

COLLABORATIVE GOVERNANCE IN REGIONAL CLIMATE RESILIENCE PLANNING:

A case study of the Resilient Mystic Collaborative

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SUMMARY

With climate change causing rapid, dramatic changes to the environment, the effectiveness of societal responses are strongly driven by the ability of institutions, particularly those of public governance, to adapt to change. Therefore, an analysis of governance systems with a particular focus on their ability to facilitate collective action is an important intermediate step to achieving climate adaptation.

This thesis focuses on the governance context of the United States where municipal fragmentation is a key institutional challenge to planning at the regional scale. As an issue that manifests across jurisdictional boundaries, climate change adaptation is increasingly being addressed through collaborative governance. Through a case study of the Resilient Mystic Collaborative (RMC) in the Greater Boston area of Massachusetts, this thesis explores answers to the following question - in the context of municipal fragmentation in the United States, what are the strengths and limitations of voluntary collaborative regional governance in achieving climate change adaptation?

I find that voluntary regional collaboratives are likely to be successful in building relationships, trust and shared understanding of climate risks and solutions. However, collaborative governance is limited in its potential to implement these measures at the scale required to achieve climate adaptation. The pace and scale of climate change calls for societies to make transformational changes in the ways they function and it is crucial to adapt existing institutions to guide this change.

The Resilient Mystic Collaborative is the first collaborative of municipalities working towards climate adaptation at the watershed scale in Massachusetts. As other watershed-based collaboratives are beginning to coalesce around this model of inter-municipal collaboration, they are likely to encounter similar challenges to those faced by the RMC. This thesis aims to prompt discussion on how to address these challenges with a recommendation for voluntary regional collaboratives to direct their efforts towards building public and legislative support for institutionalized regional climate adaptation.

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PREFACE

This is a brief description of the motivations and experiences which shaped my choice of topic and which I believe, are relevant to explaining my approach and perspective to this work.

I am broadly interested in how the geographical and historical context of place shapes values, norms and culture which in turn manifest throughout the range of human interaction from individuals and the everyday, to the government of a country. This is how I structure my understanding of the cities and countries I have lived in and also shapes my approach to academic work and this thesis. This is my first organized research on either governance or climate adaptation. My inquiry began with a study of watersheds and as I delved deeper into the subject it was apparent that management for even something as universal in nature as water, is strongly dependent on local institutions. Climate change impacts such the threat of sea level rise to coastal cities are similar in different places around the globe and studying adaptation responses, driven by local governance, offers a comparative understanding of widely differing institutional approaches to the same problem.

My arrival in Boston, in the Fall of 2018 to begin graduate studies at MIT, was the first time I had ever set foot in the United States. I travelled from Singapore where I had spent the last five years working on applied research on the spatial and social aspects of public space planning in the island-nation. Singapore is an aspirational model for cities in many emerging economies including my home country of India, but the unique geo-political context of this city-state makes its approach to urban planning both highly efficient and impossible to replicate. Nevertheless, it was fascinating to learn how its policies have evolved in response to the country's rapidly changing socio-economic conditions. I was looking forward to developing a similar understanding of urban planning issues in a local context here in the United States.

The nature of planning as an applied field, in addition to my background in architecture and applied research, shaped my approach to this work, which is empirical and qualitative. Along with studying

the theory on climate adaptation and collaborative governance, I spent time observing the work of the Mystic River Watershed Association to ground my academic work in practice. Most of my findings in this thesis are drawn from primary data that I gathered from participant observation and interviews.

As an international student, conducting participant observation in a new environment, enabled me to notice and question things that I would probably take for granted in a setting with which I am more familiar. As I am fluent in English, language was not a barrier in the context of my fieldwork. However, as a foreigner with no prior experience of the local culture, it is possible that I missed or failed to understand implicit communication in the group settings I was observing. I was also aware that being given access to meetings and people that I would otherwise not have, was a privilege as well as a responsibility.

As I mentioned earlier, I began this research with limited prior knowledge of the subject areas at the center of this research. I have lived and studied for most of my life in countries where my education was strongly influenced by the legacy of colonialism and a worldview that privileges Anglo European systems of knowledge and epistemology. These aspects of my background and training undoubtedly influenced my approach and positionality in my work in ways that I may or may not be aware of.

Through the course of the past year, my thesis advisors and collaborators at the Mystic River Watershed Association have encouraged me to value what I already came to this work with – knowledge from my own background and experiences. I am immensely grateful for their guidance, which together with the topic of this study, has motivated me to continue appreciating the variety of societal responses to problems that call for collective action. As we work towards averting environmental crises on a global scale, adaptation of institutions is an area of research that needs exploration and analysis more than ever.

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CHAPTER 1: INTRODUCTION

Societal responses to problems of a public nature such as climate adaptation are shaped by institutions which are broadly defined as the ‘prescriptions that humans use to organize all forms of repetitive and structured interactions’(Ostrom, 2005). The availability of capital, technology, information and skills do not necessarily lead to successful adaptation without crucial institutional factors that influence how society accesses and uses those resources, and mediates between individual and collective responses to climate impacts (Agrawal, 2008; Næss et al., 2005).

Understanding the role of institutional arrangements through their manifestation as governance processes, in either hindering or contributing to climate change adaptation, is central to adaptation governance (Bisaro & Hinkel, 2016). The territorial structure of government has important consequences for how governance occurs across jurisdictional boundaries (Bartolini, 2015). In the United States municipal fragmentation, where metropolitan areas have many local governments, present several challenges to addressing planning issues that manifest at regional scales. This phenomenon is particularly pronounced in Massachusetts, a home rule state, which has no active regional governance structures that coordinate between government at the state level and its 351 municipalities. Adaptation to climate change is particularly challenging in this context as climate change impacts occur on ecological scales that stretch across political boundaries and have implications for planning and policy across the spectrum of the built and natural environment.

Much of climate change impacts are mediated through water and the Greater Boston area is home to several rivers which pose flood risks to the municipalities in their watersheds. As rivers, and consequently their flood waters, flow across jurisdictional boundaries, governance at the municipal scale is ill-equipped to effectively address these risks. The void in regional governance is being filled by watershed associations which facilitate collective action on climate adaptation between the municipalities. However, as non-governmental organizations, the watershed associations have neither dedicated funding nor the authority to set mandates for adaptation measures such as the restriction of development along ecologically sensitive areas or regionally consistent zoning.

Despite these limitations, municipal planners are investing time and effort in participating in the collaboratives facilitated by the watershed associations, indicating that they see value in this participation.

Against this background, the main question guiding this thesis is:

- How can voluntary collaboratives contribute to climate change adaptation?
 - What comprises an effective approach to climate adaptation? What kinds of governance models does this include?
 - What are the ways in which the outcome of collaborative governance can be assessed? How do these outcomes play a role in achieving climate adaptation?

To answer these questions, I adopted a case study approach focusing on the Resilient Mystic Collaborative (RMC) a group of 19 of the 21 municipalities around the Mystic River facilitated by the Mystic River Watershed Association. The Collaborative, which was initiated in September 2018, has been successful in bringing together almost all the municipalities in the Mystic River watershed and has received several grants from the state to support collective climate action. I collected primary data through RMC documents, participant observation of meetings and interviews with RMC members. I then used the conceptual framework described in Chapter two of this thesis to structure my findings of why the collaborative has been successful in achieving its goals thus far, as well as the likelihood that they will continue to do so as they work towards implementing the next stages in the process of regional climate change adaptation.

A brief overview of each chapter in the thesis is as follows:

In chapter 2, I discuss why collaborative governance is often used as an approach to addressing climate change adaptation. I discuss the mechanisms through which collaborative governance addresses complex, multi-sectoral issues such as climate change adaptation and discuss frameworks which describe the scope conditions under which this approach is likely to be successful in achieving its goals.

In chapter 3, I use the conceptual framework of chapter two to structure my findings about the Resilient Mystic Collaborative (RMC) including the conditions and drivers contributing to its

initiation, its organizational structure and process, and the outcomes of its collaborative efforts thus far. I supplement descriptions with insights from interviews I conducted with RMC members that highlight their motivations for participation and views of the collaborative's achievements to date.

Finally, in chapter 4, I conclude with a discussion of the comparative strengths of a regulatory, institutionalized approach to climate adaptation versus one based on voluntary collaboration. I recommend the development of an integrated model that incorporates both regulatory and voluntary action to build climate resilience.

CHAPTER 2: LITERATURE REVIEW

This chapter explores literature on climate adaptation to understand the approaches appropriate for dealing with the uncertain, cross-sectoral nature of this problem. Climate change touches on multiple aspects of society and therefore, effective solutions call for a coordinated response from an equally diverse range of actors from the public and private sector. In the context of municipal fragmentation and increasing privatization of public services in the United States, collaborative governance has emerged as an approach to addressing complex, cross-jurisdictional public problems through public-private partnerships. This literature review draws from three frameworks to develop a conceptual model of how different aspects of collaborative governance contribute to achieving successful outcomes. The model developed here will be used to analyse and frame the findings of this thesis.

While much of climate action is focused on mitigation of future emissions that will exacerbate climate change, society is already experiencing impacts of past emissions on physical and ecological systems. Adaptation to these changes involves an adjustment in societal systems to reduce vulnerability to future climate change, alleviate its impacts or take advantage of new opportunities (ICLEI Canada, 2013).

While planning for the future typically relies on patterns of how things have unfolded in the past, societal problems like climate change adaptation are surrounded by uncertainty and ambiguity, are multidimensional in nature and interconnected with other problems. Therefore, climate adaptation as a policy field has only weakly defined ambitions, responsibilities, procedures, and solutions (Termeer et al., 2017). For example, we know sea levels are rising and precipitation patterns are changing but we don't know for certain by how much and when these conditions will occur or if the solutions that are proposed and implemented now will be sufficient for the future.

The uncertainties about the adequacy of physical interventions to protect against climate impacts means that beyond infrastructural and technical adjustments, climate governance needs to enhance the *capacity* of society to deal with future changes and vulnerabilities (IPCC, 2007; Termeer et al., 2017).

Governance extends far beyond the government to involve the processes through which public as well as private actors and institutions interact to make decisions, and implement activities towards

solving societal problems’(Bednar et al., 2019; Termeer et al., 2017; UMass Boston, 2018). Municipal fragmentation poses a particular challenge to adaptation governance since climate change action requires the involvement of almost all policy domains and governance levels (Termeer et al., 2017).

‘The need is to use approaches to governance that are capable of confronting problems in a manner that is flexible and responsive enough to adjust to complex, often unpredictable feedback between social and ecological system components such as those anticipated to result from a changing climate’ (UMass Boston, 2018). Problems affecting a range of domains, actions and actors cannot be addressed effectively through hierarchical or monocentric form of governance. Adaptive governance, therefore, focuses on decentralized decision-making through social processes such as collaborative learning, networking, and the promotion of cross-sectoral partnerships to enhance adaptive capacity (Aytur et al., 2015). This implies a polycentric governance structure that acts like a network with power distributed amongst different actors , each playing a different and necessary role: public agencies, private for-profit enterprises, and private non-profits or civil society actors (Bednar et al., 2019; Pahl-Wostl et al., 2012; UMass Boston, 2018). The building of this network is facilitated by the existence of opportunities where actors can engage in a deliberative process of debate, bargaining and mutual learning to map out actions to address problems (Pahl-Wostl, 2009)

Collaborative or network governance

A study of governance processes includes examining the role of different actors, the nature of relationships between actors, and the dominant instruments used to achieve policy objectives (Bednar, Henstra, et al.).

There are two terms that scholars use to describe the actions of state and non-state actors in solving societal issues - network governance and collaborative governance. Network governance is described as a ‘relatively stable cooperative arrangement between independent actors based on trust and reciprocity’ (Bednar et al., 2019). Collaborative governance is more specifically defined by Emerson et al. (2012), as ‘the processes and structures of public policy decision making and management that engage people constructively across the boundaries of public agencies, levels of

government, and/or the public, private and civic spheres in order to carry out a public purpose that could not otherwise be accomplished.’

In this thesis, the terms ‘network’ and ‘collaborative’ governance are considered to describe similar models as they both involve actors coming together in a spirit of trust and reciprocity to solve issues of public interest through a participatory process involving consensus. Ultimate authority may lie with the public agency (as with regulatory negotiation), but stakeholders must directly participate in the decision-making process.

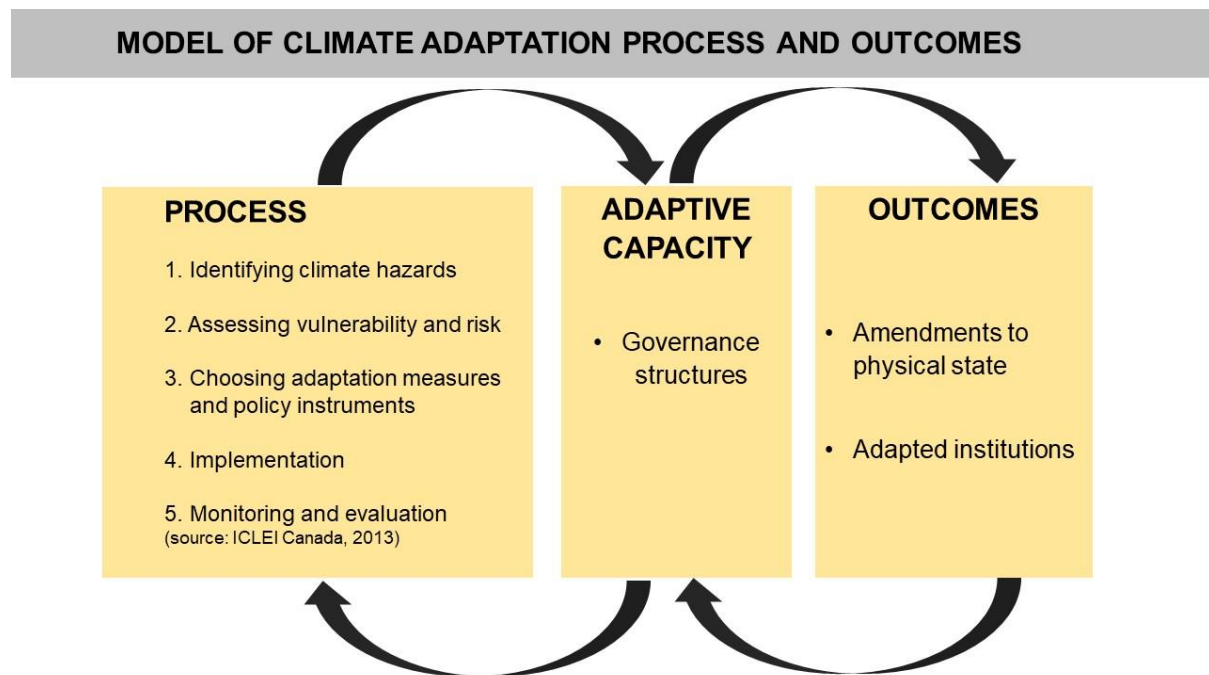


Figure 1: Model of how adaptive capacity mediates between adaptation processes and outcomes (adapted from ICLEI Canada, 2013)

The process of climate change adaptation can be conceptualized as a five-stage process that involves: (1) identifying climate hazards (2) assessing vulnerability and risk, (3) choosing adaptation measures and policy instruments, (4) implementation, and (5) monitoring and evaluation (ICLEI Canada, 2013). This process leads to adaptation as an outcome that is comprised of an amended physical state and adapted institutions. Adaptive capacity is the mediating factor that determines if the process of adaptation leads to the intended outcomes.

Framework for assessment of collaborative governance outcomes

Based on an analysis of 137 studies of collaborative governance across various policy sectors, Ansell and Gash (2008) developed an analytical framework aimed at identifying the conditions under which collaborative governance could be expected to be successful in achieving its goals and where it might expect it to founder. The framework groups these factors into four categories that define the context and stages of governance—starting conditions, institutional design, process and outcomes.

Emerson et al. (2012) expanded Ansell and Gash's framework to include context and impacts, parsing the factors categorized in the latter framework into a series of components with a hypothesis of how those components influence one another and the process of collaboration as a whole. Emerson et al.'s model facilitates an analysis of causal pathways between aspects of collaborative governance and its performance.

Collaborative governance is used to tackle a variety of issues, but the focus of this thesis lies specifically in evaluating the potential of this approach to increase the adaptive capacity of institutions (Pahl-Wostl, 2009). According to Gupta et al. (2010), institutions that promote adaptive capacity are those that (1) encourage the involvement of a variety of perspectives, actors and solutions; (2) enable social actors to continuously learn and improve their institutions; (3) allow and motivate social actors to adjust their behavior; (4) can mobilize leadership qualities (5) can mobilize resources for implementing adaptation measures; and (6) support principles of fair governance. While the authors note that 'institutions' refer not to organizations but instead to the social rules that both constrain and empower social actors, this thesis argues that organizations are an important manifestation of institutions which shape, and are shaped in turn by, human interaction (DiMaggio & Powell, 1983; Meyer & Rowan, 1977)

To assess the probability that collaborative governance will be successful, specifically in the context of building adaptive capacity, I have integrated the indicators proposed by Gupta et al. (2010) to assess if institutions nurture the adaptative capacity of society with the frameworks for assessing collaborative governance by Ansell and Gash (2008) and Emerson et al. (2012)



Figure 2: Framework for assessing components of collaborative governance in building adaptive capacity Model of how adaptive capacity mediates between adaptation processes and outcomes. Adapted from Gupta et al. (2010), Ansell & Gash (2008) and Emerson et al. (2012)

The framework outlines different stages of the collaborative process from starting conditions and drivers which define the context under which collaborative governance is likely to succeed, to the institutional design of the collaborative and the elements of process that are necessary for a successful outcome.

Starting conditions

Imbalances of power or resources (Ansell & Gash, 2008) amongst actors can make the process of collaboration vulnerable to manipulation by stronger actors .

Prehistory of Antagonism and Cooperation (Ansell & Gash, 2008) between stakeholders will hinder or facilitate collaboration. A positive history of cooperation between stakeholders creates social capital and trust which will facilitate successive attempts at collaboration. On the other hand, collaborative governance is unlikely to succeed if stakeholders have a prior history of antagonism

unless it is mitigated by other factors such as a high degree of interdependence or steps are taken to remediate the low levels of trust and social capital among the stakeholders.

Drivers

Interdependence (Emerson et al., 2012) is recognized as a precondition for collaborative action and exists when individuals and organizations are dependent on each other to accomplish a goal. Collaborative governance is common in local resource management because of the joint dependence of local groups on a common resource (Ansell & Gash, 2008).

Uncertainty (Emerson et al., 2012) about the conditions of the problem they are tackling can drive groups to collaborate in order to reduce and share risk. The absence of complete knowledge about the problem and solutions makes stakeholders dependent on each other for accessing dispersed information and planning collective action to reduce risks.

Incentives to Participate (Ansell & Gash, 2008): Incentives to participate depend in part upon stakeholder expectations about whether the collaborative processes will yield meaningful results, particularly when evaluated against the cost of time and energy that collaboration requires. Incentives increase as stakeholders see a direct relationship between their participation and concrete, tangible, effectual policy outcomes. They have to be convinced that their inputs are having an impact on the direction that the collaborative is moving in. Incentives to participate are low when stakeholders can achieve their goals unilaterally or through alternative means.

Exclusiveness of the forum (Ansell & Gash, 2008) is an important incentive for participants. Aside from filling a legitimate need, the collaborative needs to be structured in a way that participating in it imparts a unique value that other forums addressing similar issues do not.

Institutional design (Ansell & Gash, 2008) refers to the structure of the collaborative including the leadership, actors, resources. An important part of the design is governance which set down the rules and protocols for collaboration process. Ensuring that both stakeholders as well process follows these rules is critical for the procedural legitimacy of the collaborative process.

Facilitative leadership (Ansell & Gash, 2008), crucial for directing any collective effort, brings stakeholders together and gets them to engage each other in a collaborative spirit. Facilitative leadership provides motivation and assists stakeholders in agreeing on a direction to their efforts while making sure that the consensus-building process is followed. A considerable amount of time, skills and resources are required to provide effective collaborative leadership.

Variety and inclusiveness of membership (Gupta et al., 2010): Actors must be broadly inclusive of all stakeholders who are affected by or care about the issue. Successful collaboratives pay considerable attention to getting stakeholders to participate and exclusion of critical stakeholders is a key reason for failure. Broad-based inclusion is key not just to the spirit of collaborative planning but is critical to the legitimation process that is also based on i) the opportunity for stakeholders to deliberate with others about policy outcomes ii) the claim that the policy outcome represents a broad-based consensus. Having stakeholders who bring diverse interests and perspectives can help address the wide range of issues that climate change affects. It addresses the need for discourse and solutions to be introduced at different levels of governance. However, a balance must be achieved because difference in opinions can also result in an inability to reach consensus and a paralysis or stalemate which prevents any action being taken (Gupta et al., 2010).

Resources (Gupta et al., 2010) are key to the collaborative's ability to conceptualize, implement and sustain change or their actions towards change. A large benefit of collaboration is the potential to collectively leverage resources that could be financial, political, human, legal, or technological resources. Ideally, the collaborative is able to foster a culture of sharing which can mitigate some of the inevitable differences in resource levels between stakeholders.

Formalization of governance structures (Ansell & Gash, 2008) that specify who is doing what in the collaborative is sometimes seen as an important design feature. Clear ground rules and process transparency are important here. The structure should be such that it ensures fair governance that is characterized by ensuring i) legitimacy ii) equity iii) responsiveness iv) accountability (Gupta et al., 2010).

Collaborative Process: Factors that are crucial within the collaborative process itself include face-to-face dialogue, trust building, and the development of commitment and shared understanding. Collaborative process is cyclical rather than linear – depends on achieving a virtuous cycle between communication, trust, commitment, understanding and outcomes. Process must adhere to the basic principles - including fair and civil discourse, open and inclusive communications, balanced by representation of “all relevant and significant different interests” and informed by the perspectives and knowledge of all participants (Emerson et al., 2012).

Commitment to the process (Ansell & Gash, 2008)

Stakeholders’ level of commitment to collaboration is a critical variable in explaining success or failure. In contrast to motivation to participate, *commitment to the process* means holding the belief that coordinating efforts through building consensus is the best way to achieve desirable policy outcomes. In contrast to the adversarial or managerial approach where the agency is ultimately responsible for policy outcomes, in collaborative governance ownership of the decision-making process shifts from the agency to the stakeholders.

Shared understanding (Ansell & Gash, 2008)

As part of the learning process, stakeholders must develop a shared understanding of what they can collectively achieve together. At the start of collaboration this means coming to an agreement on the definition of the problem or the relevant knowledge necessary for it. Establishing what the shared understanding of a collaborative is, is needed to confirm for the stakeholders that they are working toward achieving common objectives and aims and have a common vision, ideology or goals and

Face-to-face dialogue (Ansell & Gash, 2008) allows for ‘thick communication’ and direct dialogue which allows stakeholders to identify opportunities for mutual gain. In-person communication is especially important for building trust which is crucial for effective collaboration.

Learning capacity (Gupta et al., 2010): To adapt to change, collaboratives must enable their actors to acquire new knowledge and question socially embedded ideologies, frames, assumptions, claims, roles, rules and procedures that dominate problem solving in an iterative learning process

Room for autonomous change (Gupta et al., 2010): Social actors must be able to adjust their behavior in response to environmental change. Autonomy is important at the lower levels of governance (people closest to conditions on the ground) since these are the first to produce immediate relief efforts. Building adaptive capacity means enhancing this self-help function by encouraging experimentation with and responding to everyday contingencies

Outcomes (Ansell & Gash, 2008): Processes and outcomes cannot be neatly separated in consensus building because the process matters in and of itself and because the process and outcome are likely to be tied together. Small wins from collaboration are not just tangible outcomes but also form positive feedback for the collaborative process, encouraging a virtuous cycle of trust building and commitment. Purposes and advantages of collaboration are can be made concrete when ‘small wins’ are possible . The major outcomes of collaborative process are collaborative action and achievement of intermediate goals that the actors have decided will lead to the desired impacts. Outcomes are often conflated with impacts.

Impacts (Gupta et al., 2010): These are intentional changes of state to the context or conditions which were deemed undesirable or were in need of change. Impacts include unforeseen results of collaborative dynamics.

CHAPTER 3: FINDINGS

This chapter includes my findings about the Resilient Mystic Collaborative (RMC) including the conditions and drivers contributing to its initiation, its organizational structure and process, and the outcomes of its collaborative efforts thus far. The models of climate adaptation process and collaborative governance from chapter 2 are used to analyze the strengths and weakness of collaborative governance in building adaptive capacity.

Drivers for the initiation of the Resilient Mystic Collaborative

These are the conditions that the process of collaborative governance aims to change or improve in order to achieve a goal, which in this case, is climate adaptation. The phenomenon of municipal fragmentation creates conditions where knowledge, capital, manpower and land use control, that are needed to address climate adaptation, is bound within municipal limits. The following paragraphs describe how the Resilient Mystic Collaborative was formed to address these conditions and build adaptive capacity through collaborative governance.

New York was unprepared when Superstorm Sandy hit in 2012 and it wreaked extensive damage on the area. This hurricane, which narrowly missed Massachusetts, was a catalyst for initiating climate preparedness planning in the state. The Massachusetts Department of Transportation (MassDOT) applied for federal funding to assess transportation vulnerability and commissioned the Woods Hole Group to model the effects an extreme storm event could have not just on critical infrastructure but the entire area around the Boston Harbor. This critical assessment of region-wide risks, known as the Boston Harbor Flood Risk Model (BH-FRM) provided an understanding of the region's probability of flooding from coastal storm-surge. However, actions needed to be taken on-the-ground to protect people and property against these and other climate risks like extreme heat or flooding from heavy rain is being taken by the local, municipal governments.

To provide initial impetus and support for local climate change resilience efforts, the state created the Municipal Vulnerability Preparedness grant program (MVP). As part of this program, the state awards communities with funding to complete vulnerability assessments and develop plans to execute projects on the ground to build climate resilience.

While individual municipalities can request up to \$2 million in funding, a group of municipalities are collectively eligible to apply for up to \$5 million to encourage collaborative application for grants. The Commonwealth of Massachusetts has set aside \$300 million for ‘investing in on-the-ground, proactive projects to address the specific vulnerabilities to climate change identified by each municipality’ (Executive Office of Energy and Environmental Affairs, 2018). With needs exceeding available resources, the state government has to prioritize projects that protect the greatest number of people and property so that funds are used in the most efficient way possible. Having a group of municipalities come together to agree on common priorities and approach the state as a group sends an effective signal to grant makers about the projects in the watershed that will benefit multiple parties. Acting collectively through the collaborative thus benefits both the state as well as the municipalities (Anonymous interview, March 2020).

As communities in the Greater Boston area began to assess their individual vulnerabilities to natural hazards either through the Commonwealth’s MVP program or through their own initiative, they became increasingly aware of the limitations of trying to manage risks within municipal boundaries (Anonymous interview, 19 March 2020). Massachusetts, like other New England states, relies on municipalities rather than counties as the basic form of government. With the exception of Southeastern Massachusetts, much of the Commonwealth’s county governance and budgeting was abolished in the late 1990s for purported reasons ranging from inefficiency and out-datedness, to corruption and mismanagement (Concannon, 2014). As a result, Massachusetts lacks strong regional governance structures that would allow communities to readily share budgets and policies across municipal boundaries to tackle regional challenges such as stormwater management and coastal flooding.

The only regional planning agency in the Metro Boston area is the Metropolitan Area Planning Council (MAPC), a public agency created under state government law in 1963 as a strictly advisory group, that aims to aims to "educate each community and each agency, to the needs and desires of the others " (Plotkin, 1963 as cited in Shi, 2017)

The Metropolitan Mayors Coalition (MMC): MAPC helped to establish the Metro Mayors Coalition (MMC) in 2001 comprising leaders from 15 cities and towns in the urban core of Metro Boston. MAPC provides staff support and policy expertise to this group who gather to exchange

information about common problems. In May 2015, the Metropolitan Mayors Coalition adopted the Metro Boston Climate Preparedness Commitment to support coordination among the existing and planned climate resiliency and mitigation efforts of the communities in Metro Boston (MAPC, n.d.). However, the MMC is limited in its ability to address climate resilience as its geographical coverage does not correspond to hydrological boundaries within which flood risks need to be addressed. Nevertheless, participation in the MMC served as a positive precedent that encouraged the 11 of the 15 municipalities involved in the MMC that also lie within the Mystic River Watershed, to participate in the Resilient Mystic Collaborative (RMC).

Many climate change impacts are mediated through water including storm surge, sea level rise, coastal and riverine flooding from extreme precipitation. Greater Boston does not have a centralized water agency with the regulatory and fiscal mandate to manage drinking, waste and flood waters. The Massachusetts Water Resources Authority (MWRA) provides water supply and wastewater management, but does not have the authority to manage stormwater on a regional scale.

Watershed Associations: All land drains into a river, stream, lake, pond or coastal water body and a watershed includes all the land that drains to a given water body (US EPA, 2015). Every place in Massachusetts lies within one of the state's 27 major watersheds. Land use in a watershed plays a key role in the quantity and quality of the water in the water body it drains to. The more paved surface or built-up area there is in a watershed, the less the volume of stormwater that can permeate into the ground which instead, flows across impervious surfaces, carrying pollutants with it into the water body.

Watershed associations are non-profit organizations focused on environmental preservation in and around rivers. These entities have been particularly active in monitoring water quality that is regulated by standards set by the United States Environmental Protection Agency (US EPA) to meet the requirements of the Clean Water Act. Three non-profit organizations cover the major rivers and tributaries of Greater Boston: the Mystic River, Charles River and Neponset River Watershed Associations. These organizations have long-term missions to protect the environmental quality of the rivers and the ecology they support. However, they do not have

regulatory powers and therefore pursue their missions either through legal action or collaboration with the municipalities in their watersheds.

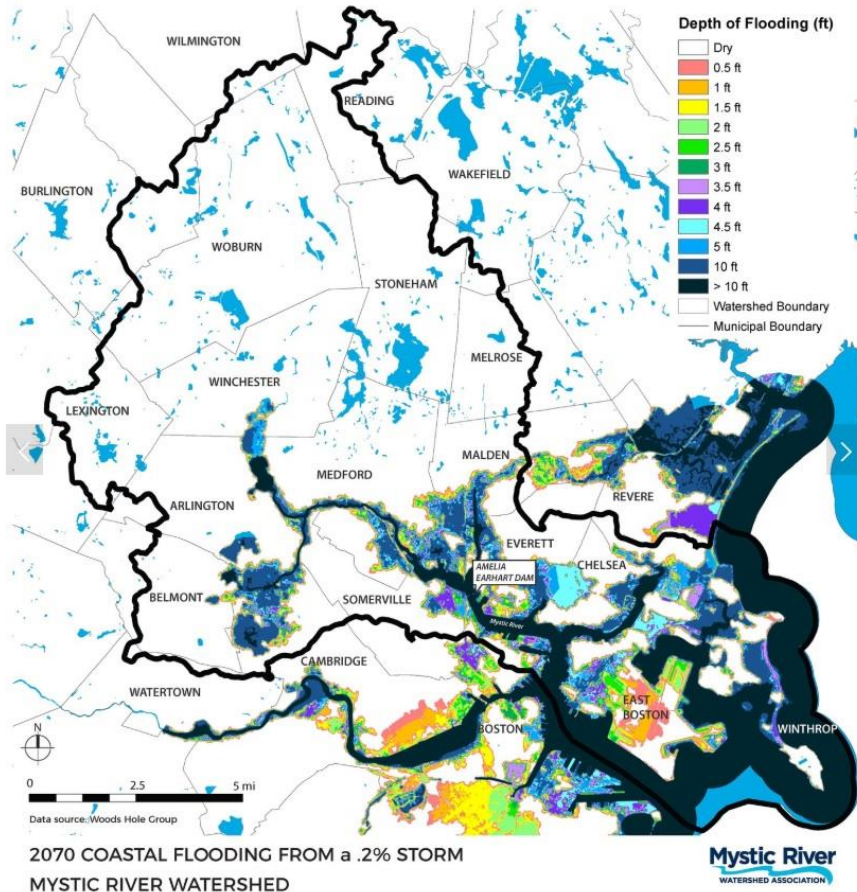


Figure 3: The Mystic River Watershed with projected flood depths (in feet) for 1 in 500-year storm (source: MyRWA, 2020)

The Mystic River Watershed: The Mystic River watershed is a low-lying and extensively developed area which makes it prone to both freshwater and coastal flooding. It spans an area of 76 sq. miles in 21 municipalities in the Greater Boston area and is home to major commercial and industrial areas, and infrastructure which serves the wider metropolitan region. Almost half of the total area of the upper watershed has been paved, reducing the potential for stormwater to permeate into the ground. During extreme precipitation events, stormwater flows rapidly over the surface, flooding low-lying areas. This causes property damage and loss, contamination of stormwater

systems with raw sewage, and extended business interruptions. The river carries flood waters from upstream municipalities to downstream communities including Winchester, Cambridge, Somerville, Medford and Boston.

Mystic River Watershed Association (MyRWA) and The Resilient Mystic Collaborative (RMC):

The Mystic River Watershed Association (MyRWA) has, for several years, been helping Mystic River communities to meet regulated standards of water quality by providing them with water quality monitoring and educational material for residents. MyRWA also facilitates communication between regulatory agencies like the EPA and the communities in the Mystic on the implementation of these regulations (Anonymous interview, March 2020).

The need to tackle climate adaptation at a regional level arose through conversations between Mystic River communities and MyRWA. As it was clear that many of the vulnerabilities like flooding were connected with the river, the watershed was the ideal geographical unit at which to tackle the issue. In 2018, the Mystic River Watershed Association (MyRWA) received a grant from the Barr Foundation, a Boston-based private foundation with an initial plan for this work that involved identifying projects of regional interest and developing the political will to get them funded. The Barr Foundation grant enabled MyRWA to hire Julie Wormser, who had extensive experience leading climate resilience work in the region, to lead this initiative. Carri Hulet, a professional mediator, from the Consensus Building Institute (CBI) assists Ms Wormer with the planning and facilitation of the initiative which came to be called the Resilient Mystic Collaborative (RMC).

Motivations and incentives for joining and continued participation in the RMC:

To begin with, the Mystic River Watershed Association (MyRWA) invited ten communities in the watershed - Arlington, Boston/East Boston, Cambridge, Chelsea, Everett, Lexington, Medford, Somerville, Winchester and Woburn to form the collaborative. These were municipalities that had already completed their climate vulnerability assessments, either independently or through Massachusetts' MVP program, to estimate the impacts that extreme weather events would have on their municipalities and were well aware of the need for regional collaboration for adaptation solutions. The process prompted a realization that they did not have all the information about their

risks which lay in other towns, and that the flood risks from storm surge and precipitation that they did have data on, would require solutions to be implemented on a regional scale. This motivated them to agree to join the collaborative in September 2018 to work together to gather data about shared risks and exchange information on strategies they were each adopting.

After the Resilient Mystic Collaborative established its goals and governance mechanisms with the ten initial municipal members, in 2019, MyRWA reached out to other towns and cities in the watershed to invite them to join the collaborative. In less than two years since its formation, 19 of the 21 communities in the watershed are now part of the Resilient Mystic Collaborative (RMC). Reading and Wilmington, the final two eligible municipalities which are not yet part of the RMC, are located in the Upper Watershed and are unaffected by what occurs in the rest of the municipalities downstream.

Power-resource knowledge asymmetries:

The watershed creates an ecological interdependence for the municipalities because of the shared passage of flood waters through the river but also because critical infrastructure and manpower is dispersed through the region. Dense municipalities downstream have limited ability to contain floods through green infrastructure and rely on opportunities for storage of flood-waters in less built-up municipalities upstream.

The municipalities in the collaborative have different levels of resources but this is balanced by a strong sense of interdependence. The cities of Cambridge and Boston are among the better-resourced members of the RMC but are also among the municipalities that face the highest risks from sea level rise and storm surge in the Mystic River Watershed. This gives them strong incentive as well as ability to collaborate with other communities to take action in mitigating regional climate risks. Apart from direct weather impacts, the cities are dependent on infrastructure and manpower that are located in other parts of the region. Many of Boston and Cambridge's workforce live in other towns and cities in the Metro Boston area. Regional infrastructure for electricity, healthcare, transportation, food and energy is spread out among the different towns and any disruptions to their functioning from extreme weather events has implications for the wider area. The winter storm of 2015 that shut down the subway lines in Greater Boston and the Nor'easters of 2018 that led to power outages in parts of the state, gave municipalities a preview of the disruptions that future weather events might cause. The data on the vulnerabilities of

facilities or infrastructure is not necessarily known or shared with the towns that are dependent on them. Working together as a group through the RMC enables the members to gather this information about their collective vulnerabilities and begin to take steps towards building resilience (Anonymous interview, March 2020).

Exclusiveness of the forum: The RMC was able to build on positive prior experiences of collaboration that the municipalities had through regional information sharing forums convened by the Mystic River Watershed Association as well as the Metropolitan Area Planning Council's Metro Mayors Coalition. The combination of the particular type of actors, goals and scale at which the RMC operates makes it unique. There are other groups that are organized around climate action or have municipal staff as members but none that combine both at the geographical scale of the watershed (City of Medford, 2019). Regardless of their individual levels of resources, the municipalities rely on the collective political power of the group when they advocate for resilience measures to the state. For eleven of the municipalities, previous participation in the Metro Mayors Coalition (MMC) convened by the Metropolitan Area Planning Council was a positive prior experience of regional collaboration where they witnessed the benefits of interfacing with the state and federal governments as a group.

Unlike the MMC which addresses climate as one among several regional issues including housing and transportation, the Resilient Mystic Collaborative (RMC) has dedicated funding to support staff that focus exclusively on climate resilience coordination in the Mystic River watershed. The goals of the collaborative in being action-oriented also sets it apart from forums which stop at information sharing. The action in turn is made possible because of the official capacity of the RMC members who are municipal staff eligible to apply for state grants and who are in charge of planning capital projects in their communities. Lastly, the geographical unit of the watershed at which the RMC operates, make it uniquely appropriate to tackling climate change impacts that manifest primarily through water. The geographical extents of the watersheds do not coincide exactly with the municipal boundaries and therefore some of the RMC's towns and cities also lie partly in other watersheds. For example, the City of Cambridge, lies within both the Mystic River Watershed and the Charles River Watershed. However, at the time of its inception, the RMC was the only watershed that was organizing around climate adaptation initiatives.

Support from elected officials and the residents of their own municipalities was mentioned during interviews with RMC members, as being important to being able to dedicate staff time and other resources to climate action. Lived experience with floods was a contributing factor to this support - one of the interviewees mentioned that her supervisor encouraged her to participate in the RMC when she showed him the Boston Harbor storm-surge flood risk maps and the impact on their city. As a long-time resident of the area, he recalled how the town used to flood in the past before the building of the Amelia-Earhart dam which convinced him of the risks of future flooding. Another municipal planner mentioned that climate action is supported in his city because it has had street flooding for a while. Additionally, the city has demographics that support initiatives that improve the quality of life – of which the environment is an important contributor.

In this section I have described the role and position of the state government of Massachusetts in initiating climate adaptation action and the challenges faced by the municipalities in approaching climate action individually. Other drivers for participation in the Resilient Mystic Collaborative included: a strong ecological dependence because of flood pathways through the Mystic River; and the dispersal of commercial, industrial and education centers through different municipalities in the watershed, positive prior experiences of collaboration and the advantages of leveraging state and federal funding as a group

Institutional design and leadership

This section describes the institutional design of the collaborative which draws leadership, resources and capacity from across the public and private (non-profit and for-profit) sectors.

THE RESILIENT MYSTIC COLLABORATIVE - INSTITUTIONAL DESIGN			
	PUBLIC	PRIVATE NON-PROFIT	PRIVATE FOR-PROFIT
FACILITATIVE LEADERSHIP		MyRWA convener and facilitator	
ACTORS	Municipal staff (voting)	Non-profits (non-voting)	
FUNDING	State level government	Barr foundation	
CAPACITY (skills, expertise)	Municipal staff	Community organizations	Consultants

Figure 4: Institutional design of the Resilient Mystic Collaborative indicating the involvement of the public and private sectors

Facilitative leadership: The facilitators from the Mystic River Watershed Association (MyRWA) and the Consensus Building Institute (CBI) have considerable experience with leading and mediating climate adaptation efforts in various organizations and this breadth of experience complements the RMC’s municipal planners’ depth of knowledge about their individual communities.

The facilitators adopt a facilitative model of leadership for the RMC where they prepare the agenda and facilitate the meetings – making sure the consensus process is followed and decisions are made. This is crucial to ensuring that the meetings are effective and have meaningful outcomes that motivate members to continue participating in the meetings. The facilitators are, however, responsive to requests for changing the process by which the meeting agenda is set. While this responsiveness to feedback is important to sustain participation, it is important that the agenda continues to reflect the wider concerns of the group.

The facilitators ensure that members abide by their commitment to have participation directed towards a search for shared benefits and not by a desire to advocate for individual agenda. In

addition to keeping the RMC's efforts directed towards benefits for multiple communities, breaking larger goals down to an agenda with achievable targets is important to keeping the group motivated. Facilitation also plays an important role in diffusing conflict during group discussions by highlighting, and getting the participants to find common ground.

Actors: Each municipality of the Resilient Mystic Collaborative (RMC) is allocated one vote in decision-making processes but there are no limits to how many municipal staff from each community can participate in the collaborative.

The municipal planners and engineers who comprise the voting members of the RMC are in charge of planning and implementing capital projects in their communities. However, they are not elected officials and therefore cannot make decisions regarding policy nor commit to finance projects from municipal resources. While it is important for there to be regionally consistent positions on policy, municipal staff do not have the authority to decide to advocate for initiatives. Any proposal for advocacy has to be detailed in a written form that the municipal staff can present to their local governments and municipal CEOs for vetting and approval. The RMC staff can therefore only provide elected officials (town managers or mayors), who ultimately have the power to make decisions, with an informed opinion on the necessity of taking certain climate adaptation measures. This limits the ability of the RMC to take immediate decisions. On the other hand, staff are usually employed with municipal governments for longer than the fixed-term of elected officials.

Capacity in terms of staff-time is another constraint for municipal staff in terms of the effort they can dedicate to the RMC as climate adaptation is just one amongst their many tasks and duties. Participation in the RMC saves time in individual search for information; however, some staff may not have enough time to attend the meetings. Therefore even though the collaborative process gives members equal opportunity and voice to participate, RMC municipalities which are short-staffed are less able to send representatives to participate in the collective.

In addition to the public sector and community groups, the private sector is engaged with the RMC albeit indirectly - through philanthropic funding to support facilitation of the collaborative and through the expertise of the consultants who are hired to conduct the assessments funded through the state government's MVP grants

Non-voting members of the RMC include representatives with relevant interest or expertise in the matter but are not municipal staff. Government staff from other levels of government also participate as non-voting members. There are representatives from the regional planning agency, the Metropolitan Area Planning Council (MAPC), which serves all of the RMC's member municipalities as well as from the Executive Office of Energy and Environmental Affairs (EOEEA), the cabinet-level office that oversees the Commonwealth's environmental and energy policy and regulation and oversees the MVP grant program.

The Steering Committee is the decision-making body of the RMC that identifies, advocates for, and communicates regional priority needs. It includes all the voting as well as non-voting members of the RMC.

Working groups: In the spirit of being oriented towards concrete action on-the-ground, every voting member of the RMC is required to be on a working group that focuses on addressing issues identified as priority areas by the Steering Committee. Working groups also include a broader range of local stakeholders relevant to the issue who are not necessarily members of the RMC/Steering Committee.

The RMC has four working groups focused around areas of priority:

- 1) The Upper Mystic Stormwater Management working group focuses on opportunities for watershed-level stormwater management
- 2) The Lower Mystic Regional Infrastructure working group identifies and prioritizes investments needed to storm-harden key regional infrastructure in the Boston Harbor region of the watershed
- 3) The Social Resiliency working group explores ways to mitigate the vulnerability of populations who are disproportionately affected during and after extreme weather events
- 4) The Advocacy and Outreach working group is focused on engaging policy making on climate-related action

Decision-making processes: Both voting and non-voting members of the Resilient Mystic Collaborative (RMC) are part of the Steering Committee which meets four times a year – once every quarter. At the beginning of the year, the RMC decides on what they want to spend the year focusing on and successive meetings include progress updates on the projects as well as

information-sharing on what RMC members are doing individually within their communities on climate action. Working group meetings are held as often as needed.

The RMC follows a commonly agreed upon governance process that structures decision-making. Decisions are made by the steering committee through consensus which is defined not by an affirmative response but rather by a lack of opposition - meaning no one opposes a decision. When consensus cannot be achieved, an 80% vote among a quorum comprising of 80% of the total RMC membership is considered to suffice for proceeding.

Recently, some RMC members expressed a desire for the collaborative-wide quarterly meetings to be spent in information sharing or discussion on actions to be taken rather than in consensus process for future directions. In preference to the current practice of having a group-wide vote on proposals for future efforts that were at a conceptual stage, they requested for the agenda to be decided by a smaller group of RMC members. This Executive Committee, open to any voting members to join, would bring proposals for future directions to the level of detail which RMC members could take back to their communities for approval. The facilitators agreed to this amendment to process, noting that it was a positive sign that RMC members were making an effort to shape the process to better suit their requirements rather than choosing to opt out of attending the meetings (Julie Wormser, personal communication, 22 July 2020).

Resources: The funding for the projects comes from the Commonwealth of Massachusetts's MVP grants which MyRWA prepares applications for on behalf of the communities. The funding from the private Barr Foundation for facilitation of the RMC covers the salary of two permanent full-time staff members at MyRWA and a professional mediator from the Consensus Building Institute (CBI). The application for MVP grants requires that the applicant municipalities provide a 25% match of the total project cost in cash or kind. The staff-time of the cofacilitators from MyRWA goes towards the joint in-kind contribution of the RMC municipalities thus bolstering their collective capacity. When grants are awarded, one of the municipalities volunteers to be the fiscal lead to which the State disburses the grant amount.

There are two types of MVP grants:

Municipal Vulnerability Preparedness Program Planning Grants through which the Commonwealth awards communities funding to complete vulnerability assessments and develop action-oriented climate resiliency plans. The program helps communities define extreme weather and natural and climate related hazards; understand how their community may be impacted by climate change; identify existing and future vulnerabilities and strengths; and develop, prioritize, and implement key actions. State-certified MVP providers or consultants offer technical assistance to communities in completing the assessment and resiliency plans. Communities who complete the MVP planning grant program become certified as an MVP community and are eligible for MVP Action Grant funding.

Municipal Vulnerability Preparedness Program Action Grants provide designated MVP Communities (who have completed MVP planning grants) funding to implement priority adaptation actions identified through the MVP planning process or similar climate change vulnerability assessment and action planning. Projects are required to use best available climate data and projections.

To date, the MVP grants from the state government have been the sole source of funding for the Resilient Mystic Collaborative's projects which are still in the assessment and planning stage. When these projects, which involve physical interventions, move to the construction stage, there are challenges in drawing on municipal revenue for supplemental funding. The primary source of municipal revenue is property tax that finances the provision of public services such as schools, fire stations etc. in the towns. The process of public approval for municipal budget allocations differs between towns and cities. For municipalities designated as "towns," budget meetings are held once every year with a large number of town representatives voting on issues. The town budget has therefore to be prepared well in advance of this annual meeting. This makes it a challenge to coordinate with the annual grant cycle of the state which determines when the MVP grant funding may be spent.

Cities, on the other hand, have elected city councilors who meet several times in a year. Municipalities issue bonds to raise resources to implement projects. This process requires city

council authorization or it has to be included in the city’s annual budget which is reviewed and approved by the city council. Depending on the interest in the issue, approval could involve a longer process with public hearings. There have to be concrete reasons for the city’s decisions to spend money on a project, the responsibility of which rests on elected officials who have community support. However, there are precedents of municipalities entering into cost-sharing agreements with one another to jointly fund projects (Anonymous interview, March 2020).

Collaborative Process:

In the case of the Resilient Mystic Collaborative (RMC), the intended outcome for collaborative governance is to achieve climate change adaptation. Since climate adaptation is a process, each stage of progress towards that goal can be considered an intermediate outcome of collaborative governance.

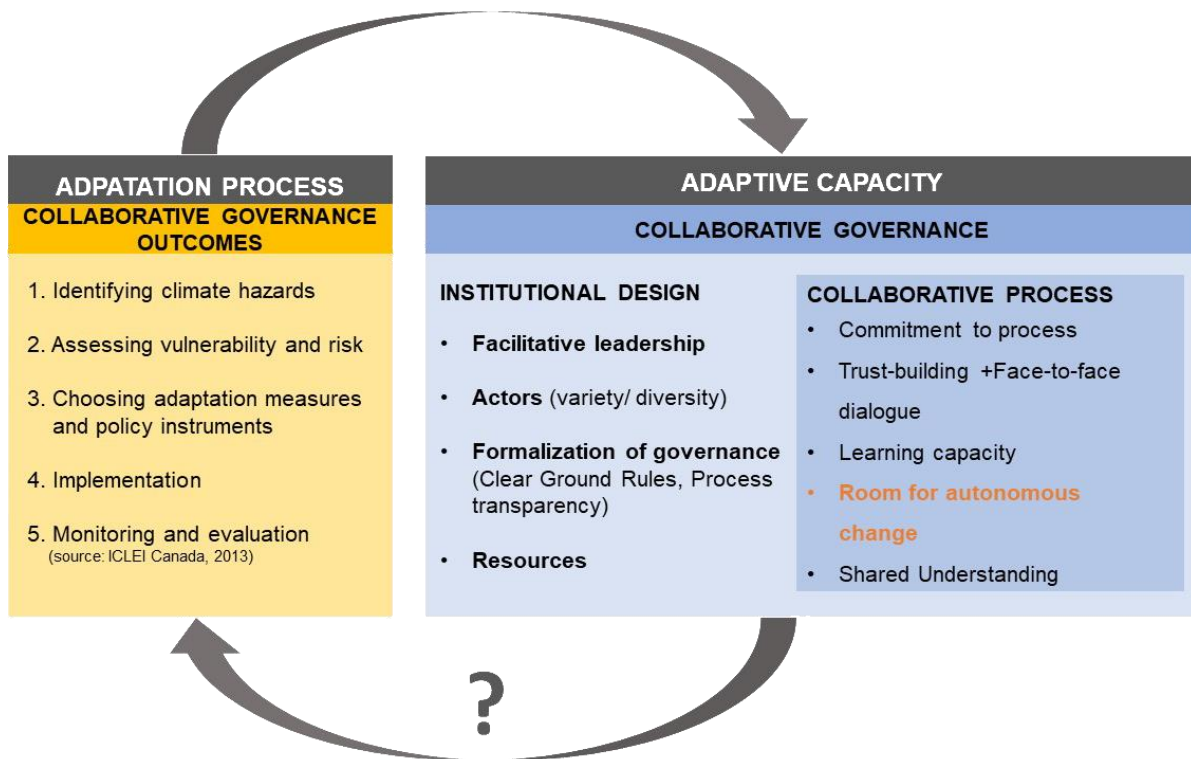


Figure 5: Model of how collaborative governance builds adaptive capacity through outcomes that involve the progressive stages of climate adaptation. Adapted from Gupta et al. (2010), Ansell & Gash (2008) and Emerson et al. (2012) and ICLEI Canada (2013)

Goals and directions: The RMC distinguishes itself from other groups formed around climate action in the Boston area by being focused on implementing concrete projects on the ground more so than advocating for policy change or mere information sharing. The communities already had an idea of their individual risks when they joined the collaborative and understood that regional action was required to address these risks. In the initial stages of the collaborative, the co-facilitators conducted brainstorming exercises for the municipalities to identify common priorities shared by the members.

Shared Understanding:

As part of the first stage of climate change adaptation that involves identifying hazards (ICLEI Canada, 2013) - a common understanding of regional flood risk from coastal storm-surge was provided by the Boston Harbour Flood Risk Model developed by the Woods Hole group and commissioned by the Commonwealth of Massachusetts. The municipalities' local understanding of risk, not just from floods but also heat, precipitation etc is informed by assessments conducted by consultants and funded by the Massachusetts's Municipal Vulnerability Preparedness (MVP) program. The municipalities therefore came into the collaborative with an understanding of regional flood risk and so it was clear that the next step was to move to identifying and designing adaptation measures. In other areas such as the vulnerabilities of critical infrastructure –assessment of risk and the implications for the wider area of failure in the event of extreme weather, had yet to be undertaken.

The projects that the RMC is working on right now were the result of the brainstorming exercises conducted at the initiation of the collaborative. The agenda is therefore one that was proposed by the municipalities and not driven by MyRWA or any external stakeholders (Anonymous interview, March 2020). Since participation is voluntary, it was and still is important, for participants to feel like this is a grassroots effort that is being driven by them terms of how the collaborative operates and the goals that it sets.

Collaborative actions

The concrete actions that the RMC is focused on are the projects that it undertakes to address its priorities for climate adaptation. The progress of each project is overseen by a working group and could be viewed as part of the collaborative process.

The Upper Mystic Stormwater Grant:

At the launch of the RMC, stormwater management was named as a major priority for action by the municipalities. In the 2019 MVP grant cycle, the RMC submitted an application for an MVP grant to identify regional opportunities for stormwater management. The work required an initial investment to study the potential contribution of various measures like depaving, stormwater wetlands and active reservoir management for stormwater management. The City of Cambridge covered the \$10,000 cost for this initial study which formed the basis of the grant application for funds to identify site-specific green infrastructure opportunities.

The Commonwealth awarded the RMC a \$350,000 MVP grant to pursue the project with the City of Cambridge as the fiscal lead, and project oversight provided by the Upper Mystic Stormwater working group of the RMC. Consultants were hired and are extending a stormwater flood model, developed by Cambridge, to identify and pursue opportunities for watershed-level stormwater management. The first year of work involves analyzing, ranking and choosing viable stormwater retention projects (e.g., stormwater wetlands, active reservoir management). The second year of work will involve community-led designs of between two and five priority projects.

The Working group on the Amelia Earhart Dam:

The Amelia Earhart Dam, built in 1966 to prevent coastal flooding from extending far into low-lying inland communities built on filled marshlands, creates an engineered river system that both protects upstream communities in the Mystic River Watershed from coastal flooding and has the potential to exacerbate freshwater flooding if its pumps fail or coastal storm surges prevent stormwater from flowing downstream. According to Cambridge's Climate Change Vulnerability Assessment, the dam could be flanked as early as 2045 or overtopped as early as 2055 by storms similar in strength to the 2018 Nor'easters which themselves came within two feet of overtopping

the dam. With typical winter storm tides exceeding 2 to 3 feet, the dam could begin regularly overtopping (or flanking) by the 2080s (MyRWA, 2020). This made it critical to coordinate with the Massachusetts Department of Conservation and Recreation (DCR), which operates and owns the Earhart Dam to take measures to raise and extend the dam.

It was realized that the dialogue with DCR would be more effective if the municipalities approached them as a group and this was put forward as a priority for the RMC to work on. The Upper Mystic Stormwater working group of the RMC is now partnering with the DCR to enhance the resiliency of the Amelia Earhart Dam. As part of these efforts, DCR and Cambridge engineers are sharing information and modeling results to ensure that future investments protect the structural integrity of the dam itself while helping upstream communities manage flooding (Julie Wormser, personal communication, 22 July 2020).

The Resilient Mystic Collaborative's (RMC) success in getting the Massachusetts Department of Conservation and Recreation (DCR), a state level agency, to agree to work together with them on measures to strengthen the Amelia Earhart Dam is notable for several reasons – i) it proves that the combined action of all the municipalities can produce enough political will to negotiate with the state government on climate adaptation action ii) the strengthening of the dam benefited all the communities with no cost to any community, so it was easier to get support through consensus from all RMC members than some other adaptation measures that might benefit some communities less than others, for example- funding the construction of a wetland to store stormwater in one town that would have greater flood mitigation benefits for another town downstream iii) control of the dam lies with a single state agency, reducing the number of parties that the RMC have to negotiate with. This is different from the case of reducing or slowing stormwater flow through the Mystic River which would need actions to be taken by every town along the river.

The Regional Infrastructure and Social Resilience Assessment is a project overseen by the Lower Mystic Regional Infrastructure working group and the Social Resiliency working group of the RMC.

Besides water pathways, the interdependence of the municipalities comes from regional infrastructure for food, fuel and power, as well as the port, that lie in the lower part of the Mystic

River watershed. The functioning of this infrastructure affects the other communities but they may not be able to access information about their vulnerability (anonymous interview, 19 March 2020). The Regional Infrastructure and Social Resilience Assessment consists of two assessments aimed at i) identifying impacts that extreme weather events will have on this key regional infrastructure and ii) the damage that could occur to vulnerable communities in the event that that infrastructure fails. These assessments are funded by a \$400,000 MVP grant from the Commonwealth of Massachusetts and awarded to a group of RMC members comprising the Cities of Boston, Chelsea, Everett and the towns of Medford and Winthrop, with the City of Somerville acting as the fiscal host.

Through the project, the Resilient Mystic Collaborative will partner with the Department of Homeland Security's Cybersecurity and Infrastructure Security Agency (CISA) and the RAND Corporation to assist with the design and delivery of a tabletop exercise. The exercise will simulate an extreme weather event, such as a 1 in 100-year storm, to identify the conditions under which components of regional infrastructure would fail.

Social resilience does not usually draw as much attention as infrastructure or buildings, in resilience efforts. However, as one of the working group members who is a municipal planner mentioned, improving social resilience can be achieved relatively quickly, with less monetary resources than building or strengthening climate resilience infrastructure and brings meaningful benefits. Building on the results of the infrastructure assessment, the second part of the project will work with a Boston-based diversity and equity consultant, to identify the health and financial damage to vulnerable residents if specific components of infrastructure did fail short- and longer-term.

The intended outcome of *The Regional Infrastructure and Social Resilience Assessment* is to identify a list of actions including capital projects, plans and strategies that the Resilient Mystic Collaborative can proceed to search funding for.

Outcomes of collaborative governance

Tangible outcomes: Findings from interviews conducted with the Resilient Mystic Collaborative's (RMC) members indicate that the most significant outcomes for them include receiving funding from the Barr Foundation to hire dedicated staff facilitators, expanding to include 19 of the 21 Mystic Communities, initiating a working group with the Department of Conservation and

Recreation (DCR) to work on improvements to the Amelia Earhart dam and receiving grants for the Upper Mystic Stormwater project and the Regional Infrastructure and Social Resilience Assessment.

Shared understanding of regional vulnerability and risk: The collaborative has reached a stage midway in the five step process of climate adaptation implementation (ICLEI Canada, 2013). It has been successful in achieving consensus amongst the RMC while progressing through these stages through a combination of effective facilitation and access to technical expertise

Stage 1: Identifying climate hazards - the City of Cambridge made important contributions to establishing a shared understanding of regional storm-surge flood risk through its work with the Woods Hole Group that extended the Boston Harbor flood risk model (BH- FRM) to cover the Mystic River Watershed. Having a well-resourced community that is proactive in climate action and willing to share technical and monetary resources with the collaborative provided crucial initial momentum to the RMC.

Stage 2: Assessing vulnerability and risk through collective oversight of technical consultants hired with the MVP grants. The outcome of the Regional Infrastructure and Social Resilience Assessment will be connections with critical regional infrastructure managers through the Lower Mystic Grant and a list of commonly agreed-upon actions to protect this infrastructure and vulnerable residents in the watershed.

Stage 3: Choosing adaptation measures and policy instruments

In the case of the Upper Mystic Stormwater grant, floods risks from precipitation could be gauged fairly rapidly from the extension of the existing stormwater model developed by the City of Cambridge to the entire watershed. The work could therefore progress to the stage of identifying solutions and preparing preliminary designs. Before moving to the next stage of implementation however, resources for construction will need to be identified.

Intangible outcomes:

One of the most important accomplishments of the Resilient Mystic Collaborative (RMC) is getting municipal planners, who are in charge of capital planning projects within their towns, to think regionally.

When interviewed, RMC members could clearly identify achievements of the group. The facilitators make it a point to acknowledge and celebrate each step of achievement, however small, as a group. This is crucial to building the confidence and capacity that the RMC needs to tackle larger issues. As evidence of concrete action, intermediate outcomes are important to sustain the members' motivation to participate as well as for the collaborative to continue receiving philanthropic and state funding. Participating in the working groups that oversee the private consultants is crucial for the municipal staff to understand and be convinced of the validity of the resulting assessments. The consultants are neutral actors since they are jointly hired by the collaborative and therefore the actions they recommend can be argued to be for the common interest of the group.

Building relationships and trust: By gathering Mystic River communities around a region-wide environmental challenge, the RMC has created a time, place and projects that brought planners together in way that hadn't existed before. There were existing relationships between municipal staff members of the RMC like city engineers from the different municipalities. However, this interaction was restricted to immediate neighbors or a few staff they had met in other forums. For example, as a Cambridge city planner mentioned, the city had been working with their immediate municipal neighbors on stormwater management but not with others who are further downstream such as the City of Everett which they are now doing through the Resilient Mystic Collaborative. Even for RMC members who do know each other by name, the process of working together on concrete projects offers them a deeper opportunity to learn about other municipalities. In working towards a common goal, members build relationships in a way that other forums that are restricted to sharing of information do not provide.

Interviewees reported having peers from the RMC reach out with questions on day-to-day municipal operations outside of climate action and noted that they in turn felt comfortable doing the same now that they had built up a rapport with one another. They also noted that during an emergency, it was important be able to talk to managers in other towns who were experiencing the

same event. For effective communication during an emergency it is crucial that municipal staff have previously met their peers in other organizations with whom they have to coordinate (Charlie Jewell, 12 March 2020).

As an indirect, but significant effect of collaborating through the RMC, municipalities are beginning to collaborate on other planning issues outside of the collaborative. Communities are restricted from using their own resources to fund projects in other municipalities. This is a challenge when a town or city needs an intervention built in another city. However, the host city can apply for state or federal funding for the project and other cities that benefit from it write letters of support for the application. When municipalities share information about the planning work they are undertaking in their own municipality during the larger Steering Committee meetings, it is an opportunity for other municipalities to identify such opportunities for mutual collaboration. Putting together a joint grant application or partnering with planners is greatly facilitated by having previously met them and heard them talk about their work in person (Alicia Hunt, 17 March 2020). Since joining the RMC, the city of Chelsea has increased working together on other areas of planning and project management such as engineering of stormwater and land use planning with the neighbouring city of Everett. The collaboration prompted by their membership in the RMC led to the conception of an inter-municipal agreement which will be a framework for capital planning and improvements, and operations and maintenance of stormwater infrastructure in border areas between the two cities (Alexander Train, personal communication, March 2020)

Information and resource sharing: Several interviewees mentioned that hearing about the experience of planning and implementing initiatives from their counterparts in other towns is an important benefit of participation. Learning about the problems other municipalities have faced in dealing with the same issues gives them insight into what they might have to watch for and how they might attempt to solve them. It also leads to other inter-municipal projects that members initiate independent of the collaborative. For communities in the Upper Watershed, who weren't yet experiencing flooding, hearing firsthand accounts from neighbors could galvanize them into action. This willingness to share information is a result of the trust that has been built up over time and nurtured through a culture of sharing and reciprocity in the collaborative (Anonymous interview, March 2020).

The ability to access technical expertise as a group is key to working towards impactful climate adaptation measures and policies. The RMC projects including the Upper Mystic Stormwater grant and the Regional Infrastructure and Social Resilience Assessment for which consultants have been hired to conduct assessments, will provide an agenda that will guide future RMC projects.

As mentioned earlier, municipalities which are dependent on infrastructure in other towns do not have access to information about the vulnerabilities of those facilities. As part of the Regional Infrastructure and Social Resilience Assessment, a table top exercise will be conducted which replicates a weather emergency and the communications that would take place during such an event. In addition to giving planners and facility managers a chance to know each other, it would strengthen their relationship through working together on making improvements to their emergency responses. This will increase the efficiency with which they can work together in the event of an actual climate emergency.

Coordination between and within different levels of state and local government

The Commonwealth of Massachusetts, when supporting climate action, disburses funds only to municipalities and not to regional agencies or watershed associations. The challenge of coordination between these two levels of government is that there are 351 communities (towns and cities) in Massachusetts. The RMC Steering Committee meetings are therefore an important venue where representatives from the state meet face-to-face with a group of municipalities. This facilitates the process of feedback and communication from the local level, where policies and projects are implemented, to the state level - where policies are formulated. The RMC coordinated a feedback session on the Municipal Vulnerability Preparedness program with a state representative who is a non-voting member of the RMC. Municipalities shared the challenges they faced with the program – for example that since it is tied to the state funding cycle, municipalities are required to spend the grant within a fiscal year which is not conducive to the implementation of construction projects that these grants are used to fund. This contributes to the feedback process and state-wide inputs which are informing the next version of the grant program (Anonymous interview, March 2020).

The RMC also facilitates coordination between the municipalities. The fragmentation of local

government creates inefficiency as planning responsibilities for different planning sectors which might have been managed by a single person or department for the region, is now the task of separate planners in each town. The limits to the number of staff that each municipality can support results in municipal staff being burdened with a variety of tasks. Coordination with neighboring towns therefore doesn't take place unless it is on a matter of great need or urgency. The Resilient Mystic Collaborative meetings brings municipal staff together in the same place at the same time, enabling them to meet many of their peers at once.

Messaging and communication: For people in the greater Boston area, news from and about the City of Boston takes precedence over local messaging which makes it challenging for municipalities to alert or inform their constituents about local matters. For example, making sure residents were aware of emergency declarations at the beginning of the COVID-19 crisis was a challenge for towns since their residents are more tuned into Boston news sources than those of their own town or city (Anonymous interview, March 2020).

The density and continuity of cities within the Boston metro area means that people are often unaware of jurisdictional boundaries. When towns have different messaging about rules for public information, it can confuse residents who freely pass across boundaries in the course of their daily lives- for example messaging about rules governing the proper disposal of pet waste that is regulated in relation to water quality control. Having a regional collaborative facilitates the maintenance of consistent messaging that can be elevated through all the local media sources and avoid having residents receiving conflicting messages. An example of this kind of coordination was the heat protection measures that were developed and spread by the Metro Mayors Coalition of cities and towns.

Individual community plans on climate action: All the towns had completed a vulnerability assessment but not all of them had an updated climate action plan yet that would include both mitigation as well as adaptation measures. When these plans are made, the RMC members who were interviewed were confident that the regional work being done through the RMC would inform climate action within their individual communities.

Inspiration for other watershed collaboratives: Burlington, one of the members from the upstream communities, is unaffected by the passage of water from the rest of the watershed. However, the impact of their participating in the RMC has influenced the other watershed Burlington lies in—the Merrimack, Ipswich and Shawsheen basin, where the town has been motivated to collaboratively apply for a grant together with other communities in that watershed (Anonymous interview, March 2020).

Challenges of building adaptive capacity through collaborative governance

Resources: The biggest challenge to sustainability of the collaborative is continued funding. The RMC needs funds to support facilitation and implementation of its projects. While the state makes funds available through the MVP grants, there is considerable effort involved in accessing these including the application process and the requirement for applicants to provide a 25% match in cash or kind. The facilitators who convene the group also write the applications for state grants and their time contributes towards the required in-kind match. It is therefore crucial to have sustained funding to support facilitation.

The resources that the state currently makes available are an important impetus for municipalities to begin to take action but aside from the delay inherent in the process of accessing funding through applications for grants, the amount of resources available from the state is likely to be inadequate for implementation. The municipalities in the Mystic River Watershed which covers less than 1% of the state's area have identified the need for \$700,000 required to cover the costs of technical analysis and planning of adaptation measures to mitigate climate risks on the regional scale. It can be assumed that the amount of capital needed for actually executing these projects will be far higher.

One possibility in the absence of external sources of funding is that the Resilient Mystic Collaborative's (RMC's) role could be restricted to initiating or incubating regional projects where once the technical analysis and plans are prepared jointly, they are handed to municipalities to implement through cost-sharing agreements. However, the pre-condition of mutual benefit underlying collaborative action creates a challenge in funding projects that do not benefit all parties

involved. It would be nearly impossible to get a town to pay for interventions within its jurisdiction if the outcomes primarily benefit another town (such as green infrastructure that reduces stormwater volume flowing to downstream towns). It also means that towns with inadequate resources would remain vulnerable.

Limits to RMC capacity: Since participation is voluntary and there are limits to the amount of time and effort that municipal staff can dedicate to the RMC, there are other climate change impacts which the collaborative does not have the capacity to address at the moment. Some of these impacts which are increasing in intensity include unpredictable winter weather and increased wind speeds. Extreme heat events, though less frequent and less disruptive than floods, are nevertheless a serious threat and disproportionately impact vulnerable populations who have limited means to mitigate their risk. There are challenges in having heat effects addressed at the state level because of the localized nature of the problem, and thus if provided with the resources, the watershed is a more appropriate scale to address this problem.

Lack of regulatory authority: Voluntary action takes place only when it benefits all parties involved. In a collaborative, this ensures that the agenda is not hijacked by a few powerful interests. On the hand, it also precludes actions that would protect some municipalities but have to be implemented within other jurisdictions that do not benefit as much from the intervention. Additionally, climate adaptation and resilience require development to be restricted and pulled back from coasts and river banks. However, a major source of municipal revenue is property taxes. With a state-imposed cap on how much property taxes can be increased; new development is the only means by which municipalities can raise additional funds. Until municipalities have a strong incentive or alternative sources of revenue, there will be strong resistance to changing zoning bylaws to restrict development. Initial goals of the RMC included working with towns to develop and adopt regionally consistent zoning to improve stormwater management and prevent a race-to-the-bottom competition to attract new development. However, this issue has been tabled in favor of other initiatives that the capacity of the RMC is better suited to take on at the moment

Potential for inequity between watersheds or regions

While the state government provides some support for climate action, it clearly falls short of the requirements of the entire state to achieve climate adaptation. Even for the stages leading up to the scoping of possible adaptation measures, the RMC has had to supplement state support with their own resources such as the stormwater flood risk model from the City of Cambridge as well as private grants to support the facilitation of the collaborative. Assuming that voluntary, collaborative governance becomes the predominant model for regional climate adaptation planning, lesser resourced regions in the state might fall behind in the competition for scarce resources from the state or be unable to bridge the gap in resources through their own capacity.

Continuity in inter-municipal relationships through the collaborative

The informality of the collaborative means that inter-municipal relationships are not institutionalized and are tied to the people representing the municipalities. As employees - municipal staff tend to serve their communities for longer periods of time than elected officials who are in office only for a fixed-term. Therefore, between the two types of municipal representatives, the relationships developed by professional staff with their peers in other communities are longer lasting than those forged between elected officials. Nevertheless, having each municipality represented by more than one person or ensuring a handover to new staff is important so that the connection to the collaborative is not lost due to staff turnover. There is still a challenge of being able to transfer tacit knowledge from engagement with the process, to successive staff.

RMC members are mindful of the limitations of voluntary action and scarce resources, but given that it is the only option for regional climate adaptation at the moment, they are doing everything within their capacity to work towards making change. They have a shared understanding and a well-informed list of adaptation measures that can be implemented when the resources to do so are found.

Parallel to their efforts to build or strengthen infrastructure against the impacts of extreme weather events, the RMC is working on building social resilience for which they can achieve results on relatively quickly with the resources at hand. While protecting property takes an enormous amount of time and resources, protecting lives in the case of a climate emergency is more important and accomplished with less material resources. The RMC recognized and made this a priority from its

inception. Again, their strength as an informal collaborative allows them to partner with community organizations that serve vulnerable populations in ways that formal, governmental agencies are limited in doing.

The findings in this chapter have described how building on a history of successful collaboration that municipalities had either with each other, or the Mystic Watershed Association, intermediate wins thus far have helped develop trust and commitment amongst the RMC members. In the process, planners have developed the skills and conditions crucial for collaboration including trust, communication and finding common ground. Many of the challenges described in the previous sections could be overcome through increased state and federal funding as well as the creation of a public agency with regulatory authority and land use control at the regional level.

CHAPTER 4: DISCUSSION AND CONCLUSION

Discussion

The case for stronger support and intervention by the state government for climate adaptation: Climate adaptation is defined a five-stage process which leads to an outcome of being adapted – which includes physical adaptation and adapted institutions. However, a society needs the capacity to progress through these five stages and this adaptive capacity is determined not just by the availability of resources but also by how those resources are accessed and used. In the specific case of the United States and Massachusetts, municipal fragmentation and home rule create barriers to adaptive capacity because resources and land use control are dispersed among many individual municipalities. While collaborative governance is successful in overcoming some of these challenges by creating shared knowledge and gathering the resources to evaluate common threats, voluntary collaboration alone is likely to be inadequate in facilitating completion of actual construction, monitoring and evaluation of projects.

Collaborative governance faces several challenges including the process of decision-making through consensus which only allows decisions that benefit all parties involved, but not those measures that benefit some more than others. Additionally, the dependence on new development for increase in revenue makes it impossible for municipalities to restrict development even if it is necessary to mitigate flood risks at the local and regional scale. This demonstrates the need for separation of land use control from revenue generation.

Moreover, while the responsibility of climate adaptation falls on individual municipal governments, many of these towns serve commercial, industrial and infrastructural needs of the wider region or even the state. For example, the cities of Boston and Cambridge are educational centres and the Cities of Chelsea and Winthrop are home to regional infrastructure that benefit the entire region but whose environmental burdens fall disproportionately on the population within those cities. It is only the state and federal levels of government that have the power to i) mediate the inequities in resources iii) create authorities at the watershed or regional authority with land use control to manage flood and heat risks. The state government therefore has to amend its current

approach which places the responsibility on municipalities to fill the gaps in resources and capacity to achieve climate adaptation.

The challenges of regulatory approach to climate adaptation and strengths of inter-municipal voluntary collaboration

While a formal, regulatory agency might be the most effective way to address the challenges encountered by voluntary collaboration, such an agency would need to have overarching land use planning authority. In Massachusetts, municipalities have control of these aspects and it would be challenging to wrest control from them. It was the opinion of interviewees that nothing short of a crisis like the one that resulted in the creation of the MWRA or the founding of the Cape Cod commission would result in the formation of such an agency.

Enforcing unfunded mandates would also have a very different impact on information sharing from that of a voluntary collaborative. On one hand, coercive power produces swifter action than voluntary, consensus driven processes. On the other hand, a regulatory agency that forces municipalities to undertake consistent ‘best-practices’ could create friction because communities have different levels of resources. This would reduce the motivation of better-resourced communities to share information about their climate adaptation strategies. Additionally, formal organizations are more rigid in their requirements to follow procedure and do not engender relationships in the same way as informal collaboratives can. In a top-down regulatory model, municipalities often deal directly with the agencies that regulate them and do not necessarily communicate with other regulated entities. On the other hand, bottom-up action through collaboratives like the RMC gives municipal actors ownership of the decision-making process and builds inter-municipal capacity, relationships and knowledge.

Finally, when a regulatory authority takes over, it can act relatively fast. However, even an agency with coercive power and dedicated funding cannot assume to be able to plan for every climate emergency. The unpredictable nature of climate change makes it impossible to ensure that society can completely escape its impacts. In that case, collaboratives play a critical role in building relationships and networks that can take action to save lives in times of emergency. However, building effective coordination between actors takes time and is equally important in times of

crises when prior investment in effective collaboration can contribute to a more effective emergency response.

The small size of municipalities is a disadvantage in terms of the dispersal of power and resources, but an advantage in terms of the proximity that municipal planners have to the everyday lives of people in their communities. A regional authority might be too removed from conditions on-the-ground to gauge the needs of vulnerable populations and support the networks of grassroots or community organizations that can provide necessary assistance to these populations during an extreme weather event.

This thesis began with the question of what collaborative governance could achieve in the absence of regulatory authority. I find that, in bringing together the particular strengths and resources of municipal, non-profit and private for-profit actors, unfettered by rigid rules of procedure, the Resilient Mystic Collaborative (RMC) is uniquely able to build capacity and relationships amongst actors and address issues that affect residents at a scale that would be more challenging for a formal, public sector agency set at a larger scale to do. Waiting for a regional agency to be developed, legislated and funded would prevent any action from being taken at the regional scale until a crisis hit. In the meantime, voluntary, inter-municipal collaboratives like the RMC are taking numerous actions to avert the worst impacts of an extreme weather event.

The RMC is also working on regional issues that are not related to the hydrologic nature of the watershed such as the Lower Mystic grant that focuses on vulnerability of critical infrastructure and social resilience. These are issues with implications far beyond the extents of the Mystic communities. This implies that, over and above its geographical suitability for tackling climate adaptation, the RMC has proven to be an effective forum for municipalities to address issues of regional importance.

Recommendations

In the long run, to overcome the challenges faced by voluntary collaboratives, regional climate adaptation planning must be institutionalized with dedicating funding and coercive power to implement adaptation measures that affect land or property in any given municipality.

This is politically challenging and the creation of regional agencies with regulatory authority in Massachusetts such as the Cape Cod Commission and the Massachusetts Water Resource Authority (MWRA) has only taken place to address crises after they have occurred. Climate impacts however, have implications too severe to wait for a crisis in order to make institutional change.

The institutionalization of climate adaptation could take place either through existing authorities, or through the passing of legislation that creates a new governance structure or watershed level authority. A regional agency would help get communities all get on the same page in terms of standards to build to and the same future to prepare for. Adaptation involves a wide scope of activities from flood control to heat mitigation, to health issues. To be effective in addressing the challenges with voluntary climate action, the agency or governance structure would need to have flooding and land use planning authority, power to negotiate with state level agencies for improvement of regional infrastructure, ability to cover costs for shared projects or interventions in a particular jurisdiction that may only benefit another.

At the moment, the state uses a system of funding to encourage towns to assess their vulnerabilities. However, it has no mandate that penalizes inaction on climate resilience. Adaptation needs reliable data and projections for future risks, resources to implement initiatives, and regulatory and enforcement capabilities. In the near future, as a transition to a regulatory approach the state can provide data and information, along with pre-conditions such as restricting development, that municipalities need to meet to access the funding for climate resilience. It is also imperative for efforts to be made both at the state and local level to build support for the state government to create one or more climate adaptation agencies. At the local level, this could parallel a function already performed by the Mystic River Watershed Association in helping municipalities meet water quality standards by preparing material for public awareness and making educational presentations in communities and schools.

Elected officials make the decisions on where to allocate resources and involving them in the Resilient Mystic Collaborative's meetings so that they are involved with the adaptation planning process will be increasingly important in implementing local climate adaptation efforts. Bringing in additional stakeholders to the Resilient Mystic Collaborative could enrich the conversation. These stakeholders could include community leaders, educational institutions – both for academic expertise and as prominent, long-term stakeholders who are large property-holders as well as employers in the Boston area. Large businesses also have interests in community resilience to avoid property damage and also to ensure their employees can get to work. Business disruption costs businesses more than the losses from property damage alone. Additionally, businesses also have a political voice that can be brought to bear to get the kinds of investments and actions that are needed.

Conclusion

I conclude that regulation and voluntary action are not necessarily exclusive. Each has its benefits and given the nature of climate change adaptation – a combination of both approaches might be more effective than either of them alone. Ideally climate adaptation could be managed by voluntary action at the watershed scale framed within a funded, regulatory context at the state level. Voluntary collaborative climate action has important benefits such as building trust and relationships between municipalities as well as identifying solutions most suited to conditions on-the-ground. With provisions from the state government to balance differences in regional resource-levels, the initial stages of climate adaptation to assess climate risks and possible mitigation measures can take place through voluntary collaboratives at the watershed level. From that stage onwards, a state level agency with funding from the state and federal governments can assume responsibility of implementing the projects. Such a system would combine the strengths of a voluntary, collaborative approach with that of a regulatory approach while mitigating the challenges inherent in each.

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