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ORIGINAL ARTICLE

The Action-oriented Stakeholder Engagement for a Resilient Tomorrow (ASERT) framework: an effective, field-tested approach for engaging stakeholders

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Abstract
The Action-Oriented Stakeholder Engagement for a Resilient Tomorrow (ASERT) framework enables a participatory approach for adaptation actions related to social-ecological resilience to sea level rise. This framework was field-tested in the Hampton Roads region of coastal Southeastern Virginia in 2016. Results show that structured public involvement, through collaborative sessions that couple geospatial and visualization tools with dialogic processes, improves the quality of information co-produced with stakeholders. The four key principles of ASERT—(1) an inclusive process, (2) an emphasis on gaining local knowledge and context, (3) integrated engagement, and (4) an explicit focus on incorporation of change mechanisms—can provide both policymakers and stakeholders with a dialogic approach that can better inform planning efforts to use local resources to build social-ecological resilience.

Keywords Stakeholder engagement · Participatory processes · Sea-level rise · Structured public involvement · Participatory mapping · Deliberative processes

Introduction

In this study, we develop and test the Action-Oriented Stakeholder Engagement for a Resilient Tomorrow (ASERT) framework as a participatory approach for engaging stakeholders in building social-ecological resilience to issues such as sea level rise (SLR) and other climate change impacts. The ASERT framework is intended to help policymakers, planners, community leaders, and others ensure broad stakeholder engagement, beyond simple public participation, that emphasizes action-oriented responses that contribute to social-ecological resilience and resilience more broadly. The ASERT framework was field-tested in a demonstration project involving several neighborhoods in Hampton Roads, Virginia, a region that spans multiple city and government boundaries. Using this demonstration project, the study analyzes if and how the ASERT framework might effectively engage stakeholders in co-creating knowledge and identifying actions for building social-ecological resilience to SLR. Study results are important for improving stakeholder engagement practices, especially approaches that are designed to encourage stakeholders' ability to better surface local context and the sharing and co-creating of local knowledge. This is particularly relevant for complex issues such as those related to social-ecological resilience. The study also contributes to research efforts to develop effective stakeholder engagement tools, strategies, and approaches that can be applied broadly to build resilience.

Sea-level rise and social-ecological resilience

In general, the government is considered to be effective in implementing standard, routine policies, but is ill equipped to handle non-standard and non-routine tasks (Head and Alford 2015; Kettl 2009). The latter is especially true for wicked problems that are complex, unpredictable, intractable, open ended, or resistant to solutions (Head and Alford 2015; Rittel and Webber 1973). Issues related to environmental change, such as climate change and sea level rise (SLR), are wicked problems, and the issues and associated challenges cannot be addressed but, at best, can be temporarily resolved.

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SLR is a disruptive phenomenon that can severely impact coastal communities, coastal ecosystems, and portside infrastructure. SLR is an escalating threat to already vulnerable coasts (Gharehgozli et al. 2016; Wamsley et al. 2015), and resilience to SLR, like many other wicked problems, requires a social-ecological resilience framework given the numerous natural and human factors involved (Biesbroek et al. 2017; Nelson et al. 2007; Folke 2006; Adger et al. 2005; Berkes and Folke 1998).

SLR is accelerating, but its magnitude is uncertain. This is due to several factors such as rising global temperatures, the shrinkage of Greenland and West Antarctic ice sheets, and non-climatic changes such as subsidence. There is further uncertainty as to how these factors will persist in the future. As a result, the impact of SLR on low-lying coastal areas and society's ability to cope via adaptation are also uncertain. The main impacts of SLR are submergence and increased flooding in coastal areas, saltwater intrusion, and the decline of saltmarshes and mangroves leading to overwhelmingly negative direct and indirect socioeconomic impacts within a region (Nicholls and Cazenave 2010).

As such, building social-ecological resilience to SLR has become important for coastal areas. A social-ecological system framework emphasizes resilience as a dynamic process linked to human actors and their agency. These are reflected in the ability to respond to and engage with uncertainty and potential change, to adapt, cope, learn and innovate, and to develop capacity to respond (Obrist et al. 2010; Bristow and Healy 2014; Adger et al. 2005; Folke 2006; Lloyd et al. 2013; Biesbroek et al. 2017). This resilience perspective is consistent with the argument by Nelson et al. (2007) that adaptation to environmental change is best approached from a resilience framework, given several important factors: (1) environmental risks are more apparent and predictable than ever, prompting greater need for adaptation responses; (2) environmental changes may be significant and adaptation does not take place in isolation; and (3) environmental change has human causes and human impacts.

Literature review

Stakeholder engagement

Engaging stakeholders in decision making regarding SLR within a social-ecological resilience framework is important for ensuring that adaptation solutions reflect the preferences of stakeholders, are considered by these stakeholders as legitimate, and have broad acceptance and support (Yusuf et al. 2018; Arvai 2003; Renn and Schweizer 2009; Moser and Ekstrom 2011). This is consistent with the broader coastal planning and management research that encourages inclusion of stakeholders to ensure support and buy-in from those affected by the decisions (Tompkins et al. 2008; Wiseman et al. 2010; Olsen 1993). Effective coastal management programs involve affected populations in issue analysis, formulation, and implementation, integrating knowledge about the ecosystem with societal needs, and promoting learning by all involved (Olsen 1993). However, in the environmental arena, most processes and tools favor decisions being made by experts. Accordingly, these processes are not able to track changing stakeholder preferences or incorporate their preferences into decision making (Tompkins et al. 2008).

Structured public involvement (SPI)

While we recognize that resilience is both an outcome and a process, our approach to stakeholder engagement for social-ecological resilience emphasizes the latter, focusing on learning, surfacing the local context, and creating knowledge to support effective decision making that improves adaptive response. Our ASERT framework is designed to meet these needs by incorporating key engagement principles from structured public involvement (SPI). SPI was developed by Bailey and Grossardt to encourage more authentic public participation by integrating geospatial and visualization tools (such as maps and visual renderings), dialogic group methods (such as the use of audience response technologies or ARS), and facilitation techniques in a reflexive manner. It has been used successfully in public engagement for complex and contentious infrastructure and environmental decisions across the USA (see for example Bailey and Grossardt 2010; Bailey et al. 2002, 2007, 2011).

Compared to unstructured public involvement which can be considered unfocused and untheorized where more involvement equates to more public meetings with the same people and using the same methods, SPI offers a formalized process that couples dialogic tools with technology to maximize authentic public input and enhance the quality of engagement (Grossardt et al. 2003). SPI respects participants' time by structuring engagement events or meetings in such a way that the methods and technologies "give the public ownership of the process and increase confidence in the legitimacy of the outcomes" (Grossardt et al. 2003, p. 97). Applications of SPI show that it provides quality guidance for professionals and technical experts ensuring satisfaction among stakeholders participating in the engagement exercise (Bailey and Grossardt 2010; Bailey et al. 2011).

Three principles of SPI are relevant to stakeholder engagement for building social-ecological resilience to SLR. First, the use of a variety of communication tools, such as maps and photographs, provides more intuitive understanding of the nature of the problem and solutions. Second, two-way communication is enhanced using dialogic approaches to understanding the problem and developing solutions. Finally, fostering broad-based participation can be achieved by

explicitly accommodating large and diverse input by facilitation, preference mapping, and scoring or rating exercises.

SPI was developed based on the premises of spatial justice, procedural justice, and access to justice (Bailey and Grossardt 2010). Spatial justice emphasizes being mindful of how space can be used to equitably address distribution of resources and takes into account how decision processes play out among institutions as well as individuals (Soja 2010). Procedural justice is about the process of deciding and access to justice is about who should be included in the deliberations (Bailey and Grossardt 2010; Rawls 1971).

SPI does so by integrating geo-spatial and geo-visual tools with dialogic processes that broaden participation in decision making (Bailey and Grossardt 2010). Conflict-ridden and complex issues such as wicked problems and SLR specifically require inclusive decision making that spans the many stakeholder groups. SPI is an appropriate framework for this context, as it facilitates stakeholder involvement and input into the resilience planning process. Key principles of SPI underpin our ASERT framework, providing proven methods and techniques to help a diverse and inclusive mix of stakeholders better understand their shared local context and community values, and create knowledge to inform adaptation solutions and actions.

Deliberation, participatory mapping, and social learning

SPI rests upon deliberation about the common good; such deliberation or reasoning about the merits of a policy defines lawmaking (Wolfe 2015). Deliberative processes are found to soften the strongly held views of participants, increase knowledge, and alter opinions (Barabas 2004). Furthermore, meaningful participatory approaches place information at the center of the deliberation, decision making, and governance processes (Walters et al. 2000). SPI also encourages active participation and deliberation utilizing a variety of strategies found to be effective, such as facilitated discussion, ranking and re-ranking exercises, and mapping tools (Few et al. 2007). These techniques allow for the introduction of new and varied perspectives, surfacing of unexamined assumptions and local knowledge, and creation of usable information (Jones 2015).

Our ASERT framework incorporates facilitated discussion, ranking or prioritization exercises, and participatory mapping. The latter is an important engagement tool for capturing the spatial representation of a community's perceptions about its physical location and significant features. According to Levine and Feinholz (2015), participatory mapping has played an important role in pulling together socio-spatial data for ecosystem-based planning and management. Through participatory mapping approaches, local knowledge can be incorporated into the assessment and mapping of risks (Cheung et al. 2016; Hung and Chen 2013; Hung et al. 2016). Participatory mapping has been used in a variety of areas related to social-ecological resilience, such as land cover change (Mapedza et al. 2003), water and sanitation (Banana et al. 2015), and coastal and marine issues (Moore et al. 2017). Applications such as Google Earth and Google Maps have resulted in the growth of participatory mapping applications (Tulloch 2007). Participatory mapping places the lived experiences into a spatial context and is a process-driven way of creating knowledge while fostering deliberation (Tschakert et al. 2016). The mapping process provides an opportunity for participants to engage with and learn from each other and co-produce socio-spatial data (Levine and Feinholz 2015).

Through participatory mapping, stakeholders can also be visually presented with different scenarios and asked to respond to these scenarios. These scenarios are particularly useful for exploring possible future paths and outcomes in complex systems and under circumstances where factors shaping future outcomes are uncertain or unpredictable (Nicholls et al. 2011). Use of scenarios can also facilitate dialog between stakeholders with different attitudes and values, unearth the underpinning causes of conflicts and differences, develop common understanding, and support convergence toward mutually acceptable solutions (Masini and Vasquez 2000).

Participatory processes can change how individuals understand and adapt to SLR, especially if such processes facilitate social learning (Yusuf et al. 2018). Social learning, which takes place when individuals come together in a shared or lived experience (Reed et al. 2010), enables convergence of goals or actions among participants who may come to the table with different interests and perspectives, and supports the co-creation of knowledge (Blackmore 2007; Muro and Jeffrey 2008). The ideas of participation and stakeholder engagement, social learning, local knowledge, and co-production of knowledge and decisions are consistent with and supportive of adaptive management approaches that are keys to the governance of social-ecological systems (Biesbroek et al. 2017; Karpouzoglou et al. 2016; Béné et al. 2018; Huitema et al. 2009).

The action-oriented stakeholder engagement for a resilient tomorrow (ASERT) framework

The ASERT framework incorporates four key principles from both the public participation and social-ecological and community resilience literature: (1) an inclusive process that engages stakeholders across multiple social dimensions and across the whole-of-community spectrum, (2) a strong emphasis on surfacing local context and knowledge, (3) integrated engagement where social and cultural factors are essential to the process of engagement, and (4) explicit consideration of change mechanisms, such as structured conversations,

deliberative dialog, and participatory mechanisms (see for example Coles and Buckle 2004; Cutter et al. 2008; Vogel et al. 2007; Quick and Feldman 2011; McCoy and Scully 2002; Schoch-Spana et al. 2007).

The participatory processes of ASERT are guided by the principles of SPI, which integrate the provision of relevant and accessible information with dialogic group methods by using an audience response system (the ARS for this study was a clicker through which respondents completed prioritization or ranking exercises) and visual and geospatial technologies (i.e., participatory mapping). The ASERT framework emphasizes the use of deliberative and participatory techniques to help a diverse and inclusive mix of stakeholders better understand problems and identify possible actions and solutions, while being attuned to social, cultural, and community factors. Having stakeholders collectively define problems and identify relevant adaptation strategies allow for the co-production of practice- and policy-relevant knowledge that are grounded in stakeholder values and the local context, enabling subsequent decision making processes that consider context-specific information (Fazey et al. 2010; Few et al. 2007; Preston et al. 2011; Smit and Wandel 2006). This co-production of knowledge with stakeholders is established via a two-way iterative process of dialog (Bierbaum et al. 2013; Hukkinen 2008; Lépy et al. 2014; Salter et al. 2010). The ASERT framework's emphasis on actionable and feasible solutions to enhance resilience also fills a large gap in current engagement approaches that tend to focus on the discursive aspects of engagement.

Demonstration project

We undertook a demonstration project to field-test the application of the ASERT framework and assess its effectiveness as a tool for engaging stakeholders in deliberation about building resilience through adaptation to SLR. The demonstration project was located in the Hampton Roads region of southeastern Virginia and involved a group of neighborhoods that spanned multiple city and government boundaries. The demonstration project location includes multiple watersheds in the two cities of Norfolk and Virginia Beach, and encompasses a federal military facility (Joint Expeditionary Base Little Creek).

In the demonstration project, the ASERT framework was operationalized as a stakeholder meeting that (1) engaged stakeholders in two-way dialog, (2) acknowledged and addressed their concerns and resistance, (3) informed and educated stakeholders about adaptation strategies, and (4) generated action-relevant knowledge for building resilience. The demonstration project included information and participatory mapping components (using an interactive platform called the "weTable"), in-depth qualitative discussion of adaptation actions including feasibility and barriers, and the use of ARS to evaluate and prioritize issues emerging from discussion. The multiple components of the stakeholder meeting are shown in Fig. 1.

For the participatory mapping component of the stakeholder meeting, we used the weTable to facilitate visualization of the impacts of SLR and identification of community assets and challenges. The weTable (Messmore 2013; Mikulencak and Jacob 2011) serves as the platform to present maps and geospatial data of coastal inundation resulting from SLR and/or storm surge. The data highlight the impacts of coastal hazards, such as to critical infrastructure and personal safety, and are used as a starting point for identifying vulnerabilities to SLR and resulting inundation. The weTable uses Wii technology to create an interactive tabletop that allows participants to simultaneously visualize SLR scenarios while collaboratively exploring and identifying vulnerabilities that negatively affect social-ecological resilience. It works by projecting a computer screen onto a tabletop surface. Participants interact with information using a light pen connected to the laptop via a Wii remote.

A key role of the weTable was to focus participants' attention on SLR and coastal inundation by using visualization to convey the magnitude of the impacts. Visualization promotes group understanding because it provides shared references and objects to talk about, think about, and use as a basis for coordinating actions and perspectives, moving from individual perceptions to a shared perception (MacEachren and Brewer 2004; Aggett and McColl 2006). For example, participants analyzed risks and vulnerabilities while interacting with the maps displayed on the weTable to indicate specific areas that might be at risk or comprehend how some areas may be more vulnerable than others (Lieske 2015).

During the weTable participatory mapping exercise, participants were asked two primary questions. The first question was:

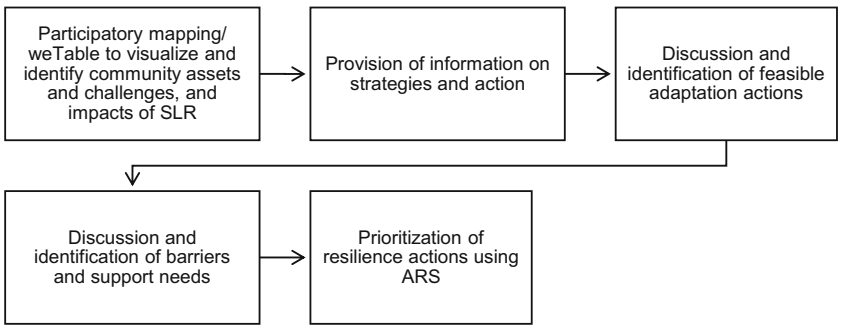


Fig. 1 Components of the ASERT stakeholder meeting application

Looking at this map, please tell us what assets are in your community (examples: schools, roads, and parks). Follow-up prompts for this question included (1) Why are these assets particularly useful? and (2) Which assets should be prioritized and why? Participants were then shown a map overlay of flooding projections given 1½ foot of SLR combined with a 100-year storm surge. Participants were asked the second primary question: With this map as an aide, what are the challenges you see? The two follow-up questions were (1) Tell us more about the specific challenges in the areas you have identified, and (2) What areas would be more challenged than others and why?

Following the participatory mapping exercise, participants were provided information about strategies and actions to adapt to SLR and build social-ecological resilience. The stakeholder meeting participants then discussed three questions: (1) How do we adapt to protect these assets or address the challenges? (2) Why do we need to do this? and (3) What is preventing us from doing this?

The stakeholder meeting concluded with a prioritization activity. Participants were given ARS clickers and asked to vote on specific issues related to adaptation actions. First, participants were asked to "Select the top 3 adaptation actions most feasible for improving your community's resilience to SLR and/or flooding." They were given nine options: natural solutions (such as dunes and beaches, wetlands), floodplain policy and management, flood-proofing buildings (such as elevating whole or parts of a building, installing flood vents), flood warning and preparedness, relocation, levees or floodwalls, storm surge barriers, none of the above, and "I don't know". With the ARS clickers, participants voted for three of these nine options. Then, participants were asked to "Select the top 3 actions that would help you adapt." With the ARS clickers, participants voted for three choices from a list of ten options: find out more about different adaptation actions, talk to public officials about allocating resources for implementing adaptation, learn more about what my city is doing to address flooding and/or sea level rise, talk to my family and friends about the problem, talk to my family and friends about how to adapt, learn what others in my community are doing to adapt, learn more about sea level rise and/or flooding, learn more about how to adapt, none of the above; and "I do not know." With the ARS, participants were able to see, instantaneously, the results of the prioritization activity.

Methodology

The demonstration project in the Hampton Roads region involved four ASERT stakeholder meetings that were held from March through July 2016 in neutral locations such as community centers, senior centers, and public libraries. Forty-three residents of Norfolk and Virginia Beach participated in a four-step process at these sessions: (1) participatory mapping, (2) discussion of adaptation actions, (3) a prioritization activity using ARS clickers, and (4) a paper survey on the effectiveness of the process used in the stakeholder meeting. The stakeholder meetings were held both in the afternoon and in the evening. Participants received $20 Amazon gift cards for attending the stakeholder meeting.

Four categories of criteria were used to evaluate the efficacy of the ASERT application in this demonstration project: (1) inclusion, (2) process quality, (3) quality of information, and (4) efficiency (see Table 1). "Inclusion" refers to the attempt to bring together a wide range of participants across different demographic aspects (e.g., age, sex, and ethnicity), in addition to seeking out participants from different neighborhoods and who may be working for different organizational types (e.g., for-profit, non-profit, and military). The goal of this criteria is to ensure that input is gathered from the broadest possible cross section (Bailey et al. 2012). "Process quality" is measured using participants' evaluation of how well the ASERT process provided a forum for engagement with stakeholders on the subject of SLR and how well the weTable served as an easy-to-use mechanism for identifying community areas at risk from SLR. In terms of "quality of information," participants assessed how well the ASERT process surfaced pertinent information about the nature of the SLR challenge at a local level. Finally, for "efficiency," participants indicated their perception of the value of the ASERT process relative to the amount of time they invested in

Table 1 Criteria for evaluating ASERT efficacy

Criteria	Indicators	Data collection
Inclusion	Participation by different organizations, sectors, citizens, and/or groups included	Count of participants; diversity of participants
Process quality	Stakeholder/participant satisfaction	Survey of participants regarding satisfaction with the participation process; access to weTable, access to information
Quality of information	Stakeholder evaluation	Survey of participants regarding quality of information generated from discussion; relevance of discussion.
Efficiency	Time	Survey of participants regarding efficiency given time commitment

Source: Adapted from Bailey et al. (2012)

participating in the process. In addition to these four categories, we also assessed ASERT efficacy in terms of its ability to enable action that would build resilience; participants indicated how likely they were to either support or take adaptation actions within their community.

Data was collected throughout each stage of the stakeholder meeting. First, information was collected about the participants themselves. Then, during the weTable exercise, mapping data was collected electronically via Google Earth map layers. This mapping data included locational data for community assets and areas where SLR poses challenges to the community, as identified by the participants. Qualitative data was also collected from the subsequent facilitated discussion on feasibility of and barriers to adaptation action. Following this discussion, quantitative data was collected electronically using ARS related to priorities for adaptation. Finally, data on the efficacy of the stakeholder meeting was collected using a survey. This survey included a variety of questions related to satisfaction with the process, access to information, quality of information, and the value of participating in the stakeholder meeting. The survey also included a question about participants' willingness to take action to build resilience.

Results

In applying the ASERT framework, the demonstration project inherently identified community assets and challenges, and facilitated discussion of the short-term concerns of stakeholders, their awareness of adaption solutions available, and their identification of resources needed to take action for adaptation and resilience. For this study, however, our focus is on the effectiveness of the ASERT framework as a tool for facilitating such discussion as a pre-cursor for mobilization and action toward resilience. Figure 2 summarizes the results of our analysis of ASERT efficacy.

Inclusion

The 43 participants of the stakeholder meetings provided a diverse group in terms of race, gender, age, and military affiliation. A third of participants were male, and participant age ranged from 20 to 80 years. Of the 39 participants who reported information about their race, 46% were white, 31% black, 13% Hispanic, and 8% Asian. More than half of the participants had military affiliations, including active duty military (7.5%), spouse or family member of active duty military (7.5%), reservist or veteran (30%), and spouse or family member of reservist/veteran (12.5%).

There was also participant diversity in terms of their level of engagement in the community. Of the 43 participants, 47% indicated that they were engaged in their community at a high or extremely high level, while 26% were neutral in their engagement, and 28% reported low or extremely low levels of engagement. Survey results revealed variety in the extent to which participants felt personally vulnerable to sea level rise. More than half of the respondents (59%) rated their personal vulnerability as high or extremely high. Twenty-six percent

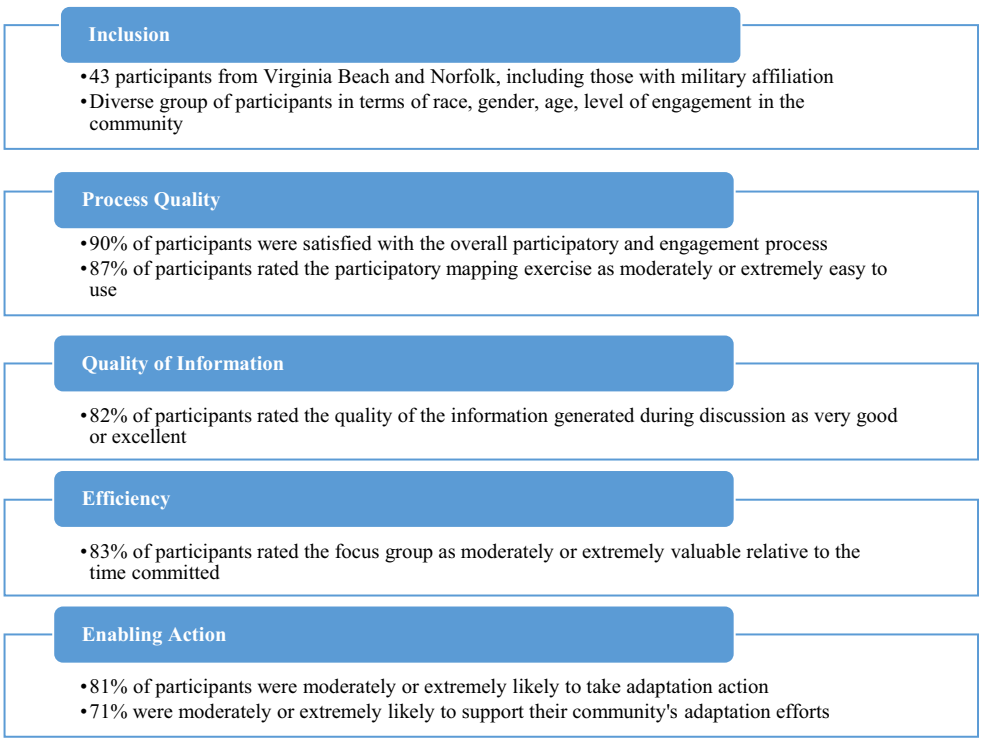


Fig. 2 Summary of ASERT efficacy indicators

were neutral in terms of their vulnerability, and 15% rated their vulnerability as low or extremely low.

Process quality

Participants were asked to rate their level of satisfaction with the overall participatory and engagement process. As shown in Fig. 3, almost 91% of participants reported being moderately or extremely satisfied with the overall process. No participants selected the "not at all satisfied" option, and just under 10% of participants indicated that they were slightly or somewhat satisfied with ASERT's overall participatory and engagement processes.

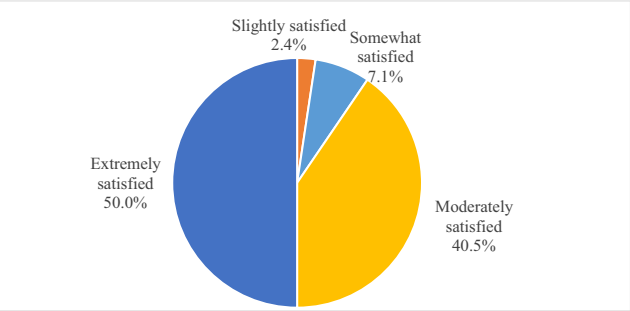
In addition, participants found the weTable participatory mapping exercise accessible and easy to use. When asked to rate how easy it was to use the weTable, 37% rated it as extremely easy to use, and another 50% rated it moderately easy to use. Fourteen percent found the participatory mapping tool somewhat or slightly easy to use.

Quality of information

Efficacy was also assessed by the quality of the information generated during the ASERT focus groups. Participants were asked: How would you rate the quality of the information generated during the discussion? Thirty percent rated the quality of information as excellent and more than half (52%) of the participants rated the information quality as very good. Another 14% rated the information quality as good and 5% as fair.

Efficiency

To assess efficiency of the ASERT framework, we asked participants to rate the value of the ASERT stakeholder meeting relative to the time they committed to participating. Results indicate that participants found ASERT to be efficient. Only 5% indicated they found participation to be slightly valuable and 12% rated their participation as somewhat valuable. In contrast, 21% found participating in the event as moderately valuable and 62% as extremely valuable relative to the time committed.



Question:
How satisfied were you with the overall participatory and engagement process today?

Fig. 3 Satisfaction with overall participatory and engagement processes

Enabling action

To measure the efficacy of the ASERT framework in terms of enabling adaptation action, meeting participants were asked two questions: (1) As a result of attending this event, how likely would you be to take adaptation action? (2) As a result of attending this event, how likely would you be to support your community's efforts to take adaptation action? Responses to these questions are summarized in Fig. 4. Overall, the responses show that participation in the ASERT stakeholder meetings indicated an increased likelihood of participants personally taking adaptation action and supporting their community's efforts to take adaptation action.

Conclusion and implications

Since the 1950s, experts have struggled with how to best communicate with stakeholders about risky situations, moving from a top-down information communication model to one that involves dialog with members of the community. Leiss (1996) pointed out that this dialogic approach has largely been driven by heightened uncertainties about hazards and stakeholder lack of trust in the experts who are attempting to manage risk. Palenchar and Heath (2006) have noted that the effective identification and management of hazards today call for a process that "values consensus building through dialogue…and meaningful stakeholder interaction."

Our ASERT approach offers further insights into how to deal with risk and resilience through such a stakeholder-centered approach. By engaging stakeholders in the process of creating knowledge about risk exposure to SLR and coastal flooding, feasible and actionable adaptation actions, and challenges to resilience, the ASERT demonstration project educated stakeholders on these key issues. But the demonstration project was not based on a top-down, expert-centered communicative approach. Instead, the insights and knowledge elicited from stakeholders was instrumental in identifying the problems and challenges of SLR and can be used to support broader planning efforts toward an integrated strategy and increased social-ecological resilience. Lessons learned from the demonstration project can inform future efforts to engage stakeholders in other areas related to environmental change and resilience.

The SPI framework has been applied to the transportation sector; this study has expanded its application within an ASERT approach designed to address an environmental issue (SLR and associated social-ecological resilience issues). The results show that the SPI framework may be applied to

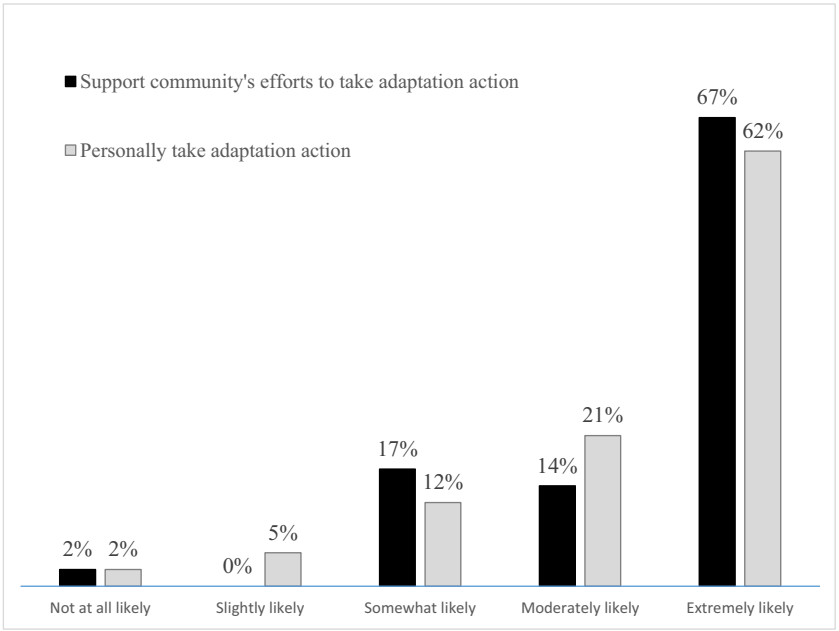


Fig. 4 Responses to questions about taking adaptation action

Question:
As a result of attending this event, how likely would you be to take adaptation action?
As a result of attending this event, how likely would you be to support your community's efforts to take adaptation action?

increasing public participation in addressing a wider range of environmental concerns. The study strengthens the claim made by Bailey et al. (2011) that when geo-spatial and geo-visual tools are integrated with dialogic processes, there is an increased likelihood of stakeholders' greater satisfaction with engagement exercises. Additionally, the study establishes the efficacy of the ASERT framework in broadening participation via greater inclusion, process quality, and highly satisfied stakeholders, generating quality information and offering value for the time committed to participating. All of these perceived enhancements come, in great part, because the ASERT approach encourages individuals to tap into, and share, their lived experiences. In turn, the ASERT process allows participants to better surface local context and co-create local knowledge with others.

This demonstration project strongly suggests that the ASERT framework can be used effectively in additional settings and with a variety of stakeholders to further confirm its utility in involving stakeholders to generate action-oriented resilient responses to sea level rise. While the demonstration project limited the scope of the stakeholder engagement effort, the ASERT framework can be operationalized to work with larger efforts. For example, the weTable exercise in the demonstration project was limited to small groups of 10 to 15 participants, but subsequent applications of a participatory mapping set-up with two weTables running concurrently have been utilized to engage up to 40 participants in one setting. The participatory mapping methodology can also be extended to a web-based approach that allows for greater numbers of participants and continuous accessibility rather than being confined to a specific stakeholder engagement event.

Effective stakeholder engagement alone, however, cannot ensure decision making that is inclusive of the perspectives of stakeholders and cognizant of local knowledge and context. Lack of enabling administrative mechanisms and governance structures can hinder the incorporation of stakeholder engagement processes and outcomes into decision making. For example, Ganapati (2011) suggests that the lack of incorporation of participatory mapping—both as a process and a source of information—in high-level decision making can be attributed to institutional and administrative reasons. Similarly, power relations also challenge wide use of stakeholder engagement in decision making processes, especially in situations related to climate and environmental policy because of the long-term and uncertain nature of the underlying issues (Few et al. 2007).

The ASERT framework, however, shows promise as a vehicle for informing future efforts to develop adaptation strategies, encourage adaptation action, implement solutions, and design an integrated response to building resilience. The ability of residents to better understand the wider local context and then co-create knowledge is an essential step toward community capacity building, which, in turn, can lay the groundwork for sound decision making regarding environmental challenges. For example, while adaptation capacity is greatly affected by larger structural factors

like local governance configurations and the policies of officials, the local community has insights about the micro nature and persistence of environmental threats that can greatly inform elements essential to adaptation. This local knowledge can inform the early-stage steps toward good decision making, what Ford and King (2015) call problem detection, information gathering, and the further redefining of the problem. While Moser and Ekstrom (2010) have pointed out that there are several barriers across these stages (e.g., political leadership indecisiveness, lack of funding for adaptation, and lack of engagement between decision makers and community members), this study points to the ASERT process as a vehicle for addressing such hindrances. Furthermore, as Gunderson and Light (2006) highlight in the example of adaptive governance in the Everglades, an approach such as ASERT can increase response capacity and foster cooperation and linkages between stakeholders, community organizations, and public agencies. As such, this study finds that a concerted dialogic process—in this case, using the ASERT framework—can facilitate the co-creation of local knowledge and context conducive to sound decision making regarding building resilience in the face of environmental challenges.

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