

2019

The Leadership Void for Climate Adaptation Planning: Case Study of the Port of Providence (Rhode Island, United States)

Austin Becker

Eric Kretsch

Creative Commons License

[Creative Commons License](#)

This work is licensed under a [Creative Commons Attribution 4.0 License](#).

Follow this and additional works at: https://digitalcommons.uri.edu/maf_facpubs



The Leadership Void for Climate Adaptation Planning: Case Study of the Port of Providence (Rhode Island, United States)

Austin Becker* and Eric Kretsch

Department of Marine Affairs, University of Rhode Island, Kingston, RI, United States

OPEN ACCESS

Edited by:

Jonathan D. Paul,
Imperial College London,
United Kingdom

Reviewed by:

Nick Obradovich,
Massachusetts Institute
of Technology, United States
Julia A. Ekstrom,
California Natural Resources Agency,
United States

*Correspondence:

Austin Becker
abecker@uri.edu

Specialty section:

This article was submitted to
Geohazards and Georisks,
a section of the journal
Frontiers in Earth Science

Received: 07 September 2018

Accepted: 05 February 2019

Published: 22 February 2019

Citation:

Becker A and Kretsch E (2019)
The Leadership Void for Climate
Adaptation Planning: Case Study
of the Port of Providence (Rhode
Island, United States).
Front. Earth Sci. 7:29.
doi: 10.3389/feart.2019.00029

Climate adaptation requires leadership from a diverse group of stakeholders to shift investment priorities and generate political will for long-term planning. This is especially true for seaport stakeholders. Ports serve as access points to goods and services from around the world, promoting a higher and more robust quality of life. However, with the increased likelihood of intense storms, rising sea levels, and resource scarcity facing coastal communities, stakeholders will need to adapt coastal infrastructure to ensure long-term viability. Solving such problems requires leadership and participation from government across jurisdictional boundaries and/or the private sector. Using the case of Port of Providence (Rhode Island, United States), this study finds stakeholder perceptions of leadership responsibility contribute to an institutional void, in which it is unclear who is responsible and who should pay for resilience investment.

HIGHLIGHTS

- “Leadership” is defined within the context of coastal resilience planning for seaports.
- Empirical results suggest leadership voids serves as barrier to resilience planning.
- Respondents value dialog that engages stakeholders in transformational planning as a first step to developing leadership.

Keywords: leadership, stakeholder systems, seaport systems, climate change adaptation, barriers, resilience planning

INTRODUCTION

Actions taken today to support climate change adaptation and natural disaster resilience can have far-reaching and positive long-term effects on society and the environment (Allison et al., 2009). Inaction, on the other hand, can set a dangerous and potentially irreversible course affecting many aspects of human life. Society relies on the continued operation and resilience of seaports (Mansouri et al., 2010) for international trade (Hanson and Nicholls, 2012) and transportation (Becker et al., 2018); they are essential for society and the economy. Climate-related disruptions have proved to be disastrous for society and the economy not only on local levels but also on regional, national, and international scales (United States Department of Transportation [USDOT], 2014; Xiao et al., 2015; Ng et al., 2016). Coastal infrastructure is especially vulnerable to climate impacts due to its exposed location. Adaptation and resilience is thus critical in the face of a changing climate (Becker et al., 2013) and increased occurrence and intensity of natural disasters (Intergovernmental Panel on Climate Change [IPCC], 2012). Adapting seaports systems to increase their resilience to climate impacts and weather events requires

long-term planning and significant investments (Hallegatte, 2009; Mansouri et al., 2010). To prepare port systems for climate change and natural disasters, many stakeholders can play a role (Becker and Caldwell, 2015), but one (or more) must take up the baton to organize and lead the system forward. The question remains: What mechanisms can drive leadership in this area, despite misalignment between costs (now) and benefits (much later)?

This paper contributes to the growing body of literature in climate change policy in two ways. First, we propose a definition of leadership within the context of coastal adaptation and resilience. Second, we provide empirical data supporting the notion that, at least in the case of the Port of Providence (Rhode Island, United States), a void in leadership serves as a significant barrier to resilience planning. Stakeholders from the Port of Providence participated in previous planning and research efforts of which this paper is a part (Becker, 2017; Becker et al., 2017). In August 2015, port stakeholders participated in a hurricane resilience workshop that used tools and visualizations to introduce concepts of hurricane vulnerability and adaptation strategies. Workshop results concluded that stakeholders – though aware of climate change risks to their businesses – reached no consensus as to who is responsible for adaptation implementation, who would pay for it, and in what time frame. We thus initiated a second phase to the project and invited 31 stakeholders from the private and government sectors to participate in an online survey and in-person interviews in order to determine where leadership for climate adaptation *should* lie, as perceived by this group. This study took place between February and May of 2016.

This work also builds on previous research conducted on the impacts of storms on ports and the range of strategies that a wide variety of stakeholders could implement. The earlier work used ports as a lens to explore climate impacts and resilience strategies, since ports rely on exposed coastal locations and serve a critical function to a wide variety of stakeholders (Becker et al., 2014; Becker and Caldwell, 2015). In that research, Becker et al. (2014) and Becker and Caldwell (2015) collected empirical data through interviews of almost 60 port stakeholders from two case studies (Providence, RI and Gulfport, MS) and identified a wide variety of direct impacts, indirect costs, and intangible consequences of hurricanes hitting ports. Port stakeholders from Providence and Gulfport identified 128 unique strategies that could enhance port resilience in the event of a major storm. Responsibility for implementation of those strategies spanned across all stakeholders that made of the port system, including private business, government, community groups, and non-governmental organizations. However, many of those strategies had not (and have not) been implemented. Interviewees indicated that some strategies would be cost prohibitive, while others fell outside of the jurisdiction or mandate of the key decision makers, and still others simply did not rank highly enough when compared to other priorities. Further, interviews from this earlier study suggested that proper incentives were not in place to drive organizations to take the lead on making long-term resilience investments. For example, individual stakeholders pointed to other stakeholders to provide the necessary funding.

These revelations suggest that there is a lack of cohesion concerning adaptation and resilience planning where resources and leadership are concerned. The research presented in this paper builds on the previous research and the 2015 workshop through additional interviews of key stakeholders in the Port of Providence around their notions of responsibility for resilience investment and action.

Concepts of Adaptation and Resilience

Herein, we adopt the 2014 National Climate Assessment's definition of resilience: "A capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment" (Melillo et al., 2014), and their definition of adaptation: "Adjustment in natural or human systems to a new or changing environment that exploits beneficial opportunities or moderates negative effects" (Melillo et al., 2014). Adaptation policies have limited exogenous incentives of action (Anguelovski and Carmin, 2011) and, in many instances mandates, laws, and job descriptions fail to address adaptation planning (Moser and Ekstrom, 2010). Adaptation's novelty and lack of policy guidance, along with the major investments and long lead times necessary, stand as key barriers to implementing resilience strategies.

Concepts of Leadership

Much of the adaptation and resilience process is complex and will require stakeholders to take early action in a process that will have long-term payoffs, but fewer clear short-term returns. Those who pay to adapt may not be the primary beneficiaries of the adaptation benefits. McEvoy et al. (2008) suggest that the disparity between "who pays" and "who ultimately benefits" makes adaptation a difficult sell to some stakeholders. This may be particularly true in the case of seaports, as often port infrastructure have long lifespans (Becker, 2013). Complicating adaptation in this area even more, a seaport is a complex nexus of human and organization factors that interacts with physical infrastructure and equipment (Mansouri et al., 2010). Stakeholders will have different values, concerns, and objectives in the climate adaptation process (Nelson et al., 2007; Adger et al., 2009; Moser and Ekstrom, 2010); and therefore, stakeholders will have different reasons for stepping up as leaders for climate adaptation and resilience. However, leadership is critical in the adaptation process (Moser, 2010) to help overcome some of the difficulties surrounding the process. In fact, leadership is often cited more for its absence (Wilbanks, 2007), which can be a significant barrier to adaptation Moser and Ekstrom (2010) and Ekstrom and Moser (2014).

The Oxford Dictionary defines leadership as "the action of leading a group of people or an organization" (Oxford English Dictionary [OED], 2013), but neither the leadership literature nor the climate literature offer a consensus regarding the definition of "leadership." **Table 1** provides examples of other leadership definitions and demonstrates that the leadership concept generally includes a process, an influence, a group, and a common goal.

Given the importance of the seaport system, complexity of stakeholder groups, and increased climate and weather related

TABLE 1 | Examples of what “leaders” do.**What “leaders” do**

Influence followers to achieve group/organizational goals (Maak and Pless, 2006)

The action of one or more people who selects, equips, trains, and influences one or more follower(s) who have diverse gifts, abilities, and skills and focuses the follower(s) to the organization's mission and objectives (Winston and Patterson, 2006)

The ability to influence individuals and mobilize organizations to realize a vision (Egri and Herman, 2000)

Move people in a direction that is genuinely in their real long- term best interests (Barker, 2001)

Arranging a situation so that various members of a group... can achieve common goals (Bellows, 1959; Bass and Bass, 2009)

Influencing the activities of an organized group in its efforts toward goal setting and goal achievement (Stogdill, 1974; Bass and Bass, 2009)

Influencing people to cooperate toward some goal which they come to find desirable (Tead, 1935; Bass and Bass, 2009)

threats (Becker, 2014), a clear, concise definition of adaptation leadership would benefit the adaptation and resilience process to inform decision makers on how to best create the proper incentives. We constructed the following definition of leadership based on those established components (process, influence, group, common goal), as follows:

Leadership for adaptation of seaport systems initiates actions – through guidance, directive, mandate, self- or altruistic-interest – that make the system, or components thereof, more resilient to climate change and natural disasters.

Adapting infrastructure to be resilient to climate change will require a variety of individual stakeholder initiatives, as well as collaborations and large investment of money and other resources (Tompkins et al., 2008). Leaders will be necessary to initiate (Moser and Ekstrom, 2010; Anguelovski and Carmin, 2011) and advance the adaptation process (Ekstrom and Moser, 2014), a process that will involve conflicting stakeholder groups (Nelson et al., 2007; Parola and Maugeri, 2013) from which leaders will, hopefully, emerge. For example, some coastal communities may be well-served by the construction of a new storm barrier, such as the Maeslantkering Barrier in Rotterdam. This type of project costs billions of dollars to construct and would be fraught with confounding implications for social justice and the environment. Many stakeholders would play a role in the choice of design, the location, the research studies, and the raising of both capital and political will, but one or more leaders from amongst the interested stakeholders would need to champion the project to push it forward.

To date, there lacks research focused specifically on leadership as a barrier to adaptation and resilience. Further, few researchers have focused on strategies for overcoming lack of leadership as a barrier to coastal infrastructure and seaport adaptation activities, leaving this vital sector largely unaddressed in the conversation. This study focuses on the stakeholders of the Port of Providence (RI) to explore issues of leadership, and the lack thereof, for resilience planning.

Case Study – The Port of Providence (RI)

The Port of Providence is located south of downtown Providence (Rhode Island, United States) at the mouth of Providence River and the head of Narragansett Bay (Figure 1). The study area for this project encompasses waterfront industrial business on both the Providence and East Providence sides of the river. The port is critical to the Rhode Island economy and the Rhode Island,

Connecticut, and Massachusetts region (Providence Working Waterfront Alliance [PWWA], 2010) and its location is exposed to climate impacts including sea level rise and storm surge from hurricanes (Rubinoff, 2007). The governance structure of the port is complex. Notably, there is no operating port authority. Overlapping local and state zoning laws and regulations govern the port and approximately 30 independent businesses operate within the study area.

As for many ports, enhancing port resilience to climate change will likely be beyond the resource capacity of port operators acting alone (Becker and Caldwell, 2015) and leadership by other stakeholder groups will be necessary to prepare seaport systems for climate change and natural disasters. Adaptation to a changing climate involves a complex group of stakeholders (Tompkins et al., 2008; Becker and Caldwell, 2015) from both the public and private sector (McEvoy et al., 2010). In the seaport context, the stakeholder list may include port authorities, shipping owners, importers, exporters, local environmental groups, local residents, regional governments, national governments, transport firms, and manufacturing industries (de Langen, 2006; Hall et al., 2013). Twenty-five stakeholders responded, representing 13 businesses or non-governmental organizations (i.e., private) and 12 government agencies (at local, state, and federal level).

Conceptual Framework for Leadership Responsibility

To structure the interview analysis, we adapted a framework (Stiller and Meijerink, 2016) for organizational responsibility around our definition of leadership (Figure 2). We rely on a simple model of the policy process comprised of three major phases that are necessary for adaptation (Moser and Ekstrom, 2010):

1. *Understanding* includes identifying problems and measuring their potential impact on a system.
2. *Planning* includes identifying potential resilience options; assessing the feasibility, costs, and benefits; and selecting the optimal option.
3. *Managing* entails installing, monitoring, and evaluating the selected resilience option.

Throughout the adaptation process, leaders provide five functions (Stiller and Meijerink, 2016) to initiate action (through

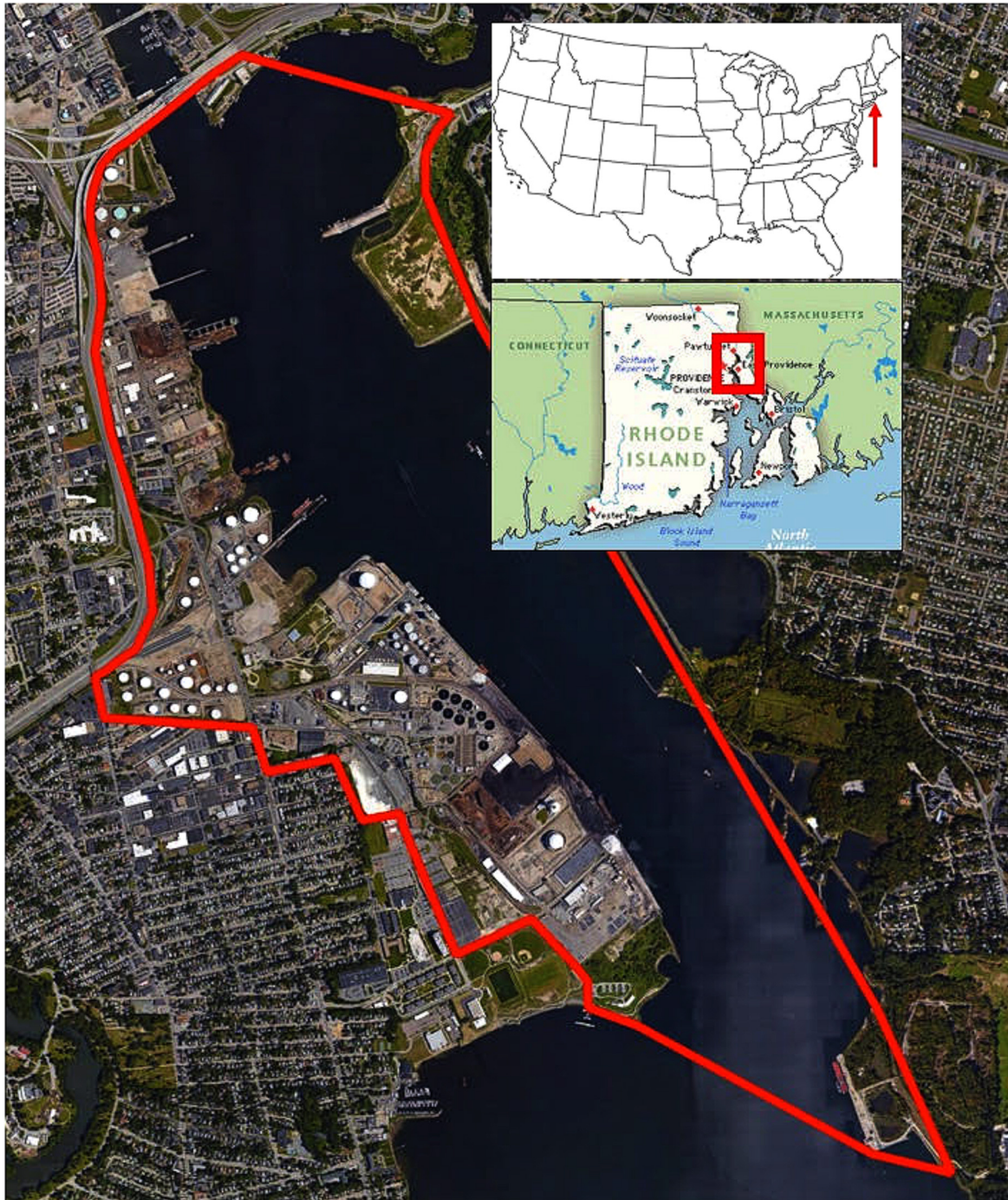


FIGURE 1 | Map of Port of Providence, RI (Becker, 2017).

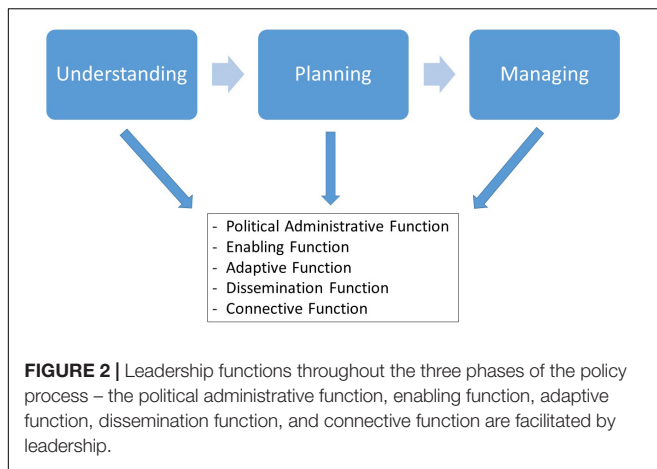
guidance, directive, mandate, self- or altruistic-interest) to make the system, or components thereof, more resilient to climate change and natural disasters. These five functions are briefly defined as follows:

a *Political administrative function* – consists of “every day” actions to facilitate the management of the policy

processes, such as making decisions on strategy options and designating funding sources for selected strategies.

b *Enabling function* – motivates progress by instilling a sense of urgency, through initiating discussions and setting deadlines.

c *Adaptive function* – creates new ideas and process, as well as solutions to exposed barriers. This function allows



the organization to change structurally to meet external changes and forces.

- d *Dissemination function* – provides information on new ideas, problems, and solutions to resilience partners and collects information from partners and incorporates them into decision-making.
- e *Connective Function* – incorporates stakeholders into a collective group. It provides connections between stakeholders by initiating meetings and work sessions and by engaging new stakeholders.

DATA COLLECTION METHODS

This study consisted of two components: First, we conducted an online survey to compare stakeholders' perceptions of leadership responsibility. We sent to the 31 stakeholders who participated in the workshop described above, with 25 respondents completing it. Thirteen respondents self-identified as representing the public sector (e.g., local, state, federal government) and 12 identified as representing the private sector. In the results section, we use these two broad groups to make some comparisons in attitudes for leadership responsibility. Second, we conducted interviews with representatives of the organizations identified by the 25 respondents as having leadership responsibility for the planning and implementation of three long-term transformational adaptation strategies developed in the earlier workshop (Figure 3).

Part I – Survey of Port of Providence Stakeholders

In Part 1, an online survey, conducted in February 2016, identified which actors or organizations respondents perceive as responsible for taking the lead and what they considered as the ideal organizational structures for pursuing the three strategies of protect, relocate, and accommodate. These were used to frame the concepts of resilience and emphasize the large-scale strategies, rather than focusing on measures more typically associated with emergency response activities.

For each of these three broad approaches, we asked respondents to identify the appropriate leadership structure for planning and implementing adaptation projects (Table 2). Options included: *private businesses independently*, *private businesses in collaboration (no government)*, *informal public-private collaboration*, *formal public-private collaboration (e.g., state mandated special committee)*, *local lead (City of Providence and East Providence)*, *state lead*, and *federal lead*. Respondents answered on a 1–5 scale that included: (1) *not responsible at all*, (2) *less responsible than others*, (3) *just as responsible as others*, (4) *more responsible than others*, and (5) *entirely responsible*.

For each strategy, we also asked which specific actors (i.e., specific agencies, organizations, or persons) respondents perceived as holding responsibility for implementing the strategy. We totaled the number of mentions and identified the nine top organizations perceived as potential leaders of adaptation, as follows:

1. City Government of Providence (planning department),
2. City Government of East Providence,
3. Rhode Island Department of Transportation,
4. Rhode Island Department of Environmental Management,
5. Rhode Island Coastal Resources Management Council,
6. Rhode Island Statewide Planning (part of the RI Department of Administration),
7. CommerceRI,
8. United States Army Corps of Engineers,
9. Providence Working Waterfront Alliance (an organization that represents much of the Port of Providence business community).

We targeted these nine organizations for detailed semi-structured interviews, as described in Part II below.

Part II – Interview of Stakeholder Perceived Leaders

In the second step conducted in May 2016, we interviewed seven of the nine “respondent-identified actors” (two were unable or unwilling to be interviewed) and asked them to self-evaluate their organization’s responsibility to facilitate the five “leadership functions” in planning and implementing resilience strategies at the Port of Providence. We conducted in-person interviews with a representative of the organization who survey respondents identified as having the most knowledge about Port of Providence resilience issues. Interviews lasted between 30 min and an hour. We asked interviewees to evaluate their own organization’s leadership responsibility and about the barriers they feel prevent them from taking a more active leadership role.

FINDINGS

This section first discusses survey results and then interview results, then implications and gaps revealed by these findings.

Protect – This concept uses infrastructure like a storm barrier located seaward of the port. It requires the construction of a barrier to protect from hurricane surge impact. The concept, unless including a lock system, does not accommodate for impacts from sea level rise, as this rise is passive, and the barrier will remain open to allow for navigation of commerce.

Relocate – This concept moves some non-essential infrastructure away from vulnerable locations. Examples are moving chemical storage (e.g., oil tanks), office space, and equipment storage to higher ground. This would require the purchase of off-port locations.

Accommodate – This concept develops coordinated micro-strategies throughout the port to improve, which cumulatively creates transformational change to the port. Examples of this are elevating properties, elevating utilities and structures, utilizing floodable spaces and break-through walls, and waterproofing structures. This strategy potentially can accommodate for sea level rise.

FIGURE 3 | Definitions of long-term adaptation approaches developed for the Port of Providence Resilience workshop (see also www.portofprovidenceresilience.org).

TABLE 2 | Organizational leadership structures for climate adaptation.

Form of leadership	Description
Businesses independently	Private businesses independently have sole responsibility for the implementation of resilience.
Business in collaboration	Private business collaborates to improve resilience collectively with no/little government support.
Public-private informal collaboration	Business and government working cooperatively to improve resilience. An example of this is a Special Area Management Plan process.
Public-private formal collaboration	Public and private organizations work cooperatively in a Rhode Island legislature authorized/mandated body. An example of this is the Governor's Commission of Dredging, formed by governor Lincoln Almond in Rhode Island in 1996.
Local lead (City of Providence and East Providence)	City governments take a lead role in facilitating implementation of resilience in the study area.
State lead (Rhode Island)	The state of Rhode Island takes a lead role in facilitating implementation of resilience in the study area.
Federal lead (United States)	The U.S. federal government takes a lead role in facilitating implementation of resilience in the study area.

Survey Finding 1: Stakeholders See a Collaborative Effort as Responsible to Implement Resilience Strategies and Believe Planning Should Begin Now

The results of the survey suggest the group's perception of the most appropriate leadership structures for resilience planning, as well as the specific actors who should take the lead (**Figure 4**).

Overall, respondents most supported a *public-private informal collaboration* structure, with the average respondent ranking it as *more responsible* to *entirely responsible*. *State lead* leadership scored as the second-choice leadership structure. On the other hand, port stakeholders did not see *private business independently* or *private businesses in collaboration* as responsible. Thus, most stakeholders see the government as playing a significant role in adaptation planning, with preference for either a completely top-down (state-lead) approach or a collaboration between state and private entities.

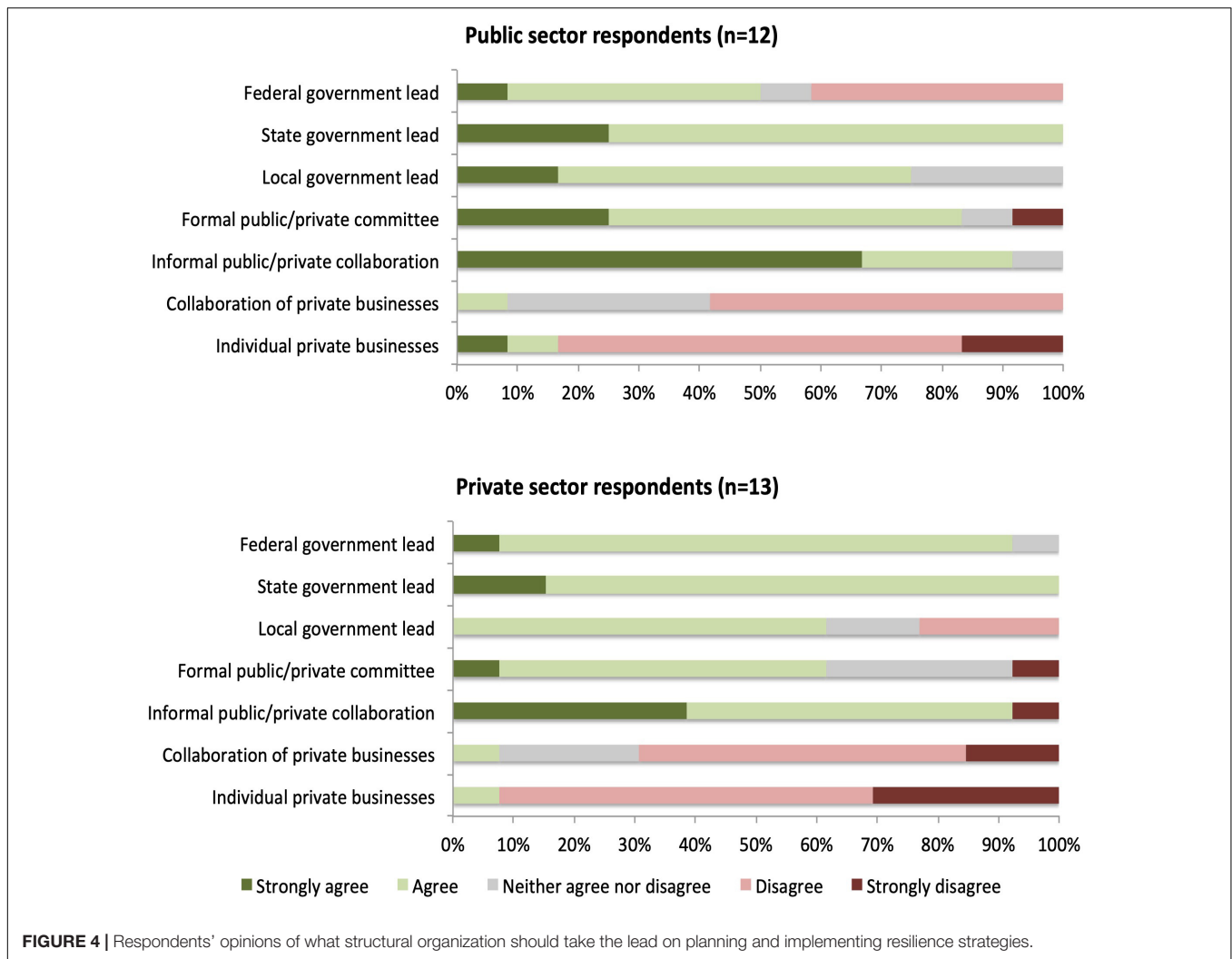
However, respondents from different sectors (public vs. private) showed different preferences about which specific organization should be responsible for leading in different resilience approaches. For example, private sector respondents felt that the *Accommodate* approach required a more public (government) leadership approach. On the other hand, public sector respondents felt that the business side should take a stronger leadership role

for *Accommodate* approaches. This example illustrates the finger-pointing nature of the resilience challenge, with government pointing to the business community to take the lead and vice-versa.

With respect to timing, 22 of the 24 respondents answering the question felt that planning for resilience should begin either immediately or within the next 2 years. Thus, while there was currently no organization in place to spearhead resilience planning for the port, the stakeholders felt that this should be a priority.

Survey Finding 2 – No Clear Specific Leader

In the open-ended survey questions asking stakeholders who, specifically, is responsible for leading the implementation adaptation approaches, stakeholders named 25 entities, with various organizations rising to the top depending on the resilience approach specified (**Figure 5**). Though the survey questions was worded to elicit *specific* organizations or agencies, many respondents provided broader responses (e.g., RI Government or Courts). The private sector respondents listed the Rhode Island Department of Environmental Management as being responsible for *accommodate*; city government and CommerceRI as responsible for *relocate*; and the United States Army Corps of Engineers and the State of Rhode Island



responsible for *protect*. Given the numerous organizations listed, we can deduce that survey respondents perceived many organizations as partially responsible for adaptation leadership. The results do not show a consensus around which organization is responsible.

However, by aggregating the individual named organizations into broader categories, it becomes clear that this group of respondents feels that the state and federal government agencies need to play a lead role in developing resilience for the port (Figure 6), with 94 of the 131 total mentions naming government organizations and only 14 naming private firms.

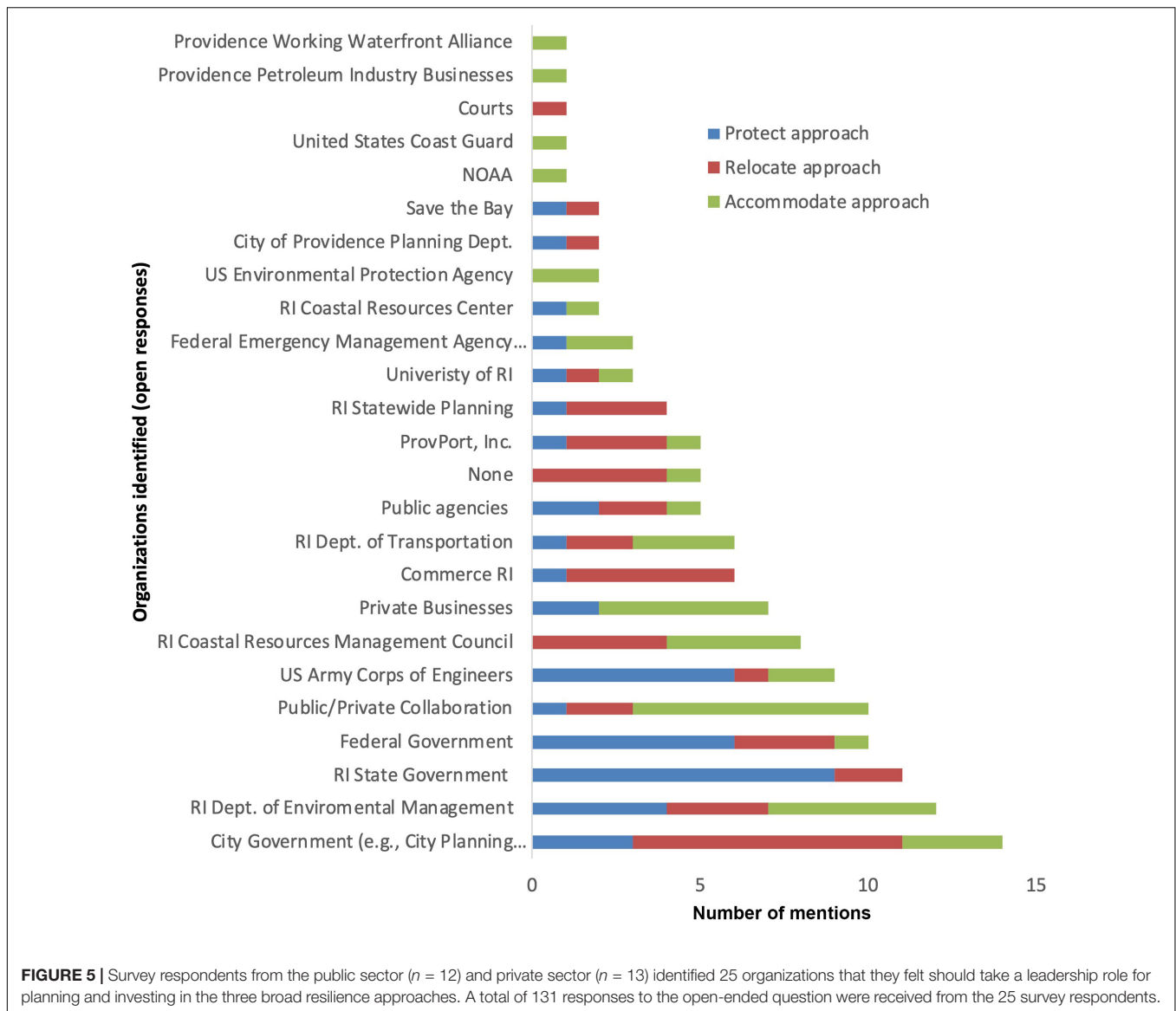
Survey Finding 3 – Private and Public Stakeholders Disagreed on Who Should Pay for Resilience

When asked which types of entities should be responsible for funding long-scale resilience projects (e.g., protect, accommodate, relocate), survey respondents from the private sector were more likely to put the burden on governments (Figure 7). Over 50% of the private sector respondents felt

that they had little or even no financial responsibility for resilience investments and the majority felt that state and federal governments were the most responsible. This finding points to the complexity of resilience investments, in which individual businesses may benefit, but the costs fall on shoulders of the taxpayer. Public sector respondents, on the other hand, tended to favor more of a shared approach. This might take the form of public/private partnerships, for example, or other strategies that involve private sector funding for resilience.

Interview Finding 1 – Identified Leaders Agreed That They Have Some Leadership Responsibilities, but Only in Part and Never for All Five Functions of the Policy Process Phases

In Part II of this study, we conducted interviews with seven of the nine organizations most frequently mentioned as having leadership responsibility in the online survey. Interview results showed that six of the seven interviewees stated that their organization is (or should be) a leader in resilience

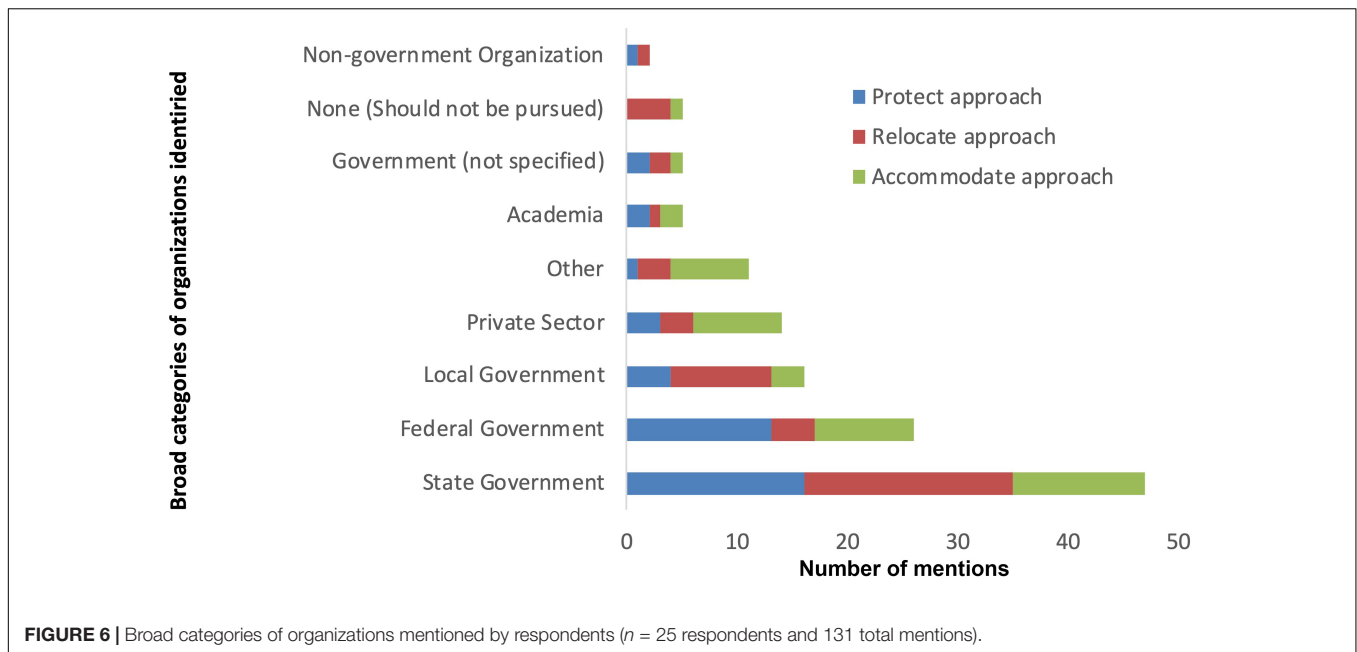


implementation. With respect to their role in building resilience for the Port of Providence, the representatives characterized their leadership in two ways: First they perceived themselves as leaders, but cited limits in their ability to implement resilience planning at the Port of Providence. As stated by one respondent, “I think we have a leadership role in all these [functions of leadership], what I am curious about ... is the magnitude of our role.” Second, they perceive themselves in a leadership role, but as a participant, partner or supporter, rather than as the “main” leader. As stated by one respondent “We do have a direct role. I see us as a direct participant.”

No representative felt his/her organization could fulfill all five of the functions of leadership throughout the various phases of the adaptation policy process. For example, two organizations felt they were responsible for fulfilling the dissemination, adaptation, and connective function during the planning phase; however, they

felt they had no role in the implementation phase and that the responsibility would be passed to someone else.

Similarly, another stated that for protect strategies, in particular, they held responsibility for the implementation of that project but not necessarily responsible for the planning phases of that project. Another organization representative stated that it focused on the dissemination of information and helping port businesses understand their risk, indicating that this organization saw themselves as fulfilling the dissemination function during the understanding phase of the policy process. As stated by one respondent, “We are trying to assist where we can, by providing data and support” and “[We are] working to make custom analyses, to look at which pieces of transportation are at risk.” One interviewee indicated that their organization held responsibility for all five leadership functions, but primarily in the planning phase: “We are already initiating the planning process by assessing risk, we do coordinate stakeholders, we are



developing, selecting, and assessing potential resiliency options” but in regards to implementation, “*Managing successful change, we are somewhat responsible for that.*”

The results show that there is no one organization that holds a leadership role for resilience from conception to management, to construction, implementation and monitoring. Thus, numerous agencies and actors would need to share responsibility, requiring some overarching collaboration and management.

Interview Finding 2 – Actors Face Three Key Barriers That Affect Their Leadership Ability

Interviewees identified four specific barriers to leadership: (1) lack of expertise, (2) lack of jurisdiction/mandate, and (3) lack of resources. These barriers left interviewees with the sense that they, even if they wanted to devote resources to resilience planning, they felt hindered and/or not wholly responsible.

Lack of Expertise

Interviewees cited a lack of skills or expertise to fulfill one or more of the leadership functions. For example, one organization found that they could not complete the *connective* function because their organization had no history of bringing together collaboration, stating, “*A limitation is our [lack of] understanding of all of the players.*” The organization could not fulfill the *connective function* because they did not know who should be involved in the process. Limited planning horizons also factored into perceptions that they lacked expertise. Only one organization stated they could plan for 50–100 years ahead, a period in which many of the major impacts of climate change are likely to occur.

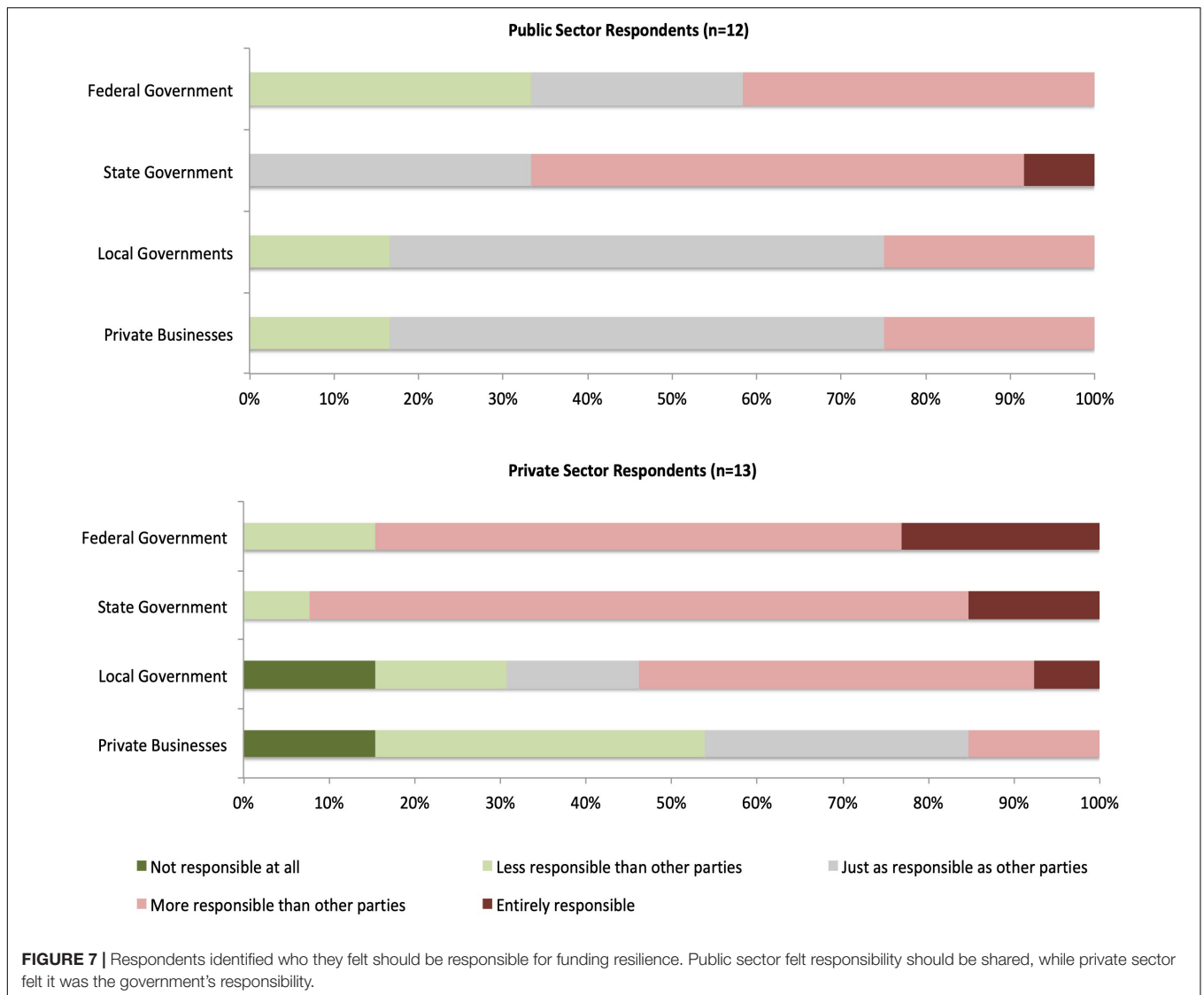
Lack of Jurisdiction/Mandate

Some interviewees felt limited by their jurisdiction, while others felt limited by the scope of their mandate. For example, one

organization stated, “*Yes we take a lead role [but only] within [our City lines].*” This representative said that within their city they had the ability to take the lead; however, they would need to be part of a larger collaborative effort if a given resilience approach impacted multiple municipalities.

Others felt that planning at the port scale was too small of a unit to work: “*We have taken [a leadership role]... for the entire coastline, including in Providence Harbor.*” Another organization stated, “*Yes, [we have] taken a high-level leadership role in Providence Harbor as well as in other locations.*” In the latter quote, the representative was discussing the fact that the organization focused on disseminating climate risk information at the local level throughout the state. This organization was currently working with the city and towns of the state in long-term resilience planning. He/she stated that if port business stakeholders reached out to them, they would be able to input information into the planning process. This organization followed up by saying at the current moment resources were also a limiting factor to their participation at the Port of Providence.

Two interviewees, one state (Rhode Island) and one federal, stated that though their involvement was within their jurisdiction, a lack of authorization from legislative organizations inhibited their leadership at the Port of Providence. An interviewee stated, “*If we are going to impose change... it would take specific authority to require that.*” Other interviewees stated that though not totally in their jurisdiction but if mandated by law, their organization would take a lead role in resilience implementation at the port, particularly if grant funding was provided to conduct the work. Another interviewee stated, “*We only get involved when someone says, ‘Hey, we think there is a problem here [and your organization] should take a look at and has the authority to solve.’*”



Lack of Resources

Every interviewee stated that a lack of staff and financial resources limited their ability to lead in adaptation planning and implantation at the Port of Providence, as evidenced in the following quotes:

“Funding is always an issue; if we don’t have the resources to complete the job correctly, then that is a barrier.”

“Funding, authority, and appropriation barriers – we can’t just go out and do anything we want.”

“Resources are always an issue, [we] are always spread everywhere thin – personnel and financial.”

All interviewees expressed the need for more money and more personnel if resilience measures were to be planned for and implemented. One organization expressed the importance of federal resilience grants to incentivize the participation of

businesses, government, and non-governmental organizations (including universities).

Interview Finding 3 – Interviewees See Opportunities to Collaborate as Motivation and a Chance to Clarify Roles

Interviewees underscored the need for dialog to help motivate their organization into a leadership role for resilience planning. As one stated, *“Resiliency is not something that is going to be addressed by one organization.”* Interviewees cited the benefits of opportunities to cooperate and of groups that drive discussion. One interviewee mentioned the Port of Providence workshop conducted prior to this research as a valuable motivating force, stating, *“It is helpful to have things like the workshop to help remind [us of potential risks] and give ideas.”* Another raised the value of workshops, *“to see what other people do.”* This was the same interviewee previously mentioned that they did not know *“all the players.”*

DISCUSSION

Climate change and natural disaster resilience have long-term effects with decisions made today having an impact for many decades (United States, 2008; Hallegatte, 2009; Savonis et al., 2014). Investing resources in making seaports resilient now is one way to avoid serious infrastructure costs and improve business over the long-term (Hallegatte, 2009; Mansouri et al., 2010). However, adapting and making seaports resilient to climate impacts will require stakeholders to take on leadership responsibility in the process. While much research and literature is devoted to stakeholder identification, engagement, and collaboration, less attention is paid to whom within a stakeholder group is best positioned to take the lead on making coastal infrastructure ready for the changing climate and oncoming natural disasters and what may motivate them to do so.

In a complex decision-making system such as the Port of Providence, organizations will need to fulfill each of the five functions of leadership for each of the three phases of resilience planning. Interviews and surveys showed that those identified by the stakeholder community as being “leaders,” agreed that their organizations had some level of responsibility. Further, the actors interviewed pointed to significant barriers, such as lack of expertise, jurisdiction, and financial resources, that stand in the way of prioritizing and implementing resilience planning. However, at the time of this project, the system, as a whole, was far too fragmented to determine a clear vision for which actors could (or should) serve as the catalyst for resilience planning. Though individual actors recognized their responsibility pieces of the process, none self-identified as a champion for resilience planning.

Results suggest that this is due in part to a lack of cohesion around the type of organizing body that would be most appropriate. Most participants favored the creation of stakeholder group, made up of both public and private sector representatives, to plan for and implement resilience. At the time of this project, no such group existed and, naturally, the formation of such a group requires one or more organizations to take a leadership role. This presents somewhat of a conundrum, given the various attitudes of the stakeholders themselves. The private sector, as seen in survey results, puts the leadership burden on the public sector. The public sector puts the burden, at least in part, on the private sector. In any case, most agreed that the state needs to play a large role in leading the process and thus resilience is not likely to occur in a bottom-up fashion from the business community of the Port of Providence.

This problem is not unique to Providence, as for most United States ports local land use and urban development powers rest with the municipality, while coastal and environmental regulations are reserved for the state, and the navigable water of the channel itself is under federal jurisdiction. However, Providence does have a history of overcoming this fragmentation. The \$63 million dredging of the shipping channel completed in 2005 serves as an example of how this stakeholder community can join together for a common goal. That project was championed by then Senator Claiborne Pell, with strong support from the RI Marine Trades Association and the Marine Pilots

Association. In this case, though, stakeholders realized immediate benefits after the 40' dredging project finished, as deeper-draft ships began using the channel.

Pre-planning and other forums for dialog could allow stakeholders to begin identifying first steps. Since resilience planning is in relatively uncharted waters, such activities allow stakeholders to better understand their roles and their risks. Dialog amongst stakeholders can provide clarification of the feasible and favored resilience options (Becker, 2017). Such dialogs further instill a sense of ownership in the process, as well as increased trust and participation (Douglas et al., 2012). The convening of workshops and focus groups is a natural fit for academics and other boundary organizations that can bridge the public and private sectors. These activities require little upfront funding and can be conducted in a low-risk, non-threatening, manner that engages stakeholders. The workshop that preceded this study (Becker, 2017) serves as an example of such a process and can be explored in more detail at www.portofprovidenceresilience.org.

Finally, we must also note that leadership is not purely a function of jurisdiction, mandate, and resource availability. Leaders must have the appropriate position within the system, but they must also have the personality and character necessary to bring the right actors together. Leadership for major infrastructure projects, especially in a federalist system such as the United States, must connect and integrate within a system designed to separate and distribute powers across scales and sectors. The major challenge in transformational adaptation for ports is finding the right actor(s), with the right personality, and the appropriate level of responsibility and mandate, in order to take the lead on major projects with big long-term gains (but less clear short-term benefits). Success often results from identifying and championing the short-term gains and making long-term resilience a “co-benefit” (Kates et al., 2012). Examples include the “Make Room for the Rivers” project in The Netherlands, which created new river parks and space to accommodate flooding. For Providence, a new storm barrier (such as the “Protect” strategy described herein) could serve the short term need of protecting the harbor from its current flood risk, create new public space on a protective berm, and serve to reduce the long-term risk from more intense storms of the future.

As a case study, this research has the advantage of describing a rich picture of one such port system, but also several limitations with respect to generalizability. As Yin (2008) well states in his seminal work on case study research, “The distinctive need for a case-study approach arises out of the desire to understand complex social phenomena.” This work is exploratory in nature, as no previous work on leadership for climate adaptation and resilience could be identified by the research team. This lays a foundation for future studies that can strengthen the conclusions or point to contrasts with other port (or other infrastructure) systems. The findings describe the unique case of a small port that does not have a public port authority, thus there is no direct government oversight of port planning activities. However, even ports that do have a state (or national) port authority likely face similar leadership voids. Since ports consist of numerous stakeholders and organizations beyond just the

port authority, each with its own priorities and authorities, responsibility for long term resilience planning may fall by the wayside as illuminated by the findings of this study.

CONCLUSION

Protecting port infrastructure systems has long-term benefits (Mansouri et al., 2010), but also requires long lead times (Hallegatte, 2009; Ford et al., 2011). In 80 years, sea level rise could mean that water levels in some areas are 11 feet higher than they are today (Sweet et al., 2017). Likewise, hurricanes may be more intense, resulting in higher levels of storm surge. Although many stakeholders recognize the likelihood of climate change and the increased occurrence of major storm events affecting their port (Becker et al., 2014), many times threats are not perceived as imminent and little is done to prepare. However, since large-scale projects can take decades to plan, fund, and construct, the process should begin today (Karassin, 2009). Whether a community like Providence wishes to construct new storm barriers or move infrastructure or enhance structures in place, numerous stakeholders will need to play a role. Today, the incentives for making such investments are still not clear. But specific leaders from the private and/or public sectors will need to step forward to initiate actions – through guidance, directive, mandate, self- or altruistic-interest – that make the system, or components thereof, more resilient to climate change and natural disasters. The empirical research conducted in this project demonstrates that the 25 stakeholders surveyed in the Port of Providence remain fragmented about which organizations can or should take up the charge. While the climate risks distribute across the system, there (as yet) appears to be no one “champion” to push a climate adaptation agenda forward for the port. The organizations identified by this group as having the *highest* responsibility for leading the effort agree that they

do have some responsibility or mandate, but only for limited aspects of the adaptation planning and investment process. The research suggests that more robust dialog would help create the momentum and differentiate roles amongst this community.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of the University of Rhode Island Institutional Review Board with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the “University of Rhode Island Institutional Review Board.”

AUTHOR CONTRIBUTIONS

AB was the principal investigator and project lead. EK conducted the interviews and surveys. Both authors contributed to drafting and revision of the manuscript.

FUNDING

This study received funding support from the Rhode Island Department of Transportation and Federal Highway Administration Grant Number – FHWA-RIDOT-RTD-17-3.

ACKNOWLEDGMENTS

Thanks to the participants who generously gave their time to assist with this research and to Prof. Richard Burroughs in the Department of Marine Affairs. Thanks also to Dr. Ken Payne for feedback and ideas.

REFERENCES

- Adger, W. N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D. R., et al. (2009). Are there social limits to adaptation to climate change? *Clim. Change* 93, 335–354. doi: 10.1007/s10584-008-9520-z
- Allison, E. H., Perry, A. L., Badjeck, M.-C., Adger, W. N., Brown, K., Conway, D., et al. (2009). Vulnerability of national economies to the impacts of climate change on fisheries. *Fish Fish.* 10, 173–196. doi: 10.1111/j.1467-2979.2008.00310.x
- Anguelovski, I., and Carmin, J. (2011). Something borrowed, everything new: innovation and institutionalization in urban climate governance. *Curr. Opin. Environ. Sustain.* 3, 169–175. doi: 10.1016/j.cosust.2010.12.017
- Barker, R. A. (2001). The nature of leadership. *Hum. Relat.* 54, 469–494. doi: 10.1177/0018726701544004
- Bass, B. M., and Bass, R. (2009). *The Bass Handbook of Leadership: Theory, Research, and Managerial Applications*. New York, NY: Simon and Schuster.
- Becker, A. (2013). *Building Seaport Resilience for Climate Change Adaptation: Stakeholder Perceptions of the Problems, Impacts, and Strategies*. Stanford, CA: Stanford University.
- Becker, A. (2014). “Maritime transportation and ports,” in *Encyclopedia of Natural Resources*, ed. Y. Wang (Abingdon: Taylor & Francis).
- Becker, A. (2017). Using boundary objects to stimulate transformational thinking: storm resilience for the port of Providence, Rhode Island (USA). *Sustain. Sci.* 12, 477–501. doi: 10.1007/s11625-016-0416-y
- Becker, A., Acciaro, M., Asariotis, R., Cabrera, E., Cretegnny, L., Crist, P., et al. (2013). A note on climate change adaptation for seaports: a challenge for global ports, a challenge for global society. *Clim. Change* 120, 683–695. doi: 10.1007/s10584-013-0843-z
- Becker, A., Burroughs, R., Kretch, E., McIntosh, R. D., and Haymaker, J. (2017). *Stakeholder Vulnerability and Resilience Strategy Assessment for Maritime Infrastructure: Pilot Project for the Port of Providence*. Providence, RI: Rhode Island Department of Transportation.
- Becker, A., and Caldwell, M. R. (2015). Stakeholder perceptions of seaport resilience strategies: a case study of Gulfport (Mississippi) and Providence (Rhode Island). *Coast. Manag.* 43, 1–34. doi: 10.1080/08920753.2014.983422
- Becker, A., Matson, P., Fischer, M., and Mastrandrea, M. D. (2014). Towards seaport resilience for climate change adaptation: stakeholder perceptions of hurricane impacts in Gulfport (MS) and Providence (RI). *Progr. Plann.* 99, 1–49. doi: 10.1016/j.progress.2013.11.002
- Becker, A., Ng, A. K. Y., McEvoy, D., and Mullett, J. (2018). “Implications of climate change for shipping: ports and supply chains,” in *Wiley Interdisciplinary Reviews: Climate Change*, ed. M. Hulme (Hoboken, NJ: John Wiley & Sons Ltd).
- Bellows, R. (1959). *Creative Leadership*. Oxford: Prentice-Hall.

- de Langen, P. W. (2006). Stakeholders, conflicting interests and governance in port clusters. *Res. Transp. Econ.* 17, 457–477. doi: 10.1016/S0739-8859(06)17020-1
- Douglas, E. M., Kirshen, P. H., Paolisso, M., Watson, C., Wiggin, J., Enrici, A., et al. (2012). Coastal flooding, climate change and environmental justice: identifying obstacles and incentives for adaptation in two metropolitan Boston Massachusetts communities. *Mitig. Adapt. Strateg. Glob. Chang.* 17, 537–562. doi: 10.1007/s11027-011-9340-8
- Egri, C. P., and Herman, S. (2000). Leadership in the North American environmental sector: values, leadership styles, and contexts of environmental leaders and their organizations. *Acad. Manag. J.* 43, 571–604.
- Ekstrom, J. A., and Moser, S. C. (2014). Identifying and overcoming barriers in urban climate adaptation: case study findings from the San Francisco Bay Area, California, USA. *Urban Clim.* 9, 54–74. doi: 10.1016/j.uclim.2014.06.002
- Ford, J. D., Berrang-Ford, L., and Paterson, J. (2011). A systematic review of observed climate change adaptation in developed nations. *Clim. Change* 106, 327–336. doi: 10.1007/s10584-011-0045-5
- Hall, P. V., O'Brien, T., and Woudsma, C. (2013). Environmental innovation and the role of stakeholder collaboration in West Coast port gateways. *Res. Transp. Econ.* 42, 87–96. doi: 10.1016/j.retrec.2012.11.004
- Hallegette, S. (2009). Strategies to adapt to an uncertain climate change. *Glob. Environ. Chang.* 19, 240–247. doi: 10.1016/j.gloenvcha.2008.12.003
- Hanson, S., and Nicholls, R. J. (2012). “Extreme flood events and port cities through the twenty-first century,” in *Maritime Transport and the Climate Change Challenge*, eds R. Asariotis and H. Benemara (New York, NY: Routledge), 243.
- Intergovernmental Panel on Climate Change [IPCC] (2012). in *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Special Report of the Intergovernmental Panel on Climate Change*, eds C. B. Field, V. Barros, T. F. Stocker, and Q. Dahe (Cambridge: Cambridge University Press). doi: 10.1017/CBO9781139177245
- Karassin, O. (2009). Mind the gap: knowledge and need in regulating adaptation to climate change. *Georget. Int. Environ. Law Rev.* 22:383.
- Kates, R. W., Travis, W. R., and Wilbanks, T. J. (2012). Transformational adaptation when incremental adaptations to climate change are insufficient. *Proc. Natl. Acad. Sci. U.S.A.* 109, 7156–7161. doi: 10.1073/pnas.1115521109
- Maak, T., and Pless, N. M. (2006). Responsible leadership in a stakeholder society—a relational perspective. *J. Bus. Ethics* 66, 99–115. doi: 10.1007/s10551-006-9047-z
- Mansouri, M., Nilchiani, R., and Mostashari, A. (2010). A policy making framework for resilient port infrastructure systems. *Mar. Pol.* 34, 1125–1134. doi: 10.1016/j.marpol.2010.03.012
- McEvoy, D., Lonsdale, K., and Matczak, P. (2008). Adaptation and mainstreaming of EU climate change policy: an actor-based perspective. *CEPS Policy Brief* 1–15. Available at: <http://aei.pitt.edu/7541/1/149.pdf>
- McEvoy, D., Matczak, P., Banaszak, I., and Chorynski, A. (2010). Framing adaptation to climate-related extreme events. *Mitig. Adapt. Strateg. Glob. Chang.* 15, 779–795. doi: 10.1007/s11027-010-9233-2
- Melillo, J. M., Richmond, T. T. C., and Yohe, G. W. (eds) (2014). *Climate Change Impacts in the United States: The Third National Climate Assessment. Global Change Research Program*. Washington, DC: U.S. Government Printing Office.
- Moser, S. C. (2010). Now more than ever: the need for more societally relevant research on vulnerability and adaptation to climate change. *Appl. Geogr.* 30, 464–474. doi: 10.1016/j.apgeog.2009.09.003
- Moser, S. C., and Ekstrom, J. A. (2010). A framework to diagnose barriers to climate change adaptation. *Proc. Natl. Acad. Sci. U.S.A.* 107, 22026–22031. doi: 10.1073/pnas.1007887107
- Nelson, D. R., Adger, W. N., and Brown, K. (2007). Adaptation to environmental change: contributions of a resilience framework. *Ann. Rev. Environ. Resour.* 32, 395–419. doi: 10.1146/annurev.energy.32.051807.090348
- Ng, A. K. Y., Becker, A., Cahoon, S., Chen, S.-L., Earl, P., and Yang, Z. (2016). *Climate Change and Adaptation Planning for Ports*. New York, NY: Routledge.
- Oxford English Dictionary [OED]. (2013). *Oxford English Dictionary*. Oxford: Oxford University Press.
- Parola, F., and Maugeri, S. (2013). Origin and taxonomy of conflicts in seaports: towards a research agenda. *Res. Transp. Bus. Manag.* 8, 114–122. doi: 10.1016/j.rtbm.2013.07.005
- Providence Working Waterfront Alliance [PWWA]. (2010). *Economic Impact - Providence Working Waterfront Alliance*. Available at: <http://providenceworkingwaterfront.org/index.php/providences-working-waterfront/economic-impact/>
- Rubinoff, P. (2007). *Increasing Resilience Along Rhode Island's Coast*. Narragansett, RI: URI Coastal Resources Center.
- Savonis, M. J., Potter, J. R., and Snow, C. B. (2014). Continuing challenges in transportation adaptation. *Curr. Sustain. Renew. Energy Rep.* 1, 27–34. doi: 10.1111/j.1365-2648.2011.05699.x
- Stiller, S., and Meijerink, S. (2016). Leadership within regional climate change adaptation networks: the case of climate adaptation officers in Northern Hesse, Germany. *Reg. Environ. Chang.* 16, 1543–1555. doi: 10.1007/s10113-015-0886-y
- Stogdill, R. M. (1974). *Handbook of Leadership: A Survey of Theory and Research*. New York, NY: Free Press.
- Sweet, W., Kopp, R. E., Weaver, C. P., Obeysekera, J., Horton, R. M., Thieler, E. R., et al. (2017). *Global and Regional Sea Level Rise Scenarios for the United States, in NOAA Technical Report NOS CO-OPS 083*. Silver Spring, MD: NOAA.
- Tead, O. (1935). *The Art of Leadership*. New York, NY: McGraw-Hill Book Company.
- Tompkins, E., Few, R., and Brown, K. (2008). Scenario-based stakeholder engagement: incorporating stakeholders preferences into coastal planning for climate change. *J. Environ. Manage.* 88, 1580–1592. doi: 10.1016/j.jenvman.2007.07.025
- United States Climate Change Science Program [USCCSP]. (2008). “Impacts of climate change and variability on transportation systems and infrastructure: gulf coast study, phase I,” in *A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research*, eds M. Savonis, V. R. Burkett, and J. Potter (Washington, DC: U.S. Environmental Protection Agency).
- United States Department of Transportation [USDOT]. (2014). *Impacts of Climate Change and Variability on Transportation Systems and Infrastructure The Gulf Coast Study, Phase 2 Screening for Vulnerability Final Report, Task 3.1*. Washington, DC: ICF International.
- Wilbanks, T. J. (2007). Scale and sustainability. *Clim. Pol.* 7, 278–287. doi: 10.3763/cpol.2007.0713
- Winston, B. E., and Patterson, K. (2006). An integrative definition of leadership. *Int. J. Leadersh. Stud.* 1, 6–66.
- Xiao, Y.-B., Fu, X., Ng, A. K. Y., and Zhang, Y. (2015). Port investments on coastal and marine disasters prevention: economic modeling and implications. *Transp. Res. Part B Methodol.* 78, 202–221. doi: 10.1016/j.trb.2015.04.009
- Yin, R. (2008). *Case Study Research: Design and Methods*. Thousand Oaks, CA: Sage Publications, Inc.

Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2019 Becker and Kretsch. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.