# Reframing Engagement Methods for Climate Change Adaptation

Running head: Engagement for Climate Change Adaptation

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## Abstract

Climate change poses known and unknown risks for coastal communities and also challenges for university faculty and local government staff who communicate about climate sciences. Conceived as a way to move beyond traditional models of science communication, this project involved public and private decision makers in specific at-risk communities in Oregon (U.S. Pacific coast) and Maine (Atlantic coast). Both state projects sought to move behavior toward decisive action that results in coastal communities that are more resilient to climate variability at all scales. To promote engagement between project staffs and publics, a dialogic model of communication was advanced, beginning with interviews and focus groups which in turn shaped further engagement through workshops and targeted video products. This means of communication led to a deeper understanding of participants' knowledge, beliefs, perceptions, values, and barriers to action related to climate change and its effects. Coinciding with this, project participant evaluations in both Oregon and Maine indicate that the workshops and videos were successful at informing them on this complex issue; and in both states, project participation led to action outcomes. We believe that applied elsewhere our multi-faceted and adaptive approach will garner similar results, provided sufficient dedicated staffing and attention to methods.

**Keywords**: climate change, adaptation, mental models, dialogic engagement, science communication

## Introduction

That knowledge of relevant science can improve individual and collective responses to issues affected by science would seem to be widely believed not only by scientists but also by

educators, policy-makers, managers, the news media, and members of the public. Furthermore, effective management requires successful communication, often with a range of public stakeholders. The uncertainty often seems to be about *how* to communicate about scientific issues successfully with adult citizens (Bubela et al. 2009). The conventional assumption, common among scientists and some managers, that if people are provided the correct science information then their behavior will change, has been shown repeatedly to be simplistic and not well supported (Kollmuss and Agyeman 2002; Nisbet and Scheufele 2009). Instead, modern science communication research focuses on understanding the intended audience and using scientific methods and standards rather than conventional practices, habits, and intuition. A 2012 colloquium at the U.S. National Academy of Sciences focused on this "science of science communication," underscoring through the range of presentations hosted by the National Academy that there *is* such a robust science and that communication not grounded in it is much less likely to be successful.[1]

This project applied communication science to one of the most pressing, and contentious, public issues: climate change. Climate variability and long-term climate change are now having and will continue to have an impact on the physical features, habitats, and human communities of coastal zones (IPCC 2007). These effects are exacerbated by increased migration to, development of, and use of coasts, particularly in low-lying, hazard-prone areas. While proven as well as promising adaptation strategies will continue to be developed, they are fruitless without implementation by coastal decision-makers and residents. In order to be prepared to respond and lessen climate effects, coastal decision makers, from household to government levels, need to better understand the challenges they face.

Working in collaboration, Oregon and Maine Sea Grant College Programs began a project in 2007 in the two states to

1. discover the barriers that target audiences in the two states have to preparing for or responding to the effects of climate variability and change;
2. encourage and facilitate collaboration among and between decision makers and coastal property owners to determine and implement appropriate responses to climate variability and change; and
3. develop educational and informational materials and strategies addressing climate concerns.

Project team members were interested in reflecting on and developing new strategies within our organizations for communicating climate science and engaging decision makers in both learning more about climate sciences and acting on that knowledge. This paper outlines the communication models and methods we used as well as some of the results of both projects.

## Engaging decision makers

Many models of public engagement with science are based in transmission models of communication (Reddy 1979). In transmission models communication occurs when information that is held by one party is adequately transmitted to a second party. In science communication, the sender is generally considered to be an expert and the receiver is generally conceived of as a non-expert. Breakdowns in communication are explained as either "noise in the signal," faulty encoding (the expert didn't get it right) or faulty decoding (the non-expert didn't understand). This model of "getting 'the word' out" is a version of what Reddy (1979) calls the "conduit

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[1] http://www.nasonline.org/programs/sackler-colloquia/completed_colloquia/science-communication.html

metaphor" of communication. In this one-way transfer of information model, whatever we know about the intended audience from front-end evaluation is simply used to "shape the message" to be maximally effective.

Models of communication that focus on information transmission, usually to overcome an information "deficit" have been critiqued from the perspectives of communications research (Nisbet and Scheufele 2009), psychology (Slovic 1987, Marx et al. 2007), education (Bak 2001), and extension (Blewett et al. 2008). However, they remain prevalent in many efforts to engage public audiences in science (Kahan 2010; Borchelt and Hudson 2008).

The project team recognized early on that engaging local decision makers in learning about, talking about, and acting toward mitigation of climate change impacts called for expanding on the traditional university Cooperative Extension role of "trusted brokers of information"—to serving as trusted brokers of dialogue or processes of engagement. This required other models of communication that do not rely exclusively on the conduit and transmission metaphors. Aware of an ongoing debate about the nature of engagement within the academic Extension realm (Alter 2003; National Sea Grant Extension Review Panel 2000), we set out explicitly to test models of engagement that would reframe our work from adequate communication to engaging, long-term dialogue among scientists, communicators, and public decision makers.

While effective public participation processes have been studied and recommended, the U.S. National Research Council also recommended investments in "social science research to inform their practice and build broader knowledge about public participation" (National Research Council 2008: 4). We intended to do such research and build such knowledge.

## The Oregon and Maine Contexts

The states of Oregon and Maine have both similarities and differences with respect to anticipated climate change effects and the communities and economic interests that will likely be most affected. The coasts of both states are primarily rural, with significant resource extraction economies based on fishing and aquaculture. Sea level rise is a concern, but for most coastal populations, increasing winter storm run-up, increasing storm frequency, or changes in fisheries due to changes in ecosystems or ocean acidification, are more consequential (Jacobson et al. 2009; Oregon Department of Land Conservation and Development 2010). A primary difference is that Oregon has public ownership of intertidal land (between the extreme low tide to 16 feet of elevation), while Maine is one of only a few states in which coastal property is owned by private landowners (out to the mean low tide). Thus, while the concerns around coastal issues related to climate change are similar, decision making for adaptation or responsiveness lies with quite different groups.

Oregon and Maine Sea Grant programs have areas of similarity as well as unique strengths. Both programs are part of the National Sea Grant College Program and support coastal and marine research, education, communication and engagement. Sea Grant programs often play the role of boundary organizations (Guston 2001; Tribbia and Moser 2008) as they serve as the intermediaries and translators that bring together marine scientists, educators, policy makers, and other stakeholder groups. At the same time, each Sea Grant program tailors its efforts to address the specific stakeholder needs in its state and has thus developed niches within the Sea Grant network. Oregon Sea Grant has active research interests in communication and learning sciences, focusing a good deal of effort on understanding how people learn and what this means in terms of communicating with a variety of publics. Maine Sea Grant is strong in

building leadership capacity at the community level and working collaboratively with stakeholders in planning and implementing community-based initiatives.

As a result, collaboration and complementary outreach efforts between the two states were intended to yield insights about critical information needs and effective outreach strategies that could be applicable to each other and to other states.

## Conceptual Framework: Dialogic engagement to mediate decision-making

The underlying assumptions of both the Maine and Oregon project teams were that
- understanding the needs of participating publics requires empirical research beyond traditional survey methods;
- creating opportunities for mutually meaningful dialogue can result not only in developing better understanding of information needs, but can also help participants generate meaning by articulating knowledge, concerns, and needs for themselves;
- mutually meaningful dialogues need to be structured and mediated—they are not the norm in these contexts;
- better understanding of public knowledge, beliefs, understanding, and needs can lead to better support of their decision-making processes.

The model that emerged from these assumptions and our ongoing work with participating communities is best described as a *dialogic approach to engagement based on eliciting and sharing mental models*. It is built on other successful models of communicating risk (Morgan et. al. 2002), scholarly engagement (Peters et. al. 2005), and nonpersuasive communication (Fischhoff 2007).

Mental models is a way of talking about and representing the more or less abstract schema that shape our thinking, remembering, and perceiving of the world. The notion of models of thinking as schemata or networks has a long history in psychology (Anderson, Spiro and Montague 1984; Bartlett 1932, 1995; Schank and Abelson 1977). In addition, mental models research has been used in climate change communication (Morgan et al. 2002). Concept mapping is one of the most popular and well-studied tools for articulating and manipulating mental models and has been used in education research (Canas et al. 2005; Gonzalvo, Canas, and Bajo 1994; Mason 1992; Markham, Mintezes, and Jones 1994; Novak and Gowin 1984), developmental psychology (Ausubel, Novak, and Hanesian 1978), marketing (Joiner 1998), and for documenting group processes (O'Connor, Johnson, and Khalil 2004). The value of concept maps lies in their ability to visually represent the abstractions of mental models in a way that makes them amenable to discussion and manipulation. In this sense they act as visible thinking tools or routines (Ritchart and Perkins 2008; http://www.pz.harvard.edu/vt) that mediate both individual and group thinking.

By making thinking visible and explicit, these mediational means act as cognitive tools (Luria 1982; Wertsch 1998) supporting remembering, learning, and making decisions. Review and deliberation with others are valuable for several reasons: individuals refine, clarify, and negotiate individual understanding as well as communicate that understanding to others.

The Maine team was oriented to creating opportunities for dialogue with property owners and the public officials in their region. Focus groups were the primary method of data collection and forum for engagement. In addition, a large survey (N=548) was conducted to elicit the

beliefs and knowledge of these groups (White 2010), as a supplement to the dialogic context of the focus groups, which provided the crucial meaning making and mutual understanding.

In Oregon, again, a survey (N=300) generated basic information that set the stage for dialogue (Borberg et al. 2009). Open-ended interviews with coastal residents began the dialogic process and were followed by a series of small community workshops.

# Methods

## *Oregon*

Overall, Oregon followed a mental models approach to science communication as described by Morgan and colleagues in *Risk Communication* (2002). Dialogue among and between domain scientists, university intermediaries, and stakeholders is the key element. Visual tools were critical in stimulating and enhancing that dialogue.

The following stages of the risk communication methodology (2002) were followed but adapted to include more dialogic engagement:

**1. Gather information about risks from the understanding of subject experts**: From interviews with climate change scientists and review of scientific literature, we created a model that diagrammed the predicted impacts of climate change on the coastal Pacific Northwest (figure 1). We began by selecting the major regional climate influences that experts at the time (2008) were relatively knowledgeable about, thought important for people to know about, and could be adapted to. We visually mapped these influences in a cause and effect chain (e.g., sea level rise will lead to increased coastal erosion, which may damage infrastructure and necessitate response). The model was reviewed by climate specialists in the region to ensure accuracy.

**2. Elicit knowledge, beliefs and values of stakeholder audience:** As part of comparing the specialists' model to the mental models of a broader population, we began with the coastwide survey mentioned earlier, which provided baseline information. Then we conducted mental model interviews (Cone and Winters 2011) of Oregon coastal residents to assess their knowledge, level of concern, and perception of risk regarding climate change. The 14 open-ended interviews asked participants about their knowledge and beliefs about climate change, particularly risks it posed, and what responses might be warranted. Interviews were transcribed and evaluated qualitatively in comparison with the climate specialists' model to determine if each interviewee (1) possessed the essence of the expert understanding, (2) misunderstood any key components of the specialists' model, (3) brought up anything specific from the specialists' model, and (4) identified anything new that was not identified in the specialists' model. Finally, before the first workshop in our case-study community, we administered our coastwide survey questions to the expected local participants.

**3. Refine set of critical climate facts of importance to stakeholders:** This was accomplished from analysis of the surveys and the open-ended interviews.

**4. Develop communication strategies and materials, implement, and evaluate**: Three workshops with coastal residents and decision makers in a small, rural city on the Oregon coast were conducted to identify and map participants' knowledge, beliefs and information needs in

preparing for climate change, and to create their own assessments of climate change risks for their particular community.

The first workshop began with the Sea Grant team providing a quick training on the meaning and process of concept mapping. The team asked the 10 community participants to write down on post-it notes what they believed about how climate change might affect their local region. The group then arranged the notes into a single concept map that diagrammed how these elements were related to each other (e.g., causes, effects, categories, etc.). From this activity, five broad climate change-effect categories were identified: effects associated with infrastructure, marine ecosystems, terrestrial ecosystems, economic issues, and extreme weather.

In the next step, participants created "influence diagrams" on poster paper by using the ideas generated by the previous steps and listing all of the risks they could identify associated with each of the five identified categories. They were asked to take one category at a time and try to address risks that they could actually do something about. In groups of two or three people, survey participants then went to the poster for each category and identified where decisions could be made to mitigate risks and who was responsible for that decision.

At the second workshop, the team distributed paper copies and projected digital images of concept maps and risk diagrams created during the first workshop, the climate specialists' model mentioned above, and a "community model" that consolidated the community and expert maps (figure 2). The community model was structured to reveal the similarities between the specialists' model and the community's. The team's premise was that organizing and making visible a great deal of information in a diagrammed form might help the community see connections clearly (Cone, Rowe, Borberg, and Goodwin, 2012)

The community model was structured in columns containing items that linked graphically and conceptually reading from left to right, from broader climate effects to primary biophysical impacts to biophysical risks to potential social/economic impacts to potential interventions. The final column considered "who is responsible" for making those interventions. Both the climate scientists and community models highlighted infrastructure effects, a decrease in drinking water, impacts on fisheries, and increased disease and public health effects.

Participants then worked together on brainstorming ways this information might be used in upcoming local needs such as re-writing both a local storm water ordinance and a floodplain ordinance. Finally, the community group was invited to select and begin planning for two or three priority risks from the community model in a final workshop.


## Maine

There were broad similarities in approach to dialogic engagement between Oregon and Maine.

**1. Identify method to gather empirical information:** For the Maine project, the focus group method emerged as the most viable approach to collect extended narrative data from a broad range of constituents about participants' perceptions of sea level rise and climate change and the resultant impacts on property and safety.

Valuably, focus group participants share both topical information and their feelings (Morgan 1996; Parker and Tritter 2006). Focus groups also provide the opportunity to capture group dynamics, participant interactions, and participant-generated discussions (Berg 2001). These same opportunities can present significant challenges, such as a dominant participant steering the discussion.

The focus group is a collection of individuals with some common interest, experience or purpose. The questions are usually posed by a moderator, who may be more or less directive in the way he or she conducts the session. The Maine moderator protocol provided sufficient structure to keep the conversation on topic but was also designed to allow for some flexibility in the responses. This approach follows the suggestions by both qualitative researchers (e.g., Berg 2001) as well as marketing analysts (e.g., Quible 1998) to keep the conversation on track without stifling it.

**2. Elicit knowledge, beliefs and values of stakeholder audience:** Researchers conducted a series of six focus groups with coastal property owners, local town officials, emergency management personnel, and other waterfront users from the midcoast region of Maine (Lincolnville) to the southern tip of the state (Kittery). Three of these groups were exclusively for coastal property owners; another two were a mixture of coastal property owners, town officials, emergency management personnel, and other beach users; and the final group consisted exclusively of town officials. Sea Grant and Cooperative Extension personnel contacted municipal officials in the communities where the focus group discussions were held, requesting their assistance in this project. All towns agreed to participate in the participant selection process, and several community leaders agreed to take part in the focus groups. Town officials identified community members who owned coastal property representative of the range of shorefront landscapes and gave these names to Sea Grant personnel. Sea Grant and Extension contacted these individuals and invited their participation.

The purpose of the coastal property owner groups was to better understand
- their personal experiences with coastal erosion, sea level rise, and increasing storm surges; with different methods of protecting their properties and shorelines from erosion or damage; and with state and federal agencies in the permitting process or after damage had occurred to their properties;
- their attitudes towards climate change, and their perceived level of threat from the accompanying sea level rise;
- beliefs about the role of government and private individuals in addressing these challenges;
- receptiveness towards differing sources of information on the topic of climate change; and
- attitudes towards different kinds of media for information.

The mixed sessions and the town-official session focused on these same issues plus participants' ability to achieve workable solutions in their towns that would meet the needs of different constituencies, codes and regulations.

The protocol for the focus groups was divided into four sections: 1) background and participant information; 2) experiences with coastal erosion or damage; 3) attitudes towards governmental regulations and agencies; and 4) attitudes and beliefs about the appropriate future planning for coastal areas.

The moderator began sessions by asking participants to introduce themselves and describe their residential properties, changes affecting them, and specifically any damage caused by storms. In follow up questions and discussion, participants generated a host of themes and

ideas not prompted by the moderator or original Sea Grant interests, including barriers to communication and the desire to take care of properties and communities.

**3. Refine set of critical concerns to address in communications:** Post-session coding identified over 20 themes of importance to participants, including "property rights", "future planning", "regulations", and "rebuilding" – with considerable overlapping among them.

# Results

## *Oregon*

About half of the Oregon coastal interview participants said they were concerned or very concerned about climate change, while the other half were only somewhat concerned or not concerned at all, a ratio consistent with the distribution seen concurrently in the most prominent national opinion surveys, known as the "Six Americas" research (Maibach, Roser-Renouf, and Leiserowitz 2009). Of those who were concerned, economic impacts were primary (e.g., to fisheries, crops, cost of food), but many also mentioned ecological impacts (e.g., how climate change will affect marine life).  The majority of participants believed that everyone (individuals and governments) should take action to address climate change, though all were focused on mitigation (e.g., reducing greenhouse gases) rather than adaptation—even when prompted about adaptation.

Comparison of responses to the climate specialists' model revealed that the majority of the interviewees had a good basic understanding of climate change. Coastal erosion and melting of polar ice were commonly mentioned, and sea level rise, habitat change, increased temperatures, increased storm activity, dead zones, flooding, and effects on fisheries, crops, and water supplies were also linked to climate change.  However, most participants replied that they do not know what the expected effects would be on the Oregon coast, and would be interested to know.

In the dialogic, group setting of the initial community workshop, participants produced thoughtful and detailed assessments of climate change risks that their community faces.  Further, they identified actions that could be taken to reduce these risks.  For example, a sequence of causes and effects identified in the "marine ecosystem effects" category articulated that climate change could lead to a loss of biodiversity, which could cause a decrease in tourism, a factor that could be addressed through diversifying the tourism base, with the local Chamber of Commerce being the responsible party for making this decision.

In the concluding informal evaluation of the workshop, participants requested more information on climate change and how it may affect their community—suggesting that this workshop did, in fact, engage them and spark their interest in thinking about this issue. Perhaps more importantly, the quite diverse group of 10 community members created a shared understanding and consolidated their views on the effects of climate change for their coastal community. Moreover, in the course of only a few hours, they were clearly able to identify visually the risks those effects posed, the decisions that could be made about those risks, and who might be responsible for making such decisions.

In follow-up interviews after the second workshop, participants described satisfaction with the workshops, stating that their participation caused them to think about risks of climate change that they would not have thought about otherwise.  Like the Maine focus group

participants, they had begun to think carefully about how climate change will affect their community and felt a need for more local, detailed science rather than science that spoke to the global and distant impacts of climate change.

### Maine

The individuals who participated in the Maine focus groups showed a high level of awareness of the issues related to climate change, e.g. sea level rise, extreme storms and how they might affect Maine's coastline through erosional forces. Many of the participants had read extensively on the topic, and several of them could cite authorities on these topics from memory. Clearly, the participants in these groups were well informed about many aspects of these issues.

However, despite their extensive background knowledge, participants were not in agreement about the severity of climate change, the kinds of strategies that should be used to protect the shoreline from damage, or about the boundary between individual rights and government authority. There was broad agreement between coastal property owners and town officials on the most significant challenges faced by Maine coastal communities with respect to sea level rise and the resultant erosion or damage. Both property owners and local officials talked extensively about damage due to erosion, mitigation strategies, issues related to property rights, and the need for better government action in response to coastal storms. There were some differences in their perceptions of the importance of human impact on the environment, the need to plan for the future, and the specific needs of the community versus the needs of the individual. In short, both groups expressed concern for most of the same issues, but their opinions about the right solutions differed substantially in three areas: government response (and non-action), property rights, and future planning.

At least part of the disagreement between parties stems from a lack of common information on these topics. For example, while town managers cited expert research, some coastal property owners denounced the same research as "politically motivated." For Sea Grant, the unique challenge is to develop materials that appeal to both audiences and have a degree of credibility that most find acceptable. Participants consistently requested materials that:

- were evidenced-based (with citations to the source)
- were clearly written in non-technical language
- offered practical and reasonable strategies
- gave links to authorities on different topics
- gave information that was linked to certain geographies (beach, salt marsh, sedimentary cliffs, river outlets, etc.) not "one size fits all"
- were available in some different formats: online (through websites and e-newsletters), in paper newsletter format, and at a well-known outreach event, the biannual Maine Beaches Conference.

# Discussion

### Similarities

Although focus groups and workshops can at first seem like substantially different kinds of dialogue because of differing purposes, durations, settings, and other variables, we think the similarities may be more significant. In each instance of Maine's focus groups and Oregon's

workshops, the initial condition was a modest degree of structure to the interaction provided by the university convener and assented to by willing participants. Research shows that group discussion performance is improved by nearly any process that structures discussions and serves three principles: avoiding coercion, permitting healthy disagreement, and building group satisfaction and, when possible, cohesion and commitment (Gastil 2010). Given the right initial conditions of structure and procedure, multilateral, respectful, and constructive dialogue resulted not only in participant satisfaction but also in an interest in more such dialogue. This is perhaps the key insight common to both state projects.

The Maine Sea Grant focus group dialogues yielded several concrete suggestions to deepen the dialogic process:

- Feature the adaptive strategies already used by coastal property owners in informational materials. In some cases, these protective measures were successful, in others, not. The lessons learned from their attempts to protect their shoreline and structures were likely to be instructive to others. Coastal property owners considering protective action on their property were likely to be more receptive to hearing about the experiences of their neighbors than from scientific experts, as was clearly demonstrated by individuals in the project's focus groups where the participants regularly asked one another how well various approaches had worked for them.

- Host community meetings with coastal property owners and local officials to discuss changes they have seen in their communities. Many participants indicated that the simple act of coming together to discuss these issues was productive in its own right. Multi-stakeholder meetings would serve to advance dialogue, identify receptive landowners, and build a network of community contacts for further educational efforts.

- Identify communities and individual property owners that have engaged in anticipatory planning and implementation. Cite useful actions previously undertaken such as the drafting of new building codes, development approvals that anticipated erosion, municipal plans that included climate change as a variable, and specific strategies such as beach nourishment, beach grass planting, as well as infrastructure and building relocation and elevation. By showcasing actions that have helped to improve local community resilience, Sea Grant could facilitate further community progress.

In Oregon, the most notable outcome of the workshop dialogues was the continuation of the dialogue with the broader community beyond the working group. Subsequently, as a result of information from, and at the initiative of, the working group, the community planning commission agreed unanimously that effects of future climate change must be considered when reviewing city ordinances, the city's comprehensive plan, and land-development proposals (Cone and Goodwin 2011).

## *Communication strategies and materials*

Maintaining the dialogues begun through inquiries was a priority for Oregon Sea Grant. The survey research was described and results summarized in an Oregon Sea Grant publication (Borberg et al., 2009) and the results of the community working group was captured in a report for the community committee members (Cone et al. 2010) and a second report back to the involved community on behalf of the local committee (Cone and Goodwin 2011).

Two video programs were developed, one for each state, by Oregon Sea Grant staff with expertise in videography.  Consistent with the nonpersuasive communication approach (Fischhoff 2007), the programs (made available in DVD and online formats) were focused to address the concerns and provide information on the relevant decisions of the target populations, according to what had been learned from the prior empirical research in the states. Thus, for example, one of the five segments in the Maine program (Cone 2009) featured a discussion of how and why structural modifications could be made to a home to reduce its climate risks (e.g., storm surge, sea-level rise, erosion). Since our research indicated that a member of the target population would be a better source for this information than a uninvolved "expert," on-camera we showed an individual coastal property owner discussing how and why she made such modifications to her own home. The Oregon DVD (Cone 2010) followed the same principle. Surveys of users of the Maine and Oregon videos revealed significant learning outcomes and even some action outcomes from viewing and considering the programs (Cone, in press).

Maine Sea Grant also placed priority on communicating this study's findings to state and federal agencies—in particular, information related to coastal property owner perceptions of these agencies. This information can assist these agencies to better understand citizen values, needs, and interests toward tailoring their public service.

The Maine project findings have been used to guide the development of a five-year outreach plan designed to address the needs expressed by participants. Sample activities include:

- producing an executive summary of research results to inform dialogue with state and federal agency staff as well as members of the Maine legislature, to inform policy development;
- developing an interactive website for property owners to facilitate their management of erosion, flooding, and other coastal hazards;
- hosting demonstration project tours for coastal property owners and municipal officials to spotlight locally-implemented hazard adaptation strategies;
- developing a network of climate adaptation service providers (including university, agencies and other organizations) to coastal municipalities;
- instigating further social science and biophysical research focused on vulnerabilities, impacts and potential solutions from extreme storm events with municipal decision makers.

## Conclusion

This project sought to move beyond traditional needs assessment techniques in order to support Sea Grant staff in Maine and Oregon to work with publics making decisions in light of climate change.  Our goals included to

1. discover the barriers that target audiences in the two states have to preparing for or responding to the effects of climate variability and change;

2.  encourage and facilitate collaboration among and between decision makers and coastal property owners to determine and implement appropriate responses to climate variability and change; and
3.  develop educational and informational materials and strategies concerning climate concerns.

We sought to meet these goals by creating dialogues about climate change and decision making among decision makers themselves, bringing the knowledge of climate change specialists, engagement specialists, and communication specialists to them as part of the conversation when needed rather than as starting points of the conversation. Drawing on focus group, concept mapping, and influence diagramming techniques, we were able in both contexts to facilitate collaboration that also helped shape the development of learning and communication products. Participant evaluation of our communication process (workshops, focus groups) and communication products (videos), expressed substantial value they found in them.

Helping communities and individuals understand and adapt to climate change requires more than simply going out to deliver facts about climate change science and its findings. Often that science is not specific enough to be of particular use to local decision makers. Moreover, local decision makers – as this study found – are relatively well informed about climate change impacts. Often it is differences in values and beliefs about actions to take that trump other factors. What is required is creating conditions for helping communities make meaning out of the science and its findings for themselves and their local conditions in ways that support their including that science into their regular decision-making. Traditional models for "getting the word out" are neither useful nor appropriate in such situations. Good models that put scientists, communicators, and publics into dialogue about what they know, what it means, and how to put it to work suggest using group processes and visible thinking routines for creating and sustaining dialogues about climate change.

Is our approach applicable and affordable in other locations? The greatest expense was in the dedicated time of qualified personnel to develop and facilitate the dialogic process. We think that amount of time not so substantial nor the qualifications so sophisticated as to prevent adoption elsewhere. The methods are learned readily where there's genuine interest.

As science communicators, we have long used a variety of tools for learning what publics know and want to know as a basic part of shaping communications products. We are not suggesting here that traditional needs assessments are not necessary or valuable. In fact, in both the Maine and Oregon contexts reported here, the work with groups was contextualized by a more general survey. What we are suggesting is that knowing "what audiences know and need to know" is only part of the story. When we approach publics not simply as "audiences" who "need" "expert" help to do anything, but as experts in their own rights who have a real stake and role in our communications, we can help facilitate their understanding and decision-making and also assess their needs for further assistance at the same time.

Acknowledgments

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