geographically, so it's important to understand local trends. A critical first step in promoting adaptation is to develop a fine-scale understanding of local climate belief patterns.

Those performing committed service, fulfilling crucial functions in thousands of small municipalities across the U.S., are the most involved in decisions relevant to climate adaptation on the local level. In our study, they were least inclined toward believing that climate change was occurring, but others—particularly the *Young, Educated & Independent* cluster—were more engaged in other types of community service and were more likely to believe in the reality of climate change. Engaging more diverse groups in committed service may bridge that gap, but also promoting collaboration between NGOs and municipal government may be a fruitful way to gain traction on adaptation.

Our results also suggest that climate beliefs, closely linked with political identity and affiliation, may make discussions and proposals that are explicitly about climate change more controversial because the prevalence of skepticism among those engaged in committed municipal service. However, observations of local, climate-related, environmental changes are more widespread and may present opportunities for proposing and planning adaptation. In the case of our study area, for example, respondents saw the greatest impact in the changes of locations and movements of plants and animals, so municipal strategies might include developing plans for resource-dependent industries to adapt. Flooding was most widely observed, and many municipal strategies aimed at flood control, wetlands conservation, and

improving transportation infrastructure could address these concerns. A critical line of research for the future will be to identify which of these climate-related changes are most aligned with local concerns and priorities in rural communities.

This study, targeting specifically those who have participated in any way with municipal governance, provides insights into they belief patterns only among those already engaged. Demographically, respondents, on average, were older and better educated than the county population at large, though their income level was comparable to the county median. The difference in age and education is likely because those who are younger may be more focused on raising small children, and those with less education may have structural and psycho-social barriers to participating in municipal governance and therefore would have been missed by our sampling methods. Also, the survey did not query respondents about their race, ethnicity or history related to generational poverty and thus did not compare beliefs based on these factors. These factors may have important impacts on climate change beliefs and should be addressed in further studies. Washington County, for example, is home to two Passamaquoddy Native American reservations and a growing Hispanic population, and these were likely under sampled by our methods. Native American populations are largely rural and may be particularly vulnerable to the effects of climate change due to a variety of factors, including cultural and economic dependence on natural resources, persistent poverty, and health problems that may be exacerbated by environmental changes (Bennett, et al., 2014; Voggesser, Lynn, Daigle, Lake, & Ranco, 2013; Chief, Daigle, Lynn, & Whyte, 2014; Daigle & Putnam, 2009). Future research should investigate the beliefs of those less likely to be engaged in municipal governance, and it should seek ways to bring their voices and perspectives into discussions about adaptation. Such studies will be crucial to completing the picture of climate patterns in rural communities and ensuring all rural people are fully empowered to meet the challenges of climate change.

# CHAPTER 5: CLIMATE PRIORITIES AND INVOLVEMENT IN RURAL GOVERNANCE

## Introduction

Rural communities, already grappling with problems such as poverty and declines in resource-dependent industries, are disproportionately vulnerable to challenges presented by a changing climate (Hales, D. et al., 2014). In recent years, there has been a rising call for social science research on climate change in rural communities to understand potential impacts and to support rural communities as they face oncoming challenges (Molnar, 2010; Dunlap, 2010). Moreover, climate change may threaten cultural mechanisms of resilience in rural communities, prompting calls for research that considers actions and their implications more deeply in already-fragile communities (Adger, Barnett, Brown, Marshall, & O'Brien, 2012).

A warming world is affecting rural communities now and will continue to do so for decades, even if a concerted mitigation effort can be mounted. So, there has recently been a renewed focus on adaptation to climate change alongside prevention efforts (Pielke, 2007; Wilbanks, 2003; Wilbanks & Kates, 2010). Adaptation is not only a pragmatic response to inevitable and imminent change, however. Many adaptation strategies are among few available responses to climate change that can be implemented on a small scale for local, immediate benefit. Adaptation strategies such as improving roads to withstand floods, for example, produces visible results immediately while also improving future resilience. By contrast, many mitigation strategies such as conserving rainforests have no immediate, discernible impact because the mechanisms operate at global spatial scales and long time frames.

Polls show, however, that for most Americans global warming ranks low on their list of priorities (Pew Research Center, 2014b; Riffkin, 2014). Even among Americans who believe

global warming is occurring, adapting to climate change is not a top priority. Linking climate adaptation measures to existing, fine-scale and near-term priorities is one way to encourage people in rural communities to take action to adapt (Wilbanks, 2003; Wilbanks & Kates, 2010; Committee on the Human Dimensions of Global Change, 1999). Moreover, it may provide a stepping stone to engaging people in the mitigation global effort (Wilbanks, 2003; Wilbanks & Kates, 2010). Therefore, research is needed to identify priorities, understand how climate-related issues are linked to priorities, and determine what prompts rural actors to action.

Connecting adaptation to priority concerns may be particularly germane to rural climate response efforts. In rural places with persistent poverty and economic distress, issues like global warming framed as an epochal, worldwide problem may be competing with many more immediate issues. So, linking to existing, higher priority concerns may be critical to moving adaptation to a higher priority position. Such an effort must begin by understanding priorities of rural actors and which may be related to potential climate adaptations. The research presented here is part of an on-going effort to develop a theoretical framework and recommendations for planners, academics and government officials promoting climate resilience in rural areas. This study used a web-based survey focused on developing a nuanced, fine-scale understanding of attitudes, priorities, and intentions related to climate change adaptation among those involved in rural governance. It addressed the following objectives:

Objective 1) Priority Concerns and Interests: To determine which issues and potential actions concern and interest rural actors, and to determine how consistent concern and interest are among rural actors.

Objective 2) Concerns and Behavior: To determine whether there is a relationship between climate-related concerns/ interests and past/ planned behavior.

Objective 3) Self- and Community Efficacy: To determine which factors contribute to perceived personal and community efficacy among rural actors, and to determine whether perceived efficacy differs among groups of rural actors.

## Literature Review

### The Theory of Planned Behavior and Climate Priorities

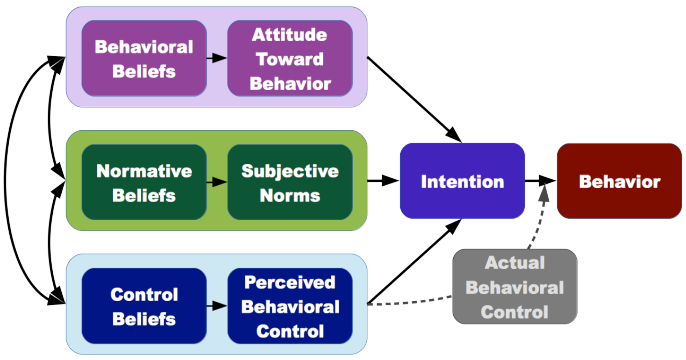
In essence, the goal of this study is to understand how to change the behavior of actors in rural communities, particularly those engaged in making and implementing decisions. Understanding how, when, and why beliefs and priorities translate into action will be crucial to this task. The Theory of Planned Behavior is a widely used framework for understanding and describing the social-psychological building blocks of intention and behavior related to value-laden actions such as climate change adaptation. Many other frameworks related to attitudes and behavior have evolved as extensions or in response to Theory of Planned Behavior.

In 1975, Fishbein & Ajzen proposed the Theory of Reasoned Action (TRA) positing that a person's intentions and eventual behavior is determined by two component factors related to expected outcomes. The first factor is behavioral beliefs, a person's expectations about whether the action would be enjoyable or unpleasant, rewarding or unrewarding, etc. In the context of climate change adaptation, for instance, the expected personal benefits of adaptive actions fall within the rubric of behavioral beliefs. The second factor is normative beliefs, a person's perceptions about what others would think of the intended behavior, especially those close or important to the subject. Normative beliefs give rise to a person's sense of the propriety or other normative aspects of the behavior. Identity and affiliation with a group, such as a political party, contribute to normative beliefs. In the TRA model, for a person to intend to undertake a

deliberate adaptation activity, they must believe that the action to be within the bounds of acceptable behavior among peers, family, and respected individuals.

The Theory of Planned Behavior (TPB), proposed by Ajzen in 1991, is derived from TRA and adds a third belief construct. Control beliefs refer to a person's sense of their own power or capacity to perform the behavior and achieve the desired outcome, their perceived behavioral control (PBC). In the context of climate change adaptation, PBC would relate to a subject's assessment of their capability to undertake an adaptation action, whether they have skills, resources, and capital to perform the task, and whether the action would produce the desired outcome (Figure 5.1). Ajzen and Fishbein later elaborated on the TPB model and developed robust methodological and statistical frameworks for testing related beliefs (Ajzen, 2001, 2002; Fishbein & Ajzen, 2010), often in response to assessments by scholars (e.g. Armitage and Conner, 2001; Kaiser, Hübner, and Bogner, 2005). Intention does not necessarily mean a person will engage in a specific behavior, so an important area of inquiry for Ajzen, Fishbein and others has sought to use the TPB framework to better understand how and when intention translates into deliberate action (Ajzen, Czasch, & Flood, 2009; Daigle, Hrubes, & Ajzen, 2002; Fishbein & Ajzen, 2010; Heberlein, 2012; Hrubes, Ajzen, & Daigle, 2001).

Figure 5.1. A conceptual model of the Theory of Planned Behavior derived from Ajzen (2006).

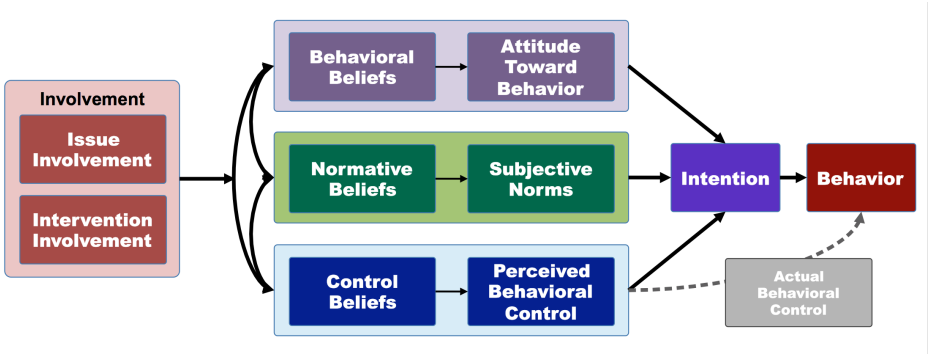


The TPB framework has proven useful in measuring beliefs, expectations, and attitudes related to behavior, but it has been less helpful in developing methods for changing attitudes and behavior (Heberlein, 2012). It has also been criticized because it lacks a formal moral construct (Kaiser, 2006). Kaine, Murdoch, Lourey, and Bewsell (2010) argued that TPB assumed a subject was sufficiently interested and engaged with a proposed behavior to form expectations and intent. Given that climate concerns are low-priority among American adults, such interest and engagement cannot be assumed. Therefore, this limitation of TPB may be especially problematic when applied to climate change adaptation.

**Involvement Theory**

Given a growing call for climate change adaptation measures that are perceived as relevant to existing local needs (Committee on the Human Dimensions of Global Change, 1999; Pielke, Prins, Rayner, & Sarewitz, 2007; Wilbanks, 2003; Wilbanks & Kates, 2010), tools are needed for measuring perceived relevance to understand which potential adaptation actions are of interest to local actors. Kaine et al. suggest that involvement, a concept devised in the 1960s in marketing research, is a precursor to the belief constructs in the TPB model (Figure 5.2.), and may be applicable to environmental issues and actions.

Figure 5.2. Involvement Theory as an extension to Theory of Planned Behavior.




The construct, involvement, is generally defined as "A person's perceived relevance of the object based on inherent needs, values, and interests" (Zaichkowsky, 1985, p. 342). Involvement theory was first developed to aid in understanding consumer behavior, based on the assumption that a product must seem relevant and useful in order for a consumer to form an opinion about it, seek information about it, evaluate alternative products, and make a purchase. Zaichkowsky (1985 and 1994) and Mittal (1995) devised and tested adjective word pairs for use in consumer surveys to test product involvement, a list Zaichkowsky called the Personal Involvement Inventory. Other scales were developed in the 1980s, based on the theoretical framework using scalar measures of relevance (see Mittal, 1995, for a brief overview). Five word pairs are in use today, typically with five-point Likert scales:

- Important to me/ Unimportant to me
- Of concern to me/ Of no concern to me
- Means a lot to me/ Means nothing to me
- Matters to me/ Does not matter to me
- Significant/ Insignificant

Kaine et al. (2010) applied involvement theory to biosecurity regulations in New Zealand. In doing so, they suggested that the framework included two central subconstructs: issue involvement and intervention involvement. Issue involvement describes an individual's concern about the issue itself. In the case of biosecurity, this relates to a person's perception of personal relevance of the issue, their sense of the risk to them, their community, or their livelihood. Intervention involvement relates to perceived relevance of potential actions. In the case of biosecurity, this may relate to the likelihood that a person would transport contraband plant material or engage in farming or forestry practices that might aid or prevent biological invasions. Kaine et al. (2010) suggest visualizing these two dimensions of involvement as axes on a continuum, which we operationalize in this survey research.

Bewsell et al. (2012) applied involvement theory in a survey on biosecurity regulations administered to a convenience sample of university postgraduates and staff. They used word pairs with five-point ordinal scales. The survey also asked respondents about other factors such as their awareness of regulations, compliance behavior, and memory of educational materials from prior travel. It did not differentiate between issue and intervention involvement. Using Cronbach's alpha, Bewsell et al. found high levels of internal reliability for each of the issue areas. They created composite scores of involvement for each of the five issue areas then added the scores together to obtain a composite involvement index (from 5 to 25) for each respondent. The Bewsell et al. study found high levels of involvement in 77% of respondents. Given the convenience sample, the study likely oversampled respondents who were well-informed and directly involved in biosecurity. However, the study did find significant results relating the involvement index. While the Bewsell et al. study may be of limited usefulness, the internal reliability of involvement measures suggests it could be a useful approach in understanding motivation to take action to adapt to climate change and therefore suited to our research aims.

The issue/ intervention involvement framework shows particular promise in studying priorities related to climate change adaptation. If survey respondents are more involved in non-climate issues than they are in climate issues, they may be less likely to act to adapt to climate change. Using the issue/ intervention involvement framework can also help separate concerns related to a contentious issue from concerns related to community resilience. For example, a survey may ask whether respondents are concerned about the issue of climate change (issue) and whether they are concerned about preventing flooding in their community (intervention).

We propose further refining the involvement framework to better understand how it operates in the personal and collective spheres. For example, a subject may feel that agricultural pests pose a significant problem in their community, but they may also feel that agricultural pests are not a significant problem to them personally. A community as a whole may have high issue involvement for agricultural pests, while some of the community's citizens may have low issue involvement for agricultural pests. This distinction is important because collective action to adapt to threats requires the combined will and investment of many citizens. If the problem is a low priority for many citizens, especially for those most involved in governance, the community may not pursue collective action, even though the issue is significant for some in the community.

**Personal and Community Efficacy**

The TPB model, including the perceived behavioral control construct, provides a method for measuring important affective factors that may mediate or constrain both beliefs and involvement. Consider, for example, the role of generational rural poverty. It is well known that generational poverty can diminish a person's sense of self-efficacy (Beegle, 2000; Beegle, Ellis, & Akkary, 2007), which could in turn lead to a diminished motivation to act. The demands and trials of poverty often give rise to adapted norms about how to behave and whom to trust

(Beegle, 2000; Beegle, Ellis, & Akkary, 2007) and injure dignity (Hicks, 2011), which could affect normative and behavioral beliefs. Also, the strictures of poverty constrain priorities that would inevitably influence involvement, especially if the intended behavior in question does not affect immediate survival. In situations where factors such as poverty and economic stress are prevalent (as they commonly are in rural areas), attitudes, motivations and priorities related to climate adaptation may be significantly affected.

Also, the actions of an individual often become part of a collective action, but the TPB framework focuses on the beliefs, intentions and actions of the individual only. TPB, along with its extensions, may be effective in explaining individual planned behavior, for instance, in deciding whether to recycle. However, it cannot sufficiently explain the behavior of engagement in a participatory process. Rural communities often face challenges to governance (Locke & Rissman, 2015) and problems related to capacity (Flora and Flora, 2013; Moser & Ekstrom, 2010) and leadership (Moser & Ekstrom, 2010) that may be additional barriers to climate adaptation requiring collective action. They are barriers not merely because they impede decision-making. They also may influence the control beliefs of participants (or potential participants) in collective processes. A person who sees a governance process as dysfunctional may have lower perceived behavioral control and be discouraged from participating. To understand whether a rural community will undertake climate adaptation actions, it is important to not only examine barriers to action internal to the actor but also those that rest on their beliefs about the process.

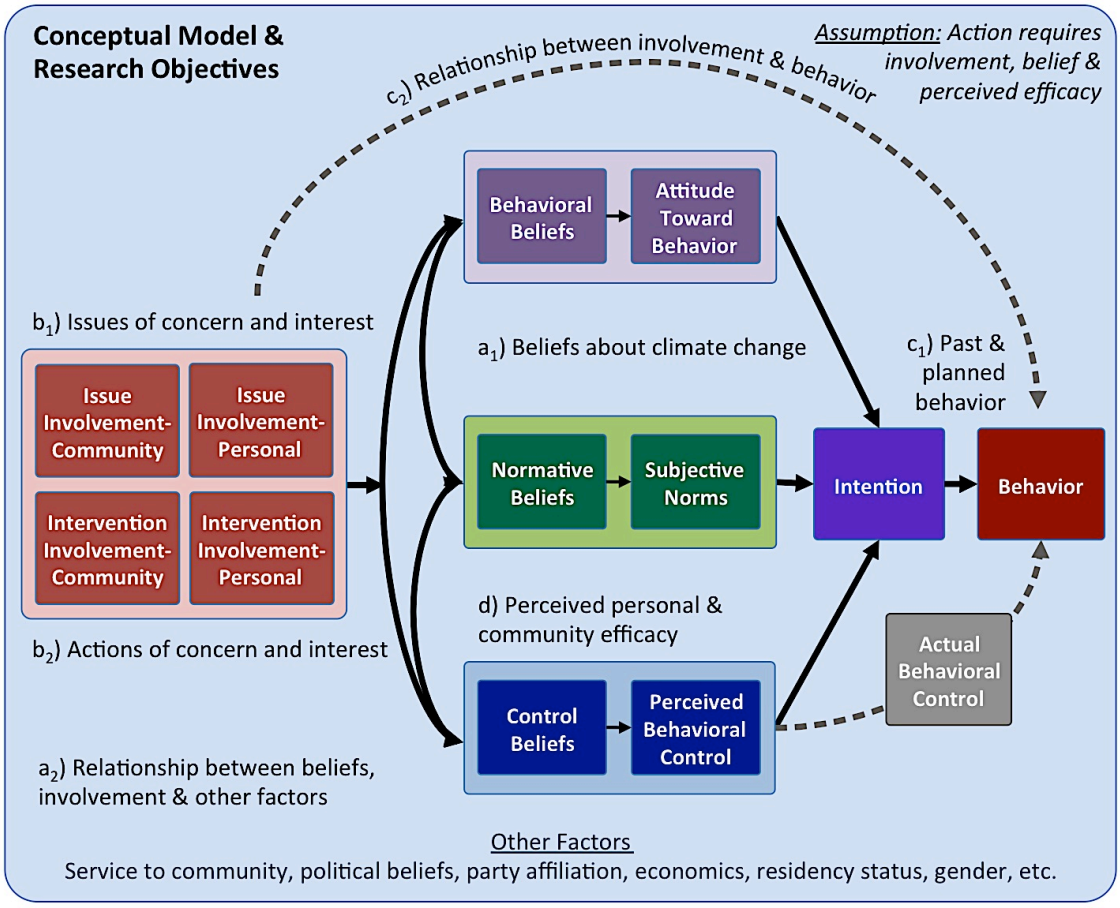
**Conceptual Framework**

Following the assumptions related to the Theory of Planned Behavior, involvement theory, and rural community theory, we assume that, in order to take behavioral action to adapt to climate change, rural actors must:

- Believe that climate change is occurring.
- Believe problems presented by climate change are relevant to their needs and interests, exhibiting issue involvement.
- Be interested and motivated to undertake adaptation activities, exhibiting intervention involvement.
- Believe they themselves and their communities are capable of taking effective action, perceiving behavioral control, here termed personal and community efficacy.
- See climate adaptation as a priority or as related to an existing priority warranting action, normative beliefs.

Figure 5.3. depicts the conceptual framework tested in this study. Assuming that behavioral and normative beliefs ($a_1$) vary with demographics and exogenous forces ($a_2$), we addressed Objective 1 by determining which issues ($b_1$) and potential actions ($b_2$)—both related and unrelated to climate—concerned and interested rural actors. We then determined the level of consistency among items of concern and interest, differentiated between personal and collective issues and actions. We addressed Objective 2 by evaluating past and planned climate change adaptation actions ($c_1$), and investigating the relationship between involvement and past and planned behavior ($c_2$). Finally, for Objective 3 we determined which factors contributed to rural actors' belief in the potential efficacy of their actions, both personally and in their community. We determined whether perceived personal and community efficacy differed among groups of rural actors (d).

Figure 5.3. Conceptual model showing the theoretical framework of the study.



## Methods

### Study Site

Washington County, Maine, is in the Downeast Region, bordered to the east by Canada and to the south by the Gulf of Maine. Deeply rural, the region is highly dependent on natural resources to support the main industries of fisheries, forestry, agriculture and tourism. The economy is chronically depressed, with poverty rates consistently higher than in the rest of Maine and the U.S. The region has seen persistent out-migration of young people, as well as a persistent in-migration of retirees and aspiring young farmers. As is common in the U.S. (Brown & Schafft, 2011), the municipalities of Washington County have minimal tax bases because of falling property values. Budgets are dominated by the cost of operating schools as populations decline. Most municipal officials are volunteers or part-time employees receiving minimal compensation. Retirees, seasonal residents, and other in-migrants often serve on town boards.

As is also common in rural areas (Hales, et al., 2014; Lal, Alavalapati, & Mercer, 2011), the region has been slow to pursue climate change adaptation. This study took place in 2015, one year after the conclusion of a regional planning effort that created the first climate vulnerability assessment for the county and municipal officials, primarily those involved in emergency response and planning.

A 2010 survey examined the needs and attitudes of Maine municipal officials (Hutchins, Lindenfeld, Silka, Bell, & Leahy, 2011). For the 1,176 mostly-rural respondents, climate change was competing with other concerns. Disregarding issues that are irrelevant in rural areas (e.g. traffic congestion), the top three environmental concerns for were invasive organisms, loss of farmland, and loss of working waterfront. Climate change, per se, was fourth on the list of concerns, however, each of the top three may be worsened by climate change. Land use and shoreland zoning were overwhelmingly regarded as the most contentious public policy issues.

**Survey**

To address our research questions, we conducted a survey in the spring of 2015. Items addressed involvement (Bewsell, Bigsby, & Cullen, 2012; Kaine, Murdoch, Lourey, & Bewsell, 2010; Mittal, 1995); perceived personal and community efficacy, political beliefs, and political party affiliation (Appendix C). The sample frame included adults who had been involved in local governance in Washington County, Maine, in any capacity. The panel was compiled from the email list of the Washington County Council of Governments and official town websites. The entire panel of 708 was invited via email to take the online survey administered using the Qualtrics survey system.

Objective 1) Priority Concerns and Interests: Items related to involvement were designed to measure both issue and intervention involvement among respondents—personally and within their communities—using a five-point scale with word pairs from Mittal (1995). Involvement items were related to multiple domains, with between one and seven items each for issues and interventions (Table 5.1). The involvement framework allowed us to determine whether climate-related concerns were a higher priority than climate change framed explicitly, as predicted by Wilbanks & Kates, (2010). For example, a person with low issue involvement in climate change may be worried about damage to roads from storms, a climate-related issue linked to other local concerns.

Objective 2) Concerns and Behavior: Respondents were queried about the past and planned advocacy for climate change adaptation and two climate-related, non-environmental interventions, improved transportation infrastructure and emergency planning for extreme weather. This was to further test the hypothesis posed by Wilbanks and Kates (2010) that action may be more likely if adaptation measures are framed to address existing local priorities.

Objective 3) Self- and Community Efficacy: The survey also included nine items to measure perceived personal and community efficacy modeled on PBC framework vetted by Ajzen. Items related to perceptions of the functioning of local governance and the ability of individual citizens to influence actions and decisions in their community.

Table 5.1. Domains covered by involvement items.

| Domains | Issue Examples | Intervention Examples |
|---|---|---|
| **Non-Climate, Non-Environmental** | Unemployment | Food or fuel assistance |
| **Climate-Related, Non-Environmental** | Aging infrastructure | Improving roads & bridges |
| **Climate-Related, Environmental** | Coastal flooding | Land use regulation |
| **Climate, General** | Global warming | Advocating for climate adaptation |
| **Non-Climate, Environmental** | Brownfields | Brownfield Cleanup |

Finally, the survey included demographic items, as well as items related to respondents' involvement in local governance processes and their beliefs about climate change. There were six items using standard measures of climate beliefs on a five-point Likert scale (Pew Research Center, 2014a and 2014b; Arbuckle et al., 2013; and Leiserowitz, et al., 2014).

**Analysis**

Statistical analysis of the survey data was conducted using SPSS Statistical Software. The confidence interval for all analyses was 0.05, unless otherwise noted, and partially completed surveys were included if they had complete and valid responses to relevant items. The mean of ratings on climate change belief items was comprised a global warming belief score. The party affiliation variable was recoded to an ordinal variable with Republican = 1, Independent- Leaning

Republican = 2, Independent- Neutral = 3, Independent- Leaning Democrat = 4, Democrat = 5, and the “other” category was excluded from analysis.

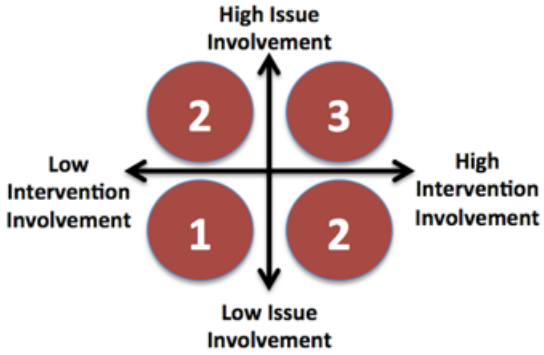
Objective 1): Involvement items were used to identify priority concerns and interests. To test internal consistency, Cronbach’s alpha was calculated for each of the four groups of items, including issue/ community; issue/ personal; intervention/ community; and intervention/ personal. Alpha was also calculated for each of the domains (climate-related, environmental; non-climate-related, non-environmental, etc.). Pairs with correlation coefficients greater than 0.70 were aggregated and weighted as a single item in involvement quadrant analysis.

Operationalizing the quadrant framework of Kaine et al. (2010), involvement items in each domain were averaged and used to create scatterplots on the issue (y)/ intervention (x) involvement continuum and thus to assign each case to a quadrant of the involvement scale for each domain. Each case was assigned two involvement quadrants for each domain, one community and one personal. A chi-square test compared quadrant assignments of those reporting committed municipal service and those reporting no committed service to determine if observed differences were significant.

To determine if personal and community quadrant assignments differed significantly and could therefore be considered to measure different constructs, quadrant assignments were recoded as an ordinal variable (Figure 5.4.), and compared in a one-way ANOVA.

To measure relative involvement, we calculated and ranked unweighted mean ratings for each involvement item in the four involvement groups (issue/ community; issue/ personal; intervention/ community; and intervention/ personal).

Figure 5.4. Ordinal quadrant values.




Objective 2): To test the relationship between involvement quadrant (independent variable) and past and planned behavior (dependent variable), we conducted a chi square test between past and planned behavior items and a binary quadrant value for the relevant involvement domains. Cases residing in the upper right involvement quadrant were assigned a value of 1 (high/ high), and those in all other quadrants were assigned a value of 0.

A factor analysis of variance was used to examine relationships among past and planned behaviors, specifically to determine whether respondents regarded climate action, per se, to be linked to actions related to emergency planning or transportation infrastructure (Vaske, 2008). Bivariate correlation coefficients were also calculated for past and planned behavior items with global warming belief score, party affiliation, and level of commitment in municipal service.

Objective 3): We ranked the mean ratings on self and community efficacy items, and compared self and community efficacy ratings between those reporting committed service to their municipality and those reporting no committed municipal service. Cronbach's alpha, cross-correlation, and factor analysis were performed on the nine items addressing perceived personal and community efficacy. Pairs with a correlation coefficient greater than 0.70 were aggregated for factor analysis. Finally, we calculated correlation coefficients between the mean of all efficacy ratings and all past and planned behavior items to determine if perceived efficacy and behavior

are significantly related.

**Sampling Error and Non-Response Bias**

Following Dillman, Smyth, & Christian (2009), we estimated the margin of error for the results regarding those in committed service to be +/- 4.06%, and for those reporting any involvement in municipal governance it would be +/- 3.03%. Also, we conducted ANOVA tests comparing key variables between the three waves of responses following the first invitation and each of the two reminders to determine if there were statistically significant differences between those responding to the survey at different times (Lankford, Buxton, Hetzler, & Little, 1995). None of the variables showed significant differences between waves.

## Results

Of the panel of 708, 293 (41%) began the survey, and 226 (32%) completed all questions. In all, there were 246 (35%) valid, complete or partially complete responses. Forty-seven percent of respondents (116) reported committed service in municipal governance, including service as staff or volunteering as a fire fighter or board member. Survey respondents had, on average, higher educational attainment and were wealthier than the Washington County population as a whole (Table 5.2).

Table 5.2. Demographics of survey respondents.

| **Demographics** | n | % | Census |
|---|---|---|---|
| *Gender* | | | |
| Female | 104 | 52.3 | |
| Male | 88 | 44.2 | |
| Prefer not to answer | 7 | 3.5 | |
| | | | |
| *Age* | | | |
| 18 to 29 years | 6 | 2.4 | |
| 30 to 39 years | 21 | 8.6 | Median |
| 40 to 49 years | 38 | 15.6 | 46.1 a |
| 50 to 59 years* | 66 | 26.8 | |
| 60 to 69 years | 82 | 33.3 | |
| 70 years or more | 31 | 12.7 | |
| | | | |
| *Household Income* | | | |
| Less than $25,000 | 27 | 14.6 | Median |
| $25,000 to $40,000 | 36 | 18.8 | $37,236 b |
| $40,000 to $55,000 | 25 | 13 | |
| $55,000 to $70,000* | 31 | 16.1 | |
| $70,000 to $85,000 | 18 | 9.4 | |
| More than $85,000 | 54 | 28.1 | |
| | | | |
| *Education* | | | |
| High School Diploma | 12 | 5.9 | |
| Some College | 73 | 35.9 | % |
| Bachelor's Degree or Higher | 118 | 58.2 | 20.0 b |
| | | | |
| *Resource-Dependent Occupation* | | | |
| Not Resource-Dependent | 146 | 81.1 | |
| Resource-Dependent Secondary | 19 | 10.6 | % |
| Resource-Dependent Primary | 15 | 8.3 | 3.3 c |

* Median category for survey respondents

a Maine Census State Data Center, n.d.

b US Census Bureau, 2015

c Maine Center for Workforce Research and Information, 2015

Respondents reporting committed service in municipal governance activities were significantly more conservative and more likely to affiliate with the Republican party than those who reported no committed municipal service. Chi square tests for both party affiliation ($\chi 2 = 13.99$, $df = 5$, $p = 0.016$) and political beliefs ($\chi 2 = 11.70$, $df = 4$, $p = 0.020$) showed the difference to be significant. Sixty-five percent (132) of respondents' global warming belief scores were in the "Agree" or "Strongly Agree" range. Seventeen percent (35) were in the "Disagree" or "Strongly Disagree" range, and 18% (37) were in the "Neither" range. T-tests showed that those who reported committed municipal service had significantly lower global warming belief scores than those who reported no committed service ($t = 3.92$, $df = 197$, $p < 0.01$).

**Objective 1) Priority Concerns and Interests**

Overall, within groups of involvement items (community/ personal and issue/ intervention) there was high internal reliability with alpha ranging from 0.812 to 0.891 after aggregating highly correlated items (Table 5.3).

Table 5.3. Chronbach's alpha values for involvement items before and after aggregation.

| **Items** | **α** | **Highly Correlated Items (*r* > 0.700) for Aggregation** | **α w/ Aggregates** |
|---|---|---|---|
| Issue Involvement: Community (17 items) | 0.858 | Lobster Prices and Shellfish Closures (*r* = 0.773)<br>Agricultural Pests and Forest Pests (*r* = 0.714)<br>Global Warming and GHG Emissions (*r* =0.870) | 0.817<br>(14 items) |
| Issue Involvement: Personal (17 items ) | 0.870 | Lobster Prices and Shellfish Closures (*r* = 0.862)<br>Agricultural Pests and Forest Pests (*r* = 0.823)<br>Global Warming and GHG Emissions (*r* = 0.925) | 0.823<br>(14 items) |
| Intervention Involvement: Community (12 items ) | 0.883 | Heating Fuel Asst. and Food Asst. (*r* = 0.723)<br>Comprehensive Planning & Land Use (*r* = 0.774)*<br>Shoreland Zoning and Land Use (*r* = 0.767)* | 0.833<br>(9 items) |
| Intervention Involvement: Personal (12 items) | 0.848 | Heating Fuel Asst. and Food Asst. (*r* = 0.791)<br>Shoreland Zoning and Land Use (*r* =0.826) | 0.812<br>(10 items) |
| All Community Involvement (aggregates, as above; 23 items) | 0.885 | | |
| All Personal Involvement (aggregates, as above; 24 items) | 0.891 | | |

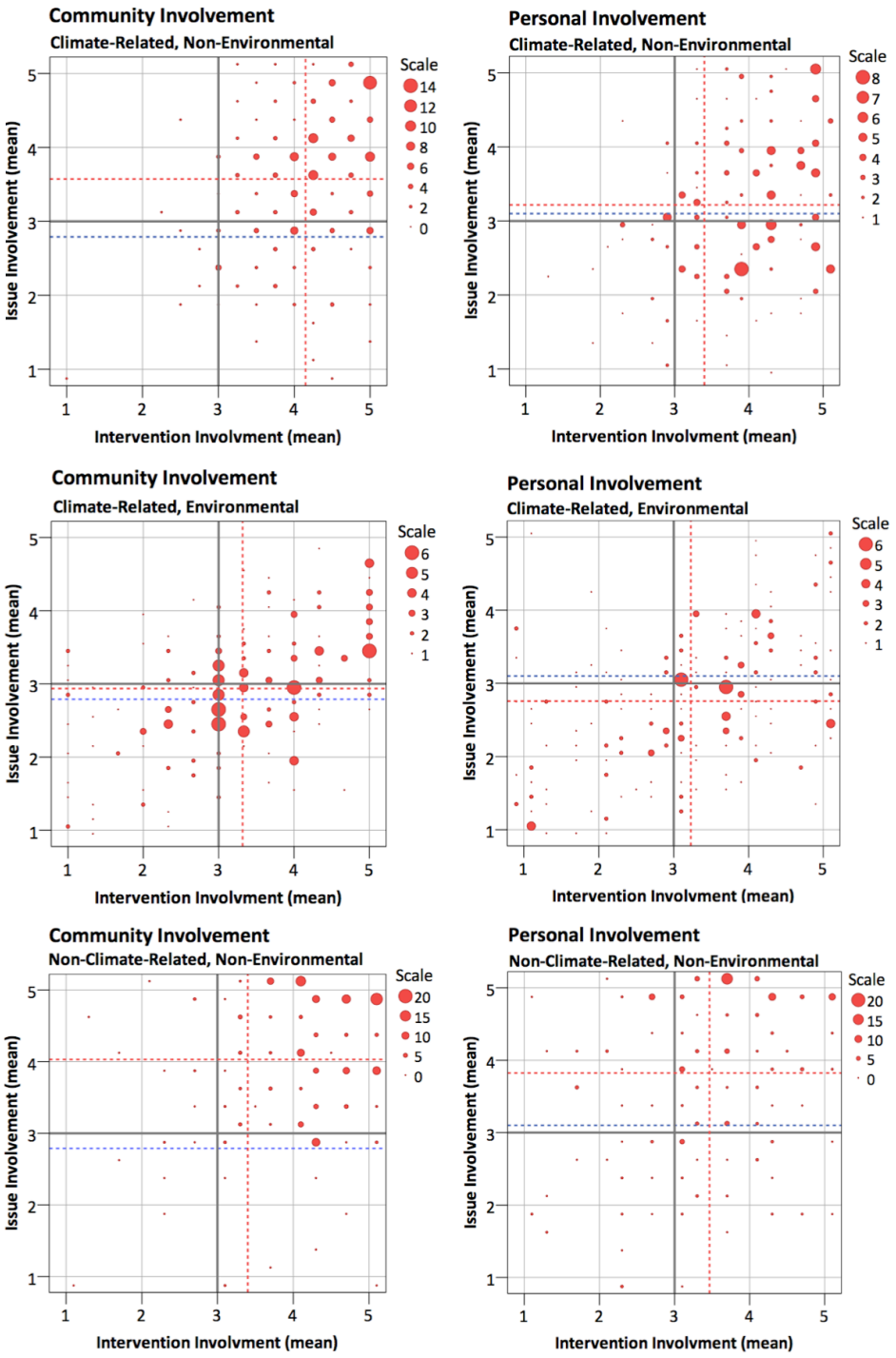
** Three items aggregated into a single variable for recalculating α.*

Based on alpha calculations for each domain addressed by multiple items, items were removed prior to quadrant analysis to improve reliability (Table 5.4.). Note that the heating fuel cost/ assistance and unemployment items were rated highly by respondents but did not reliably target the domains of interest and were excluded from quadrant analysis. The non-climate-related, environmental items relating to brownfields were addressed by just one item in each domain, so reliability could not be assessed. These items were excluded from quadrant analysis.

The scatterplots in Figure 5.5. show the distribution of involvement values among the issue/ intervention quadrants for each domain, both related to community (left column) and personal (right column). For non-environmental items, both climate-related and non-climate-related (first and last row of graphs), more than 60% of respondents occupied the upper right

quadrant, indicating high issue involvement and high intervention involvement. Lines indicating mean issue and intervention involvement (red dashed) intersected in the upper right quadrant. For climate-related environmental items, however, less than 45% of respondents occupied the upper right quadrant, and mean involvement lines intersected in the lower right quadrant in both community and personal plots, indicating overall high intervention and low issue involvement. On climate-related environmental items, about 40% of respondents occupied the area on and around the boundary between quadrants, which may reflect uncertainty or indecision.

Figure 5.5. Scatterplots of involvement means for all respondents by domain. Red dashed lines indicate mean issue (y) and intervention (x) involvement scores for that domain. Blue dashed line indicates the mean for the climate change issue involvement items for comparison.



The trend of high involvement in non-environmental items and low involvement in environmental items was more pronounced among those reporting committed service. A chi-square test showed committed respondents were significantly less likely than non-committed respondents to occupy the upper right quadrant (Q1) for community involvement in the climate-related, environmental domain. They were more likely to occupy Q1 for personal involvement in the non-climate-related, non-environmental domain (Table 5.4.).

Table 5.4. Results of chi-square test of association between quadrant assignment and service to municipality.

| **Climate-Related, Non-Environmental** | **Q1** | **Not Q1** | **Chi Square** | |
|---|---|---|---|---|
| **Community** | High Issue & High Intervention | Low Issue &/or Low Intervention | χ2 (df) | Asymp. Sig. (2-sided) |
| No Committed Service | 81.2% | 18.8% | 0.088 | 0.767 |
| Committed Service | 79.6% | 20.4% | (1) | |
| **Personal** | | | | |
| No Committed Service | 56.6% | 43.4% | 2.033 | 0.154 |
| Committed Service | 66.3% | 33.7% | (1) | |

| **Climate-Related, Environmental** | | | **Chi Square** | |
|---|---|---|---|---|
| **Community** | **Q1** | **Not Q1** | χ2 (df) | Asymp. Sig. (2-sided) |
| No Committed Service | 50.9% | 49.1% | 6.521 | 0.011* |
| Committed Service | 33.7% | 66.3% | (1) | |
| **Personal** | | | | |
| No Committed Service | 43.4% | 56.6% | 3.042 | 0.081 |
| Committed Service | 31.6% | 68.4% | (1) | |

| **Non-Climate-Related, Non-Environmental** | | | **Chi Square** | |
|---|---|---|---|---|
| **Community** | **Q1** | **Not Q1** | χ2 (df) | Asymp. Sig. (2-sided) |
| No Committed Service | 92.2% | 7.8% | 3.360 | 0.067 |
| Committed Service | 84.3% | 15.7% | (1) | |
| **Personal** | | | | |
| No Committed Service | 60.7% | 39.3% | 3.891 | 0.049* |
| Committed Service | 73.7% | 26.3% | (1) | |

* $p < 0.05$

ANOVAs comparing the ordinal involvement quadrants for community and personal items in each domain addressed by multiple items all showed statistically significant differences. This suggests that community and personal items do, indeed, measure distinct phenomena (Table 5.5.).

Table 5.5. Results of ANOVA comparisons between community and personal mean involvement scores for each domain

**Climate-Related, Non-Environmental Domain: Community vs Personal**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 3.133 | 2 | 1.566 | 7.89 | 0.000* |
| Within Groups | 40.694 | 205 | 0.199 | | |
| Total | 43.827 | 207 | | | |

**Climate-Related, Environmental Domain: Community vs Personal**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 35.862 | 2 | 17.931 | 43.214 | 0.000* |
| Within Groups | 85.061 | 205 | 0.415 | | |
| Total | 120.923 | 207 | | | |

**Non-Climate-Related, Non-Environmental Domain: Community vs Personal**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 1.278 | 2 | 0.639 | 4.882 | 0.008* |
| Within Groups | 26.703 | 204 | 0.131 | | |
| Total | 27.981 | 206 | | | |

* $p < 0.05$

Ranking the unweighted, unaggregated means of involvement items allowed us to assess relative involvement to determine priority concerns and actions. Among issue involvement items, economic issues topped both community and personal rankings (Table 5.6). “School budgets” were tied for first with “Unemployment” in community involvement rankings, and were second in the personal rankings behind “High property taxes.” Just after these

economic issues, however, were concerns with direct links to climate adaptation. “High price of heating fuel,” “Aging roads, bridges and culverts,” and “Unusually strong storms” all appeared in top five issue rankings. In the community-related issue involvement group, global warming and greenhouse gas emissions ranked 12$^{th}$ and 16$^{th}$ respectively with mean ratings (mean = 2.79, std. dev. = 1.29). However, in personal involvement items, the two climate change items rated more highly (mean = 3.10, standard deviation = 1.49), among the top 10 items.

Among intervention involvement items, “Emergency response” ranked first for both community and personal involvement (Table 5.7). Emergency response, handled largely by volunteers, is linked with climate impacts such as flooding, strong storms, and heat-related medical emergencies. “Economic development” ranked second on both lists, and school budgets ranked fourth on both. “Repair and improvement of roads, bridges and culverts” and “Emergency planning for extreme weather events” also appeared in the top five. Heating fuel assistance ranked third on the community rankings but tenth on the personal. This is likely because relatively affluent survey respondents are more likely to see heating fuel as a community problem, rather than a personal one. Other climate-related actions such as planning and zoning ranked lower in both community and personal rankings.

Table 5.6. Ranking of mean issue involvement ratings.

**Issue Involvement: Community**

*Please indicate the extent to which each problem is significant in the Downeast town where you live or spend the most time.*

| Issue | Mean Ranking | n | Std. Dev. |
|---|---|---|---|
| Unemployment (tie for 1st) | 4.18 | 231 | 1.04 |
| School budgets (tie for 1st) | 4.18 | 229 | 0.98 |
| High price of heating fuel | 4.07** | 226 | 1.02 |
| High property taxes | 3.89 | 229 | 1.16 |
| Aging roads, bridges & culverts | 3.75** | 228 | 1.12 |
| Poor quality housing | 3.38 | 230 | 1.11 |
| Unusually strong storms | 3.25 | 223 | 1.18 |
| Land use regulations | 3.12 | 225 | 1.25 |
| Shellfishing closures | 3.1 | 221 | 1.37 |
| Lobster prices | 2.96 | 221 | 1.34 |
| Forest pests & diseases | 2.91 | 220 | 1.14 |
| Global warming | 2.9* | 223 | 1.38 |
| Flooding & erosion | 2.77 | 224 | 1.16 |
| Agricultural pests & diseases | 2.75 | 219 | 1.15 |
| Endangered Atlantic salmon | 2.74 | 222 | 1.37 |
| Greenhouse gas emissions | 2.69* | 218 | 1.27 |
| Brownfields | 2.53 | 215 | 1.25 |

**Issue Involvement Personal**

*Please indicate the extent to which each problem is important to you personally.*

| Item | Mean Ranking | n | Std. Dev. |
|---|---|---|---|
| High property taxes | 3.89 | 218 | 1.21 |
| School budgets | 3.79 | 219 | 1.32 |
| High price of heating fuel | 3.58** | 212 | 1.33 |
| Aging roads, bridges & culverts | 3.54** | 217 | 1.17 |
| Unusually strong storms | 3.32** | 209 | 1.30 |
| Unemployment | 3.26 | 215 | 1.47 |
| Global warming | 3.17* | 214 | 1.55 |
| Land use regulations | 3.08 | 210 | 1.37 |
| Greenhouse gas emissions | 3.01* | 209 | 1.50 |
| Forest pests & diseases | 2.9 | 208 | 1.41 |
| Agricultural pests & diseases | 2.84 | 208 | 1.44 |
| Flooding & erosion | 2.73 | 215 | 1.32 |
| Brownfields | 2.65 | 209 | 1.39 |
| Poor quality housing | 2.5 | 210 | 1.39 |
| Endangered Atlantic salmon | 2.43 | 206 | 1.36 |
| Shellfishing closures | 2.32 | 210 | 1.34 |
| Lobster prices | 2.29 | 209 | 1.31 |

* Climate change item

** Top-five-ranked climate change-related item

Table 5.7. Ranking of mean intervention involvement ratings.

**Intervention Involvement: Community**
*Please indicate how important each of the following activities is to the community in Downeast Maine where you live or spend the most time.*

| Intervention | Mean Rating | n | St. Dev. |
|---|---|---|---|
| Emergency response | 4.67** | 220 | 0.66 |
| Economic development | 4.14 | 218 | 1.12 |
| Heating fuel assistance program | 4.12** | 216 | 0.98 |
| School budget planning | 4.11 | 217 | 0.97 |
| Repair & improvement of roads, etc | 4.09** | 220 | 0.93 |
| Food assistance | 3.93 | 215 | 1.05 |
| Emergency planning for extreme weather events | 3.7 | 218 | 1.09 |
| Shellfish management | 3.36 | 216 | 1.37 |
| Shoreland zoning | 3.35 | 217 | 1.26 |
| Comprehensive planning | 3.33 | 217 | 1.21 |
| Land use regulation | 3.27 | 217 | 1.17 |
| Clean-up of Brownfields | 2.76 | 213 | 1.35 |

**Intervention Involvement Personal**
*Please indicate how much each of the following community activities means to you personally.*

| Intervention | Mean Rating | n | St. Dev. |
|---|---|---|---|
| Emergency response | 4.4** | 216 | 0.86 |
| Economic development | 4.09 | 208 | 1.19 |
| Repair & improvement of roads, etc | 3.93** | 214 | 0.96 |
| School budget planning | 3.79 | 211 | 1.30 |
| Emergency planning for extreme weather events | 3.6** | 212 | 1.22 |
| Land use regulation | 3.27 | 208 | 1.33 |
| Comprehensive planning | 3.239 | 209 | 1.34 |
| Shoreland zoning | 3.19 | 211 | 1.42 |
| Clean-up of Brownfields | 2.68 | 207 | 1.44 |
| Heating fuel assistance program | 2.58 | 211 | 1.40 |
| Food assistance | 2.54 | 209 | 1.38 |
| Shellfish management | 2.35 | 209 | 1.30 |

* Climate change item

** Top-five-ranked climate change-related item

**Objective 2) Concerns and Behavior**

Items regarding past and planned behavior centered on advocating for three activities related to climate adaptation. Two are commonly regarded as politically non-environmental activities and included upgrades to transportation infrastructure and planning for emergencies. The third was climate change adaptation, generally. In reliability analysis, alpha for all items on past behavior was 0.60, however, with the climate change adaptation item removed, alpha rose to 0.70. All items on planned behavior yielded an alpha value of 0.71. With the climate change adaptation item removed, alpha rose to 0.74. This suggests that, especially for past behavior, the emergency planning and infrastructure items are more reliably related to each other than they are with climate change adaptation. Factor analysis on all past and planned behavior items yielded a two-component solution explaining 78% of the variance and indicating that climate change adaptation items measured different constructs than those measured by the infrastructure and emergency planning items (Table 5.8).

Table 5.8. Results of factor analysis on past and planned behavior.

| **Behavior Item** | **Component 1** *Climate-Related Intervention* | **Component 2** *Climate Change Adaptation* |
|---|---|---|
| *In the past year, I have advocated for upgrades to infrastructure* | **0.766** | -0.377 |
| *In the past year, I have advocated for emergency planning* | **0.776** | -0.282 |
| *In the coming year, I plan to advocate for upgrades to infrastructure* | **0.809** | -0.304 |
| *In the coming year, I plan to advocate for emergency planning* | **0.828** | -0.168 |
| *In the past year, I have advocated for adaptation to climate change* | 0.587 | **0.747** |
| *In the coming year, I plan to advocate for adaptation to climate change* | 0.648 | **0.700** |

| ***Component Factor*** | ***Eigenvalues*** | ***Percent of Variance*** | ***Alpha*** |
|---|---|---|---|
| Component 1 | 3.294 | 54.896 | 0.860 |
| Component 2 | 1.390 | 23.159 | 0.897 |

A chi square test was conducted to compare past and planned behavior based on involvement quadrant assignments in the Climate-Related, Non-Environmental (CRNE) domain. This was to test the assumption that a person in the upper right quadrant, exhibiting high issue and high intervention involvement for a behavior is more likely to engage in that behavior (Kaine et al., 2010). The CRNE involvement domain does not include items explicitly addressing climate change; it is a measure of involvement in issues and interventions related to climate change but not regarded as environmental. For the chi square test, the quadrant assignment values were recoded to into a binary variable: upper right quadrant = "Q1;" other quadrants = "Not Q1."

The percentage of those in Q1 reporting past or planned behavior was higher in all cases, community and personal. However, behavioral differences between Q1 and Not Q1 were not uniformly significant. Those with high issue and high intervention involvement personally for the CRNE domain were significantly more likely to report both past ($\chi2 = 6.28$, $p = 0.012$) and planned ($\chi2 = 8.32$, $p = 0.004$) advocacy for emergency planning (Table 5.9A). There was no significant difference between community involvement quadrants for emergency planning. Also, there was no difference between involvement quadrants, whether community ($\chi2 = 0.351$, $p = 0.554$) or personal ($\chi2 = 1.37$, $p = 0.241$), in past advocacy for upgrades to transportation infrastructure. However, those in Q1 for community involvement were significantly more likely to plan to advocate for upgrades ($\chi2 = 4.77$, $p = 0.029$). The difference for personal involvement was just slightly over the 0.05 significance value ($\chi2 = 3.82$, $p = 0.051$; Table 5.9B).

Those who exhibited high issue and high intervention involvement for the CRNE domain for their community were much more likely to report both past ($\chi2 = 9.56$, $p = 0.002$) and planned ($\chi2 = 9.05$, $p = 0.003$) advocacy for climate change adaptation (Table 5.9C). However, there was no significant difference between Q1 and those not in Q1 related to personal involvement.

Table 5.9. Results of chi-square test of association between involvement quadrant and behavior.

| Community Involvement<br>Climate-Related, Non-Environmental Domain | | | | | Personal Involvement<br>Climate-Related, Non-Environmental Domain | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **A. Behavior: Advocating for Emergency Planning** | | | | | | | | | |
| **Past*: In the past year, I have advocated for emergency planning.*** | | | | | | | | | |
| **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** | **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** |
| **Q1** | 78% | 22% | 2.577 | 0.108 | **Q1** | 74% | 26% | 6.275 | 0.012* |
| **Not Q1** | 91% | 9% | (1) | | **Not Q1** | 90% | 10% | (1) | |
| **Planned*: In the coming year, I plan to advocate for emergency planning.*** | | | | | | | | | |
| **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** | **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** |
| **Q1** | 68% | 32% | 3.731 | 0.053 | **Q1** | 63% | 37% | 8.324 | 0.004* |
| **Not Q1** | 85% | 15% | (1) | | **Not Q1** | 84% | 16% | (1) | |
| *** *p* < 0.05** | | | | | | | | | |
| **B. Behavior: Advocating for Transportation Infrastructure Upgrades** | | | | | | | | | |
| **Past*: In the past year, I have advocated for upgrades to roads, bridges, etc.*** | | | | | | | | | |
| **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** | **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** |
| **Q1** | 56% | 44% | 0.351 | 0.554 | **Q1** | 53% | 47% | 1.374 | 0.241 |
| **Not Q1** | 61% | 39% | (1) | | **Not Q1** | 62% | 38% | (1) | |
| **Planned*: In the coming year, I plan to advocate for upgrades to roads, bridges, etc.*** | | | | | | | | | |
| **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** | **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** |
| **Q1** | 53% | 47% | 4.767 | 0.029* | **Q1** | 50% | 50% | 3.819 | 0.051 |
| **Not Q1** | 74% | 26% | (1) | | **Not Q1** | 66% | 34% | (1) | |
| *** *p* < 0.05** | | | | | | | | | |
| **C. Behavior: Advocating Climate Change Adaptation** | | | | | | | | | |
| **Past*: In the past year, I have advocated for adaptation to climate change.*** | | | | | | | | | |
| **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** | **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** |
| **Q1** | 69% | 31% | 9.555 | 0.002* | **Q1** | 71% | 29% | 0.978 | 0.323 |
| **Not Q1** | 94% | 6% | (1) | | **Not Q1** | 78% | 22% | (1) | |
| **Planned*: In the coming year, I plan to advocate for adaptation to climate change.*** | | | | | | | | | |
| **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** | **Quadrant** | **Disagree** | **Agree** | **χ2 (df)** | **Sig.** |
| **Q1** | 64% | 36% | 9.047 | 0.003* | **Q1** | 67% | 33% | 0.673 | 0.412 |
| **Not Q1** | 91% | 9% | (1) | | **Not Q1** | 73% | 27% | (1) | |
| *** *p* < 0.05** | | | | | | | | | |

In a bivariate Pearson correlation, global warming belief score and party affiliation are strongly and positively correlated with past and planned advocacy for climate change adaptation. Notably, committed service to a municipality is significantly and negatively correlated with planned climate change adaptation. By contrast, committed service is significantly correlated with advocacy for both transportation infrastructure improvement and emergency planning. Notably, climate belief score is significantly and positively correlated with planned advocacy for emergency planning (Table 5.10).

Table 5.10. Bivariate correlation coefficients between behavior items and global warming belief score, party affiliation, and committed service.

| | **Behavior: Advocate for climate change adaptation** | | | | | |
|---|---|---|---|---|---|---|
| | **Past** | | | **Planned** | | |
| | R | p | n | R | p | n |
| Global Warm Belief Score | 0.454** | 0.000 | 202 | 0.530** | 0.000 | 202 |
| Party Affiliation[a] | 0.308** | 0.000 | 180 | 0.384** | 0.000 | 180 |
| Committed Service | -0.105 | 0.067 | 203 | -0.155* | 0.013 | 203 |
| | **Behavior: Advocate for upgrades to transportation infrastructure** | | | | | |
| | **Past** | | | **Planned** | | |
| | R | p | n | R | p | n |
| Global Warm Belief Score | -0.034 | 0.317 | 202 | 0.024 | 0.366 | 203 |
| Party Affiliation[a] | -0.095 | 0.205 | 180 | -0.079 | 0.288 | 181 |
| Committed Service | 0.322** | 0.000 | 204 | 0.208** | 0.001 | 205 |
| | **Behavior: Advocate for emergency planning** | | | | | |
| | **Past** | | | **Planned** | | |
| | R | p | n | R | p | n |
| Global Warm Belief Score | -0.015 | 0.416 | 201 | 0.161* | 0.011 | 202 |
| Party Affiliation[a] | -0.008 | 0.918 | 179 | 0.081 | 0.918 | 180 |
| Committed Service | 0.199** | 0.002 | 203 | 0.147* | 0.018 | 204 |

* *p* value <0.05 (1-tailed)

** *p* value <0.01 (1-tailed)

a Ordinal variable: Republican = 1; Indep., Lean Rep. = 2; Indep., Neutral = 3; Indep., Lean Dem. = 4; Democrat = 5; Other is excluded

**Objective 3) Personal and Community Efficacy**

The means of the perceived efficacy items on the five-point Likert scale are ranked from highest to lowest in Table 5.11. For two items—maps for making decisions (mean = 3.31; st. dev. = 1.12; median = 4) and skills needed to solve problems (mean = 3.30; st. dev. = 1.15; median = 4), central tendencies were in the "Agree" category. The lowest rated items included finances (mean = 2.39; st. dev. = 1.09; median = 2) and ability for everyone to influence important decisions (mean = 2.62; st. dev. = 1.20; median = 2), where central tendencies were within the "Disagree" categories. The mean of all efficacy items was 2.85 (st. dev. = 0.72) and the median was 3, the "Neither" category.

We conducted a t-test comparing perceived efficacy between those who reported committed service to their municipality to those who did not. Overall, those reporting committed service believed that the efficacy of their community was significantly higher than those reporting no committed service ($p = 0.019$), though neither group's mean was above 3, the "Neither" category. For three items, the differences between the two groups were statistically significant. Those reporting committed service were significantly more likely ($p < 0.01$) to believe they were able to influence important decisions in their community (mean = 3.29) than those without committed service (mean = 2.84). Committed respondents were also significantly ($p < 0.01$) more likely to believe their community was able to plan for the future (mean = 2.89) and had sufficient finances to meet the community's needs (mean = 2.66) than their non-committed counterparts (mean = 2.46 and 2.15 respectively). However, it's important to note that on both the planning and financial items, means were below 3, indicating a central tendency to disagree with the statement that their community has sufficient efficacy in these areas (Table 5.12).

Table 5.11. Ranked means of perceived self- and community efficacy ratings.

| ***Please tell us your opinion on the capabilities of the town in Downeast Maine where you live or spend the most time.*** | ***Five-point Likert Scale*** | | | |
|---|---|---|---|---|
| | **n** | **Mean** | **Std. Dev.** | **Median** |
| *My town has the maps it needs to help in making decisions.* | 182 | 3.31 | 1.12 | 4 |
| *The people of my town have the skills they need to solve problems in my community.* | 208 | 3.30 | 1.15 | 4 |
| *I am able to influence important decisions in my town.* | 200 | 3.06 | 1.20 | 3 |
| *My town has sufficient infrastructure (roads, bridges, utilities, etc.) to serve the community's needs.* | 208 | 2.87 | 1.15 | 3 |
| *My town has sufficient computer skills, equipment and services to meet my community's needs.* | 197 | 2.80 | 1.15 | 3 |
| *The people of my town are able to effectively resolve controversial local issues* | 212 | 2.71 | 1.14 | 3 |
| *My town is able to effectively plan for the future.* | 204 | 2.66 | 1.17 | 3 |
| *Everyone in my town is able to influence important decisions.* | 198 | 2.62 | 1.20 | 2 |
| *My town has the finances it needs to resolve problems in my community.* | 205 | 2.39 | 1.09 | 2 |
| ***All Perceived Efficacy Items*** | **213** | **2.85** | **0.72** | **3** |

Table 5.12. Results of t-test comparisons of mean rankings self- and community efficacy items based on level of committed service to municipality.

| ***Please tell us your opinion on the capabilities of the town in Downeast Maine where you live or spend the most time.*** | **Group** | **n** | **Mean** | **Std. Dev.** | **T-Test t (df)** | **Sig.** |
|---|---|---|---|---|---|---|
| *The people of my town have the skills they need to solve problems in my community.* | Committed | 98 | 3.38 | 1.19 | 0.883 | 0.378 |
| | Non-committed | 110 | 3.24 | 1.12 | (206) | |
| *My town has the maps it needs to help in making decisions.* | Committed | 94 | 3.31 | 1.18 | -0.059 | 0.953a |
| | Non-committed | 88 | 3.32 | 1.05 | (179) | |
| *I am able to influence important decisions in my town.* | Committed | 97 | 3.29 | 1.24 | 2.651 | 0.009* |
| | Non-committed | 103 | 2.84 | 1.13 | (198) | |
| *My town has the finances it needs to resolve problems in my community.* | Committed | 95 | 2.66 | 1.17 | 3.43 | 0.001a* |
| | Non-committed | 110 | 2.15 | 0.96 | (181) | |
| *My town has sufficient infrastructure (roads, bridges, utilities, etc.) to serve the community's needs.* | Committed | 98 | 2.92 | 1.17 | 0.57 | 0.57 |
| | Non-committed | 110 | 2.83 | 1.13 | (206) | |
| *My town is able to effectively plan for the future.* | Committed | 97 | 2.89 | 1.19 | 2.663 | 0.008* |
| | Non-committed | 107 | 2.46 | 1.11 | (202) | |
| *The people of my town are able to effectively resolve controversial local issues.* | Committed | 98 | 2.86 | 1.21 | 1.782 | 0.076 |
| | Non-committed | 114 | 2.58 | 1.06 | (210) | |
| *My town has sufficient computer skills, equipment and services to meet my community's needs.* | Committed | 96 | 2.8 | 1.19 | 0.061 | 0.952 |
| | Non-committed | 101 | 2.79 | 1.12 | (195) | |
| *Everyone in my town is able to influence important decisions.* | Committed | 95 | 2.72 | 1.24 | 1.064 | 0.289 |
| | Non-committed | 103 | 2.53 | 1.17 | (196) | |
| ***Mean of all efficacy items*** | **Committed** | **99** | **2.97** | **0.75** | **2.358** | **0.019*** |
| | **Non-committed** | **114** | **2.74** | **0.68** | **(211)** | |

* $p < 0.05$

a Equal variances not assumed

Cronbach's alpha for the nine perceived efficacy items was 0.79. However, two items were highly correlated: resolving conflict and planning for the future ($r$ = 0.809). These were assumed to be measuring highly similar constructs and were aggregated by calculating their mean. Alpha was recalculated with the aggregated variable, yielding a value of 0.73.

A principal components factor analysis resulted in a two-component solution explaining 65 percent of the variance (Table 5.13). The first component, explaining 36 percent of the variance, related to skills, resources, and influence (alpha = 0.75). The second, involving just two variables and explaining 17 percent of the variance, related to technical capacity, specifically including map resources and infrastructure. The alpha value for the second component was low (0.53), however, suggesting these two items do not reliably measure the same construct.

Mean efficacy ratings were highly significantly correlated with both past and planned advocacy for emergency planning and climate change adaptation. Planned advocacy for upgrades to transportation infrastructure was significantly correlated with efficacy, but past advocacy was not. (Table 5.14)

Table 5.13. Results of factor analysis on self- and community efficacy items.

| ***Please tell us your opinion on the capabilities of the town in Downeast Maine where you live or spend the most time.*** | **Component 1** *Skills, resources, and Influence* | **Component 2** *Technical Capacity* |
|---|---|---|
| *My town is able to effectively plan for the future AND The people of my town are able to effectively resolve controversial local issues. [mean of two correlated variables]* | **0.840** | -0.121 |
| *The people of my town have the skills they need to solve problems in my community.* | **0.746** | -0.214 |
| *I am able to influence important decisions in my town.* | **0.637** | -0.464 |
| *Everyone in my town is able to influence important decisions.* | **0.602** | -0.342 |
| *My town has sufficient computer skills, equipment and services to meet my community's needs.* | **0.599** | 0.411 |
| *My town has the finances it needs to resolve problems in my community.* | **0.441** | 0.095 |
| *My town has sufficient infrastructure (roads, bridges, utilities, etc.) to serve the community's needs.* | 0.321 | **0.693** |
| *My town has the maps it needs to help in making decisions.* | 0.465 | **0.545** |

| ***Component Factor*** | ***Eigenvalues*** | ***Percent of Variance*** | ***α*** |
|---|---|---|---|
| Component 1 | 2.905 | 36.31 | 0.747 |
| Component 2 | 1.349 | 16.87 | 0.533 |

Table 5.14. Correlation of mean efficacy score and behavior items.

| **Behavior** | **R** | **Sig.** | **N** |
|---|---|---|---|
| Past advocacy for upgrades to roads, bridges, etc. | 0.023 | 0.374 | 203 |
| Planned advocacy for upgrades to roads, bridges, etc. | 0.118* | 0.046 | 204 |
| Past advocacy for emergency planning | 0.198** | 0.002 | 202 |
| Planned advocacy for upgrades emergency planning | 0.277** | 0.000 | 203 |
| Past advocacy for climate change adaptation | 0.298** | 0.000 | 202 |
| Planned advocacy for climate change adaptation | 0.355** | 0.000 | 202 |

* Correlation is significant at the 0.05 level (1-tailed).

** Correlation is significant at the 0.01 level (1-tailed).

## Discussion

This study operationalized the Kaine et al. (2010) issue/ intervention involvement framework, adding the personal/ community dimension. Involvement analysis allowed us to glean a somewhat more detailed understanding of climate change attitudes and priorities among respondents. The results clearly indicate that climate change adaptation is not a top priority among respondents, but some climate-related adaptation activities are among the top priorities. Respondents had a generally low level of perceived self and community efficacy, pointing to additional potential barriers to action. An important finding is the consistent and prevalent differences between people who report committed service in their municipality and those who do not. Those reporting committed service were more conservative, less inclined toward involvement with climate-related environmental issues, and more confident in the efficacy of their community and their own service.

### Objective 1) Priority Concerns and Interests

Corroborating national polls on priorities (Pew Research Center, 2014b; Riffkin, 2014) and a Maine survey (Hutchins, et al., 2011), our study using involvement scales showed that items addressing climate change explicitly were low priorities, eliciting less involvement than many other issues and interventions. As might be expected for an economically stressed region, the issues and interventions eliciting the most involvement were economic, suggesting that framing adaptation in relation to economic concerns and objectives may be a pragmatic strategy.

Climate-related items were in the top five of all priority lists, both personal and community. Emergency response was the top-ranked intervention for both community and personal involvement rankings with very low variability (st. dev. = 0.66 for community, 0.86 for personal; all others > 0.95). This not only shows respondents see emergency response as

important to their community, they feel personally involved. Given this involvement the role of emergency response during extreme weather events and an organized cadre of engaged volunteers, strategies that work with and support emergency responders may be especially effective. Indeed, the climate vulnerability assessment work in Washington County prior to this study was most effective in engaging emergency responders. Other highly-ranked involvement items included other climate-related issues and interventions concerning heating costs, aging transportation infrastructure, and major weather events. It's important to note that these were the priorities within our study site. Research in other localities would reveal commonalities and differences among rural communities.

None of the environmental issue items was ranked among the top concerns. Planning, zoning and land use items received low intervention involvement ratings, for example. Land use regulation is commonly a controversial topic in the region (Hutchins, et al., 2011), and the pattern of low involvement in environmental items was more pronounced among those reporting committed service in their municipalities. Given these realities, adaptation via municipal planning and zoning is likely to be difficult unless efforts are framed to relate to higher-involvement issues and actions. Further research should determine how to best productively engage rural actors in climate-related environmental actions like land use planning.

The study also provided some insights on the relatively new application of the involvement framework in environmental social science. The issue/ intervention framework devised by Kaine et al. (2010) can be operationalized for quantitative study. Based on the statistical differences between personal and community involvement items and the high reliability of the items within groups, it appears that personal and community involvement items do measure different phenomena and are thus a potentially useful extension of the framework to reveal important details. For example, "Unemployment" tops the issue involvement rankings

for communities, but in the personal ranking, it is sixth. Respondents may understand that unemployment is critical for their communities, while it is not a critical issue to them personally, if they are gainfully employed. Marketing applications of the involvement construct (e.g. Zaichkowsky, 1994; Mittal, 1995) were solely aimed at personal or familial involvement among consumers. However, personal versus collective dimensions of involvement may play a critical role in environmental decision making in the public sphere. The distinction could be important in mediating decisions to engage in collective action, which should inform future research.

**Objective 2) Concerns and Behavior**

Respondents do not view climate-related interventions such as upgrades to aging infrastructure and emergency planning as associated with climate change adaptation. However, respondents do see these interventions as important, given their appearance in the top-ranked intervention involvement items. This suggests an avenue for framing climate change adaptation to more clearly link it with these and other climate-related issues and actions.

This study tested the assumption of the Kaine et al. (2010) issue/ intervention involvement model that those in the upper right involvement quadrant (Q1) for a given set of prospective actions would be more likely to intend and ultimately take relevant action than those in other quadrants. The percentages of past and planned behaviors were higher for those in Q1 for all tests, but the prediction was significant only for personal involvement in emergency planning and community involvement in climate change adaptation. These results suggest that quadrant analysis may be a viable approach to better understanding the relationship between concern, interest and behavior, but further scale development will be required, particularly to fully incorporate the framework with the Theory of Planned Behavior.

The results related to transportation infrastructure items were consistently different from the other behavior items. Rates of past and planned advocacy for climate change adaptation and emergency planning were similar, but respondents reported less past advocacy for infrastructure upgrades and more planned. This may be caused by multiple factors. The survey was administered during the winter of 2015 when Washington County had record snowfalls of 14 to 17 feet that caused heavy damage to roads and culverts. Also, an important element of the Washington County climate vulnerability assessment released prior to this study was detailed assessment of potential damage to roadways, culverts and other transportation infrastructure. These two factors, along with other extreme precipitation events may have spurred a dawning interest in improving transportation infrastructure.

As we have seen throughout this study, those reporting committed service to their community exhibit important differences. They are significantly more likely than non-committed respondents to advocate for emergency planning and infrastructure upgrades (which are climate related) but less likely to do so on climate change, per se. This adds to the evidence that adaptation efforts linked to climate-related, high priority issues will gain more traction than efforts framed solely as climate change adaptation measures.

**Objective 3) Self- and Community Efficacy**

Control beliefs are a critical element of TPB in understanding how beliefs relate to action (Ajzen, Czasch, & Flood, 2009; Fishbein & Ajzen, 2010; Heberlein, 2012; Hrubes, Ajzen, & Daigle, 2001), so measuring efficacy provides important insights related to potential behavior. The mean rating for all efficacy items was just 2.85 out of 5, and no efficacy item had a mean rating above 3.5. This suggests a widespread dearth of belief in the efficacy of communities and in the ability of respondents to affect change. Also, efficacy ratings were significantly correlated

with all but one of the past and planned behavior items. Therefore, perceived efficacy may be a significant barrier to climate change adaptation, particularly where resources are scarce. Research focusing on ways in which planners and others can increase confidence among rural residents could be crucial to the success of climate change adaptation efforts in the future.

Those reporting committed service were much more confident in their communities' efficacy than their non-committed counterparts. The differences between committed and non-committed respondents can be interpreted in multiple ways. It may be that those who feel most optimistic and empowered are more likely to volunteer and serve, or their greater confidence may arise from the experience of serving. Conversely, those not serving their municipalities may choose not to serve because they are less confident in the efficacy of their community and/ or they are less confident in their own ability to accomplish goals based on expectations or prior experience. Further study should elucidate this important factor, as it could point to strategies to engage more people in municipal adaptation activities.

## Conclusion

People in committed municipal service are on the front lines of rural climate change adaptation. They are most engaged in decision making, and for certain issues they commonly reside in the upper right involvement quadrant. However, they have several characteristics that may make adaptation efforts difficult in rural communities. Insights from this study suggest important strategies for moving forward.

The results of this study regarding involvement add to a growing body of work pointing to the importance of framing climate adaptation to link it to top priorities, interests and concerns (Wilbanks, 2003; Wilbanks & Kates, 2010; Committee on the Human Dimensions of Global Change & Committee on Global Change Research, 1999). In this study, the climate-

related, non-environmental issues and interventions emerged as promising avenues to begin climate change adaptation. Emergency planning and response show promise as issues and interventions that are widely accepted as a priority and are easily linked to climate. The other area of great potential is adaptation linked with the economic needs of rural communities, again, dependent on framing.

Given the results of our study, those pursuing climate adaptation on environmental issues will likely gain the most traction if they can be linked to other, higher priorities such as economic concerns and emergency planning and response. Without these critical links, it will be very difficult to motivate rural municipalities to act on climate-related environmental concerns.

Our results suggest that personal and community involvement and priorities do indeed differ. However, this raises important questions about how collective priorities and actions relate to personal priorities and actions. If community priority issues and interventions do not align with an actor's personal priorities, the decision to act in a collective sphere will involve setting aside personal priorities for collective ones. Further study will be required to understand when and how that can occur.

A primary limitation of this study and any that seeks such a detailed understanding of attitudes, beliefs and behavior is that it is geographically limited in extent. The results are, necessarily, about a particular place, so we cannot draw definitive conclusions about rural communities generally. Further detailed studies should reveal the diversity and commonalities of priorities and barriers to engagement among rural communities. Also, researchers can assist practitioners by providing robust tools and practices they can use to assess local priorities and barriers to engagement. A critical focus of such research is framing, especially for linking environmental issues to priority areas of concern, and particularly for those tasked with helping rural communities make complex decision. Finally, the involvement framework will need further

refinement if it is to elucidate the critical but oft-ignored nexus between individual intent and collective action.

## CHAPTER 6: CONCLUSION

This research is the first to apply dignity theory to the case of municipal governance, and it points to important questions that may be addressed with future studies on the role of dignity in rural communities. The case of conflict over the Hampden, Maine, comprehensive plan presented in Chapter 2 provided insights into the discursive construction of dignity that may be applied by municipal staff seeking to avoid conflict and regain traction. Meeting minutes suggested that municipal staff had not fully addressed the need for key elements of dignity early in the planning process, specifically, inclusion, independence and accountability. Municipal staff exhibited a strong normative tendency that may provide additional explanation about why minutes focused more strongly on efforts to re-establish a dignified milieu. A concerted effort to reconstitute a dignified milieu eventually led to forward momentum in Hampden.

Newspaper coverage of the clash over Hampden's comprehensive plan focused disproportionately on conflict and intractability, framing the issue around narratives of injured dignity. Focusing on conflict is a common tendency in press coverage of challenges to governance (Hutchins & Lester, 2015; Lester & Hutchins, 2012), but placing it in the context of the dignity framework provides a new perspective. It was beyond the scope of the study presented in Chapter 2 to demonstrate definitively that the discourse in news coverage led to individual perceptions of the process as undignified, but it seems likely and points to an important direction for future research on communication about environmental conflict.

The climate vulnerability assessment project discussed in Chapter 3 utilized many best practices that could be explicitly linked to dignity. In the CVA process and in the Hampden planning process, success ultimately hinged on recognizing, acknowledging, accepting, and including stakeholders—all among Hicks' elements of dignity. In both cases, leadership that safeguarded or restored dignity was critical, as well, which translates to accountability and

fairness. Both case studies point to the dialectical nature of dignified leadership, involving learning loops (Pahl-Wostl, 2009) for incorporating knowledge and interests of stakeholders, as well as feedback loops of information (Ostrom, 1990) that support accountability and demonstrate fairness. Also in both cases, people who might ordinarily oppose activities like zoning or climate change adaptation were, in the end, successfully engaged. While these results are limited to these specific places and issues, they suggest potentially transformative perspectives on the most contentious environmental issues facing rural communities today. Further, the case study presented in Chapter 3 examines a potentially transformative role for community-engaged research on climate change resilience.

The survey results presented in Chapter 4 showed that, while about two-thirds of all respondents believe climate change is occurring and that humans are the cause, the remaining one-third do not believe it is occurring or are unsure. Conservatives and those serving in committed service to their community such as staff and board volunteers were more likely than others to doubt that climate change was occurring. However, when asked whether they had observed impacts from a list of climate-related problems affecting Maine, 87% said they had seen a minor or major effect. These results suggest that focusing on key areas of vulnerability that are of concern to rural actors and are also related to climate change may be seen as more salient than focusing on climate change, per se. To place these results in the context of the dignity framework, accepting, acknowledging, recognizing and understanding the concerns and vulnerabilities of rural actors and framing those concerns within the scope of climate action may give rise to a process seen as inclusive, accountable and fair.

We may consider involvement, as discussed in Chapter 5, as a way to measure in some detail the concerns and interests of rural actors. If we understand their patterns of involvement, especially relative to the larger constellation of issues in their lives, then we have a guide for

taking steps to create a dignified frame. Indeed, by simply asking and carefully considering their answers, we have taken the first steps toward dignity.

Respondents in the survey discussed in Chapter 5 were most involved in non-climate-related issues and potential actions, but climate-related non-environmental issues and actions, such as emergency response and planning, were among the top concerns and interests of respondents. Those in committed roles in municipal government showed greater interest in climate-related actions that are not framed explicitly as climate change adaptation, and they felt a greater sense of both self- and community efficacy than those who play non-committed roles. This speaks to great potential for future action.

## Next Steps for Dignity Research

Rural American communities are facing an array of natural resource management challenges that have been the subject of intense interest among researchers concerned with an array of looming vulnerabilities. Some research has focused on the individual sphere, such as the experience of poverty (e.g Beegle, 2000; Sherman, 2009), land use decision-making (e.g. Jansujwicz, Calhoun, Leahy, & Lilieholm, 2013; Paolisso, Weeks, & Packard, 2013), and beliefs and vulnerabilities related to climate change (e.g. Hamilton & Keim, 2009; Marshall, Fenton, Marshall, & Sutton, 2007; Marshall, Gordon, & Ash, 2011). Others focus on the collective sphere, such as social captial (e.g. Adger, 2003; Smith, Anderson, & Moore, 2012), governance (e.g. Plummer, 2013), and a wide array of conflicts over natural resources.

As outlined in Chapter 1, some researchers study the nexus between the individual and the collective spheres where personal beliefs, attitudes, and emotions interact with governance processes involving activities like decision-making, collaborating, and interacting. Many interesting and important things happen in the nexus: people come together to embody,

legitimize, and challenge governance arrangements (Ostrom, 2000; Ostrom & Ostrom, 2004; Ostrom, Ostrom, Sabetti, & Aligică, 2014; P. A. Sabatier, 2005). They share and create knowledge (Cash et al., 2003), social order (Jasanoff, 2006) and culture (Jasanoff, 1996). The nexus is where trust among individuals and of government agencies can grow or wither. A few psychometric studies have added to the understanding of community/ agency trust (Leahy & Anderson, 2008; Smith, Leahy, Anderson, & Davenport, 2013a, 2013b). Others have evaluated the role of trust in the climate change debate (Grasswick, 2014; Leiserowitz, Maibach, Roser-Renouf, Smith, & Dawson, 2013). Often the processes occurring at the nexus between the personal and collective spheres give rise to conflict, and when conflict becomes rancorous, as many researchers have noted, hard feelings remain and influence governance processes (Johnson, 2005; Lewicki, Gray, & Elliott, 2003; P. A. Sabatier, 2005; P. Sabatier, Hunter, & McLaughlin, 1987). The fields of planning and collaborative decision-making apply themselves to understanding and aiding in the function of the nexus (Bryson, 2011; Bryson & Anderson, 2000; Straus, 2002). They identify and teach ways in which diverse groups of people govern together by cooperating, collaborating, making collective decisions, and addressing challenges. However, little attention has been paid to the role of past conflict, cultural and ideological differences, or emotional trauma—the dignity context—in natural resource governance processes. This may be especially important in rural communities where certain socioeconomic and structural elements can lead to psycho-social issues affecting the ways people view and interact with government agencies and governance processes (e.g. Beegle, 2000; Beegle, Ellis, & Akkary, 2007; Kent, 2005).

Hicks' (2011) framework for understanding the role of dignity and indignities in conflict offers potentially fruitful directions for research on the nexus between the individual and collective spheres. Hicks' outline of the elements of dignity provides the basis for a coherent, psychometrically testable conceptual model of the role of dignity in an individual's engagement

in group processes. Dignity is widely discussed in academic literature but rarely measured systematically. While most who have written about dignity (and its antonym humiliation) have largely focused on philosophical, moral or legal perspectives (e.g. Brown, 2006; Brunner, 2010; Delli Priscoli, 2012; D'Entremont, 2007; Mattson & Clark, 2011; Murray, 2000). Hicks offers a well-articulated, coherent and practical description of the workings of dignity with a basis in behavior.

There have been two prior psychometric methodologies developed to measure dignity, one in nursing care of the elderly and one in palliative care for the terminally ill. In her initial study of dignity in elder care, Jacelon (2003) compiled a literature review and used a grounded theory approach with focus group interviews to establish a definition and conceptual framework for dignity in elderly hospital patients. The elements of dignity arising from Jacelon's grounded theory work could be divided into two categories: self-dignity arising from a sense of self worth, and interpersonal dignity arising through interactions with others. This work also led to important insights that could be applied to nursing care (Jacelon & Henneman, 2004). Most notably, the definition of dignity centered on psychometrically measurable behaviors related to respect: respect for self and interpersonal respect for the fundamental humanness of the patient (Jacelon et al., 2004). Respect for self, they found, was vulnerable to harm from interpersonal indignities in their care, as well as the indignities inherent in aging such as losing one's independence. This framework aligns with Hicks' observations among people involved in conflict. Those surviving armed conflict had suffered harm to their dignity both in conflict and as a result of depredations of war and poverty such as hunger, physical injuries and displacement.

Using the framework established by this early qualitative work, Jacelon and colleagues developed the Attributed Dignity Scale (ADS) and conducted initial pilot tests to determine construct validity (C. Jacelon, Dixon, & Knafl, 2009). Most recently, in a larger test of the ADS,

Jacelon and Choi (2014) assessed the scale using factor analysis and narrowed the set of measures to 18. Tests for internal validity showed significant consistency among multiple items tested. Factor analysis showed factor loading related to four general, interrelated constructs: perceived value from others, self value, self in relation to others, and behaviors indicating respect from others. The constructs also showed temporal stability when respondents were resurveyed. The work of Jacelon and her colleagues may now lead to wider studies on the dignified treatment of elders in medical settings with potential for widespread improvements.

Chochinov and colleagues undertook a pair of studies, one qualitative and the other a survey of 213 patients, to begin building a model for understanding the role of dignity in the quality of life and care for terminally ill patients. The survey was constructed using concepts arising from prior qualitative work and elements from other surveys that logically related to the concept of dignity. The survey found dignity issues to be of great concern to 7.5% of the sampled population, and these patients showed much higher rates of emotional distress than those who did not show concern related to dignity issues (Chochinov, Hack, Hassard, et al., 2002).

The qualitative study used interviews to build on the conceptual model regarding the elements of dignity for later empirical testing. The interview research yielded three general categories of factors related to dignity. One category was illness-related dignity concerns which involved items such as loss of independence or physical or mental distress. Another category related to activities or perspectives that preserved dignity such as a sense of normalcy or a sense of autonomy or control. The third category was the social dignity inventory, measuring interpersonal elements of dignity. (Chochinov, Hack, McClement, Kristjanson, & Harlos, 2002)

The qualitative and survey work of Chochinov and colleagues described above laid the groundwork for developing and testing a 25-item Patient Dignity Inventory (PDI) designed to allow doctors and nurses to assess dignity-related distress in terminally ill patients. In a test of

the PDI with 253 palliative care patients, Cronbach's alpha showed strong internal reliability (0.93), and test/ re-test reliability showed strong correlation. Exploratory factor analysis informed by the prior studies derived five categories, some related to personal and others to interpersonal dimensions. The instrument is now being used to assess the distress levels of patients in palliative care. (Chochinov et al., 2008) Most recently, the PDI was used in a randomized, controlled study assessing a dignity therapy intervention for terminally ill patients (Chochinov et al., 2011).

Future research will begin the process of building a scale based on the elements of dignity outlined by Hicks (2011) and methods modeled on the work of Jacelon, et al. The overall goal will be to better understand the role of dignity in rural community members' attitudes and behaviors related to conflicted and complex issues facing rural communities today. When complete, the scale will operationalize each of Hicks' elements as actions to determine whether participants believe they are treated with dignity by people involved in governance processes and whether they believe the process itself supports dignity.

The scale development will begin with focus group interviews. The interview instrument will be designed to identify potential measures of dignity, as well as associated affective and process-related factors in rural environmental decision making. This will form the basis for refining the conceptual model of the role of dignity and related constructs in environmental governance and identify metrics that may be measured quantitatively.

## Next Steps for Planning and Applied Research

There is still a great deal left to learn about the role of dignity in natural resource governance in rural areas, but for now it can serve as a framework to understand many of the things we already know about how and why governance arrangements succeed or fail. Chapters

2 through 5 offer specific recommendations related to each presented study. However, there are recommendations related more generally to dignity arising from this research that can inform future efforts, even as we pursue further research on the particulars of the dignity framework. Attending to dignity as we traverse the nexus between individual experience and collective action will be very difficult for many people and communities. It means not only changing the structure of governance processes, but also our own attitudes, beliefs and actions.

The primary focus in supporting dignity is that, Hicks writes, "We must treat others as if they matter, as if they are worthy of care and attention." (2011, p. 4). Dignity is supported by governance arrangements that seek out, accept, recognize, and acknowledge the lived experience of stakeholders. Often, that experience extends beyond the issue at hand, and it may seem beyond the scope of the process to hear, acknowledge, and understand exogenous factors of concern to a participant. However, rancor and gridlock are likely to be an even less efficient use of time if we fail to acknowledge concerns that are important to participants. Also, such information may lead to ideas that improve the outcome of the process. Ideas arising from the climate vulnerability assessment meetings described in Chapter 3 offer a case in point. Participants at the meetings were often less concerned about climate change, per se, but when queried about their concerns they identified storm damage to culverts as a persistent problem. In subsequent discussions and exchanges, leaders and participants realized that the towns shared a common issue with people working to improve endangered Atlantic salmon habitat by installing wider, open bottom culverts. A new initiative was borne.

The culvert anecdote also points to the importance of framing problems, goals and solutions around the concerns and interests of stakeholders. Inclusive framing is one means of showing acknowledgement, acceptance and inclusion. Based on the climate change belief patterns revealed in the survey in Chapter 4 and involvement patterns revealed in Chapter 5, for

example, proposals framed as climate change adaptation are likely be of limited interest to most rural actors, even those who accept the reality of climate change. However, the results in both chapters provided insights on potential frames for climate change adaptation around existing concerns like emergency planning. Therefore, it is critical that governance arrangements involve robust mechanisms for understanding concerns and asking novel questions.

The conflict over Hampden's comprehensive plan discussed in Chapter 2 provided a valuable lesson about inclusion. The planning board and town council held hearings and meetings about the comprehensive plan over a period of three years before the conflict arose and derailed the process. They believed they were being open and including all who wanted to participate, since the meetings and hearings were advertised in local newspapers. After the conflict arose, the councilors recognized that they had not been proactive enough about engaging the public in the process. Given the fact that the final version of the plan was nearly identical to the one that had been originally proposed, it appears that the process and not the content was the most important aspect of the plan to the town residents who originally opposed the plan.

For governance arrangements to be perceived as fair and inclusive, they must be accountable to participants. In the context of the dignity framework, accountability can be understood as an information feedback loop, as envisioned by Ostrom (1990). It is insufficient to have mechanisms for collecting public comments and concerns. Governance processes must respond with information that demonstrates stakeholder input has been accepted, acknowledge, understood, and recognized. This is necessary for a stakeholder to feel included and to understand the process as fair.

Perhaps the most challenging practice in supporting dignity is personal: adopting reflexivity and openness to the experiences of others. This is especially difficult when we

encounter those whose views differ from our own. The phenomenon of devil-shift (Sabatier, 2005) such as the sudden rancor described in Chapter 2, can be understood as a feedback loop of undignified reactions to indignity. Such a cycle can only be halted when participants override their own instincts and react with dignity. That requires immense courage, self-knowledge, and a commitment to honoring the dignity of others.

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## APPENDIX A. HAMPDEN COMPREHENSIVE PLAN TIMELINE

Spring & Summer 2010:

- Near end of 2.5 year planning process, Hampden Town Council holds three public hearings. Total attendance: 2.

Winter 2010/11:

- Nationally renowned expert in conservation zoning gives a workshop to the town planners, councilors, and a local non-profit.

Spring 2011:

- New member of the Town Council sworn in, begins to question comprehensive plan.
- 250 angry residents attend a Town Council meeting to demand the repeal of comprehensive plan.
- Council refers the matter to the planning and development committee which establishes a special citizen's committee to consider changes to the plan.
- Town begins televising Town Council meetings.
- Mayor and council chair steps down, vacates a seat on the Town Council.

Summer 2011:

- Series of contentious Town Council meetings with angry citizens opposing the plan; many believe that they can vote at meetings to repeal the plan, which is untrue.
- Citizens comprehensive planning committee begins meeting and working through the plan.
- An opponent of the plan runs for the vacant seat but loses by a margin of 2 to 1.
- Angry citizens form the Hampden Association of Land Owners or HALO.
- HALO lawyer finds a procedural oversight that renders the 2010 comprehensive plan invalid. This is confirmed by the town's attorney.

- HALO unsuccessfully challenges the prior comprehensive plan of 2001, which is still in effect.
- Personal attacks, accusations of conspiracy, angry outbursts, and police oversight become commonplace at Council meetings.
- The town staff are flooded with FOIA requests for documents and materials
- The number of restive citizens attending each meeting diminishes over time.
- The town manager announces that she would resign by the end of the year.

Fall 2011:

- Citizens committee fails to complete its work by the deadline set by the council, asks for an extension. Council agrees to extend the deadline but without the costly professional facilitator.
- Over 60 people attend a presentation by a well-known landowner rights activist.
- In November, another plan opponent is elected to the town council, though three other challengers were unsuccessful.
- HALO supporters challenge the results of the election, and an investigation by the town's election officials finds a discrepancy of five votes.

Winter 2011:

- The state election commission oversees an investigation and recount of the November election.
- On December 1st, the citizen's committee approves a new version of the comprehensive plan.

Spring 2012:

- In March, results of the November election are validated by the state's election commission.

## APPENDIX B: SOURCES FOR HAMPDEN COMPREHENSIVE PLAN STUDY

### Municipal Meeting Minutes

Town Council

- December 20, 2010
- November 15, 2010
- February 7, 2011
- April 4, 2011
- April 11, 2011
- May 2, 2011
- May 16, 2011
- June 6, 2011
- June 20, 2011
- August 1, 2011
- September 19, 2011
- November 14, 2011

Planning & Development Committee

- January 5, 2010
- December 15, 2010
- April 6, 2011
- April 20, 2011
- May 4, 2011

Comprehensive Plan Informational

- April 26, 2010
- May 4, 2010
- May 13, 2010
- May 20, 2010
- March 1, 2011

Strategic Planning Workshop

- February 5, 2011

Other

- Comprehensive Plan Considerations, April 6, 2011
- Citizens Comprehensive Plan Committee, 2011

**Bangor Daily News Articles**


Russell, E. (2010, Apr 17). Legacy of the landfill Hampden prepares for trash facility's transition from waste storage to energy production. *Bangor Daily News*, pp. 1. Retrieved from http://search.proquest.com.ursus-proxy-5.ursus.maine.edu/docview/414503822?accountid=28946

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**APPENDIX C: ANNOTATED CLIMATE PRIORITIES AND INVOLVEMENT SURVEY**

***Involvement****: This section is aimed at understanding how climate-related problems fit within existing vulnerabilities and concerns in the minds of local residents using the construct of involvement. The items to be rated cross multiple dimensions of existing or potential problems in these communities, as shown below.*

***[Issue Involvement for Community]***

**Question 7: Please indicate the extent to which each problem is *significant in the Downeast town where you live or spend the most time***. *(We'll ask about your personal concerns next)*

| | Insignificant in my Community 1 | 2 | 3 | 4 | Significant in my Community 5 |
|---|---|---|---|---|---|
| *[Non-Climate, Non-Environmental]* | | | | | |
| Unemployment | | | | | |
| High property taxes | | | | | |
| School budgets | | | | | |
| *[Climate-Related, Non-Environmental]* | | | | | |
| High price of heating fuel | | | | | |
| Poor quality housing | | | | | |
| Aging roads, bridges & culverts | | | | | |
| Land use regulations | | | | | |
| *[Climate-Related, Environmental]* | | | | | |
| Shellfishing closures | | | | | |
| Lobster prices | | | | | |
| Endangered Atlantic salmon | | | | | |
| Flooding & erosion | | | | | |
| Unusually strong storms | | | | | |
| Agricultural pests & diseases | | | | | |
| Forest pests & diseases | | | | | |
| *[Climate, General]* | | | | | |
| Global warming | | | | | |
| Greenhouse gas emissions | | | | | |
| *[Non-Climate, Environmental]* | | | | | |
| Brownfields (polluted former industrial or commercial properties) | | | | | |
| Other (Please specify) | | | | | |

**Which of the problems above is the most *significant in your community*?** (*Please name one*

***[Issue Involvement Personally]***

**Question 8: Please indicate the extent to which each problem is *important to you personally*.**

| | Unimportant to me Personally 1 | 2 | 3 | 4 | Important to me Personally 5 |
|---|---|---|---|---|---|
| *[Non-Climate, Non-Environmental]* | | | | | |
| Unemployment | | | | | |
| High property taxes | | | | | |
| School budgets | | | | | |
| *[Climate-Related, Non-Environmental]* | | | | | |
| High price of heating fuel | | | | | |
| Poor quality housing | | | | | |
| Aging roads, bridges & culverts | | | | | |
| Land use regulations | | | | | |
| *[Climate-Related, Environmental]* | | | | | |
| Shellfishing closures | | | | | |
| Lobster prices | | | | | |
| Endangered Atlantic salmon | | | | | |
| Flooding & erosion | | | | | |
| Unusually strong storms | | | | | |
| Agricultural pests & diseases | | | | | |
| Forest pests & diseases | | | | | |
| *[Climate, General]* | | | | | |
| Global warming | | | | | |
| Greenhouse gas emissions | | | | | |
| *[Non-Climate, Environmental]* | | | | | |
| Brownfields (polluted former industrial or commercial properties) | | | | | |

Other (Please specify)

**Which of the problems above is the *most significant* in your community?** *(Please name one)*

***[Intervention Involvement for Community – note: Intervention involvement for climate change specifically is measured.]***

**Question 9: Please indicate how *important* each of the following activities is *to the community* in Downeast Maine where you live or spend the most time**. (*We'll ask about your personal interests next)*

| | Unimportant to my Community 1 | 2 | 3 | 4 | Important to my Community 5 |
|---|---|---|---|---|---|
| *[Climate-Related, Non-Environmental]* | | | | | |
| Emergency response such as fire department or EMT | | | | | |
| Emergency planning for extreme weather events | | | | | |
| Repair and improvement of roads, bridges and culverts | | | | | |
| *[Non-Climate, Non-Environmental]* | | | | | |
| Heating fuel assistance program | | | | | |
| Food assistance (e.g. food pantry or meals-on-wheels) | | | | | |
| Economic development | | | | | |
| School budget planning | | | | | |
| *[Climate-Related Environmental]* | | | | | |
| Shellfish management | | | | | |
| Comprehensive planning | | | | | |
| Land use regulation | | | | | |
| Shoreland zoning | | | | | |
| *[Non-Climate, Environmental]* | | | | | |
| Cleanup of Brownfields (polluted former industrial or commercial properties) | | | | | |
| Other (Please specify) | | | | | |

**Which of the activities above is *most important* in your community?** (*Please name one)*

***[Intervention Involvement Personally]***

**Question 10: Please indicate how much each of the following community activities *means to you personally.***

| | Means Nothing to me Personally 1 | 2 | 3 | 4 | Means a Lot to me Personally 5 |
|---|---|---|---|---|---|
| *[Climate-Related, Non-Environmental]* | | | | | |
| Emergency response such as fire department or EMT | | | | | |
| Emergency planning for extreme weather events | | | | | |
| Repair and improvement of roads, bridges and culverts | | | | | |
| *[Non-Climate, Non-Environmental]* | | | | | |
| Heating fuel assistance program | | | | | |
| Food assistance (e.g. food pantry or meals-on-wheels) | | | | | |
| Economic development | | | | | |
| School budget planning | | | | | |
| *[Climate-Related Environmental]* | | | | | |
| Shellfish management | | | | | |
| Comprehensive planning | | | | | |
| Land use regulation | | | | | |
| Shoreland zoning | | | | | |
| *[Non-Climate, Environmental]* | | | | | |
| Cleanup of Brownfields (polluted former industrial or commercial properties) | | | | | |
| Other (Please specify) | | | | | |

**Which of the activities above is the most important to you personally?** (*Please name one)*

***[Perceived Behavioral Control-- Related to Intervention Involvement]***

**Question 11: Please tell us your opinion on the capabilities of the town in Downeast Maine where you live or spend the most time.**

| | Strongly Disagree | Disagree | Neither | Agree | Strongly Agree | Don't Know |
|---|---|---|---|---|---|---|
| The people of my town have the skills they need to solve problems in my community. | | | | | | |
| My town has the finances it needs to resolve problems in my community. | | | | | | |
| My town has sufficient computer skills, equipment and services to meet my community's needs. | | | | | | |
| My town has the maps it needs to help in making decisions. | | | | | | |
| My town has sufficient infrastructure (roads, bridges, utilities, etc.) to serve the community's needs. | | | | | | |
| The people of my town are able to effectively resolve controversial local issues. | | | | | | |
| My town is able to effectively plan for the future. | | | | | | |
| I am able to influence important decisions in my town. | | | | | | |
| Everyone in my town is able to influence important decisions. | | | | | | |

**Please share any additional thoughts about the capabilities of the town in Downeast Maine where you live or spend the most time.**

***<u>Beliefs about Climate Change Effects:</u>*** *This section is informed by Arbuckle et al. (2013); Raymond and Spoehr (2013); Hamilton and Keim (2009). In each of these recent studies, researchers surveyed or interviewed participants about whether they perceive climate changes locally. Arbuckle et al. Actually used double-barreled questions, asking in the same item whether respondents believed climate change was happening and whether they believed humans were the cause.*

*I've chosen to separate each of the elements. The items in this section asks respondents to indicate whether they have observed climate-related changes locally without explicitly linking*

*them to climate change. In this way, I hope to determine whether traction on climate change adaptation might be gained by linking it to observed changes in their environment, regardless of their causes. The later questions ask specifically about their climate change beliefs.*

***[Climate Change Beliefs]***

**Question 12: The following is a list of environmental problems that may be affecting your community. Please indicate whether each issue has had a major effect, minor effect, or no effect on your community *over the past five years*.**

| | No Effect | Minor Effect | Major Effect | Unsure |
|---|---|---|---|---|
| Coastal flooding | | | | |
| River or stream flooding | | | | |
| Unusually warm summers | | | | |
| Changes in the abundance of animals or plants on land or in the water | | | | |
| Changes in the locations or movements of animals or plants on land or in the water | | | | |
| Unusually high amounts of rainfall | | | | |
| Agricultural pests or diseases | | | | |
| Forest pests or diseases | | | | |
| Lyme disease | | | | |
| Loss of habitat for animals or plants | | | | |

**Please share any additional thoughts about environmental problems that may be affecting the town in Downeast Maine where you live or spend the most time.**

***[Dignity and Trust]***

**Section E: We would like to know your opinion about government agencies that provide information and assistance to communities addressing environmental problems.**

**Question 13: Which government agency provides you with the most trustworthy information about environmental problems affecting your community?**

**Question 14: Which government agency provides you with the most useful information about environmental problems affecting your community?**

**Question 15: Which government agency treats you with the most dignity when addressing environmental problems affecting your community?**

***[Intervention Involvement/ Climate-Related Reported Behavior]***

**Question 16. Please read each of the following statements carefully and check the box that best describes your past activities.**

| | False 1 | 2 | 3 | 4 | True 5 |
|---|---|---|---|---|---|
| In the past year, I have advocated for upgrades to roads, bridges and culverts in my community. | | | | | |
| In the past year, I have advocated for emergency planning for extreme weather events in my community. | | | | | |

***[Intervention Involvement/ Climate-Related Planned Behavior]***

**Question 17. Please read each of the following statements carefully and check the box that best describes your planned activities.**

| | Unlikely 1 | 2 | 3 | 4 | Likely 5 |
|---|---|---|---|---|---|
| In the coming year, I plan to advocate for upgrades to roads, bridges and culverts in my community. | | | | | |
| In the coming year, I plan to advocate for emergency planning for extreme weather events in my community. | | | | | |

**Section G: In this section, we will ask about your attitudes toward global warming and adapting to the effects of climate change in the Downeast community where you live or spend the most time.**

Local effects of climate change may be positive or negative. They might include more frequent and stronger storms, more precipitation, warmer temperatures, changing abundance of plants and animals, and pests and diseases affecting agriculture, forests, fisheries and human health.

**Question 18. Please read each of the following statements carefully and check the box that best describes your opinion.**

| | Strongly Disagree | Disagree | Neither | Agree | Strongly Agree | Don't Know |
|---|---|---|---|---|---|---|
| Global warming is happening now. | | | | | | |
| Humans are the cause of global warming. | | | | | | |
| I have personally observed the effects of global warming. | | | | | | |
| There is not enough evidence to tell whether global warming is happening now. | | | | | | |
| Most scientists agree that the earth is warming. | | | | | | |
| Burning of fossil fuels is a primary cause of global warming. | | | | | | |

***[Intervention Involvement/ Climate-Explicit Reported Behavior]***

**Question 19. Please read the following statement carefully and check the box that best describes your <u>past activities</u>.**

| | False 1 | 2 | 3 | 4 | True 5 |
|---|---|---|---|---|---|
| <u>In the past year</u>, I have advocated for adaptation to climate change in my community. | | | | | |

***[Intervention Involvement/ Climate-Explicit Planned Behavior]***

**Question 20. Please read the following statement carefully and check the box that best describes your <u>planned activities</u>.**

| | False 1 | 2 | 3 | 4 | True 5 |
|---|---|---|---|---|---|
| <u>In the coming year</u>, I plan to advocate for adaptation to climate change in my community. | | | | | |

## BIOGRAPHY OF THE AUTHOR

Tora Johnson was born in Worcester, Massachusetts, on December 7, 1963. She was raised in Worcester and Cape Cod, Massachusetts, graduating from Dennis-Yarmouth Regional High School in 1981. She attended the University of Oregon where she earned a Bachelor of Science degree in Biology. After a career teaching marine and nautical science aboard sailing ships in New England, Tora returned to academia to teach environmental studies at Cape Cod Community College in 1997. She earned a Master's of Philosophy in Human Ecology from College of the Atlantic in 2003, and remained there to teach geographic information systems, biology and mathematics until 2005. Her book, *Entanglements: The Intertwined Fates of Whales and Fishermen*, was published by The University Press of Florida in 2005. Since 2007, Tora has served as the director of the Geographic Information Systems (GIS) Laboratory and Service Center at the University of Maine at Machias where she teaches GIS and environmental studies. In that role, she has led statewide and nationwide initiatives in GIS education, serving on the National Visiting Committee of the National Geospatial Technology Center for Excellence. In 2015, she was given a lifetime achievement award by the National Center for her work in undergraduate geospatial technology education. Tora is a candidate for the Doctor of Philosophy degree in Forest Resources from The University of Maine in August 2015.