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Verna G. DeLauer
Franklin Pierce College

Andrew A. Rosenberg

Nancy C. Popp

David R. Hiley

Christine Feurt
University of New England

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The Complexity of the Practice of Ecosystem-Based Management

Verna G. DeLauer, Andrew A. Rosenberg, Nancy C. Popp, David R. Hiley,
Christine Feurt¹

Abstract: In the United States, there are more than 20 federal agencies that manage over 140 ocean statutes (Crowder et al., 2006). A history of disjointed, single sector management has resulted in a one-dimensional view of ecosystems, administrative systems, and the socio-economic drivers that affect them. In contrast, an ecosystem-based approach to management is inherently multi-dimensional. Ecosystem-based approaches to management (EBM) are at the forefront of progressive science and policy discussions. Both the U.S. Commission on Ocean Policy (USCOP, 2004) and the Pew Oceans Commission (POC, 2003) reports called for a better understanding of the impact of human activities on the coastal ocean and the result was President Obama's National Policy for the Stewardship of the Ocean, our Coasts, and the Great Lakes (2010).

EBM is holistic by seeking to include all stakeholders affected by marine policy in decision-making. Stakeholders may include individuals from all levels of government, academia, environmental organizations, and marine-dependent businesses and industry. EBM processes require decision-makers to approach marine management differently and more comprehensively to sufficiently require a more sophisticated conceptual

¹ **Verna DeLauer**, Ph.D. is an assistant professor at Franklin Pierce University and a research scientist at Clark University. She is interested in the influence of adult learning on environmental decisions. This paper is adapted from her dissertation: *The mental demands of ecosystem-based management*.
vdelauer@clarku.edu Corresponding author.

Andrew A. Rosenberg, Ph.D. is director of the Center for Science and Democracy at the Union of Concerned Scientists. He has more than 25 years of experience in government service, academic and non-profit leadership. He is the lead author of the oceans chapter of the U.S. Climate Impacts Advisory Panel, a member of the National Academy of Sciences' Ocean Studies Board, and the U.S. Commission on Ocean Policy.
arosenberg@ucsusa.org

Nancy Popp, Ed.D. is an adult developmental psychologist specializing in issues of identity and conflict. She is co-author on *The New Science of Conflict: Integral Conflict* to be published this year by SUNY press.
npopp@antioch.edu

David Hiley, Ph.D. is emeritus professor of philosophy at the University of New Hampshire. His books include *Philosophy in Question* (1988), *The Interpretive Turn* (1991), *Richard Rorty* (2003), and *Doubt and the Demands of Democratic Citizenship* (2006).
david.hiley@unh.edu

Christine Feurt, Ph.D. is Director of the Center for Sustainable Communities in the Department of Environmental Studies at the University of New England. She is also the Coordinator of the Coastal Training Program at the Wells National Estuarine Research Reserve. She is the author of *Collaborative Learning for Ecosystem Management* (2008) and the national training curriculum for ecosystem managers "Working together to Get Things Done" (2012).
cfeurt@une.edu



understanding of the process and the people involved. There are implicit cognitive, interpersonal, and intra-personal demands of EBM that are not addressed by current literature. This research seeks to understand the mental demands of EBM. A constructive developmental framework is used to illuminate how decision-makers reason or make sense of the ideals and values underlying EBM, the mutual relationships that must be built among natural resource management agencies, and the personal experiences and emotions that accompany change.

Keywords: Adult development, adult learning, complexity, constructive developmentalism, natural resource management, stakeholder engagement.

Background

Marine ecosystems are complex mosaics of ecological, chemical, biological, geophysical, and human interactions. They are valued for the services they provide for humans including food, pharmaceuticals, shoreline protection, climate regulation, and tourism. Human disturbance specifically threatens these interactions and services through destruction of habitat, pollution, and displacement of native fauna and flora. The current single-sector, single resource approach to management attends to human activities such as coastal development, fisheries, tourism, and shipping, each in isolation from the others. This single sector approach fails to address, much less maintain, the integrity of the interactions between the sectors, leading to a loss of valued ecosystem goods and services, and ultimately to a diminishment in potential human well-being. Single-sector approaches are called less effective because they tend to treat the cumulative impacts of human activities as unimportant (DeLauer, 2009).

In the United States, there are more than 20 federal agencies that manage over 140 ocean statutes (Crowder et al., 2006). A history of disjointed, single sector management has resulted in a one-dimensional view of ecosystems, administrative systems, and the socio-economic drivers that affect them. In contrast, an ecosystem-based approach is inherently multi-dimensional. Ecosystem-based approaches to management (EBM) are at the forefront of progressive science and policy discussions. Both the U.S. Commission on Ocean Policy (USCOP, 2004) and the Pew Oceans Commission (POC, 2003) reports called for a better understanding of the impact of human activities on the coastal ocean and the result was President Obama's National Policy for the Stewardship of the Ocean, our Coasts, and the Great Lakes (2010).

In 2005, over 200 scientists and resource managers in the United States endorsed the Scientific Consensus Statement on Marine Ecosystem Management (McLeod et al., 2005). This document lays out the underlying principles and characteristics of the approach, particularly that humans are part of ecosystems. This definition, and others like it, refers to the impact humans have on parts of ecosystems and conversely, the impact ecosystem services have on human well-being. What's missing, from all definitions of EBM, is the fact that humans are also part of the decision-making process about ecosystems; they have a responsibility to the marine environment through the decisions they make. Current definitions implicitly assume that all stakeholders have the capacity to manage in the way the definitions suggest – to adapt to a different set of principles when given the mandate or enough information to do so.

Due to added complexity, resource managers and policymakers engaged in marine management in the United States grapple with the challenge of taking EBM from concept to practice to move beyond decades of fragmented management (Parenteau et al., 2007). Our research question is: Do the implicit expectations and mental demands of EBM practices require a complexity of logic and reasoning that outweighs participants' capacities?

This paper is based on dissertation work (DeLauer, 2009) that sought to understand how stakeholders were making sense of an ecosystem-based management decision-making process in the state of Massachusetts located in the northeastern part of the United States. She spent 16 months embedded within a stakeholder engagement process whose goal was to get feedback about pending State ocean management legislation. Her research focused on the ways in which stakeholders held their own perspectives and took in the perspectives of others during dialogue and deliberation. Robert Kegan's theory of mental complexity (2009) was used to identify characteristics of meaning making in that particular context.

Introduction

In the last 15 years, considerable research has gone into examining integrated watershed management decision-making processes and learning that occurs through interaction, democratic deliberation, collaborative problem-solving, and design of fair and competent processes (Habron, 1999, 2003; Rhoads et al., 1999; Webler & Tuler, 1999, 2001; Wondolleck & Yaffee, 2000; Wooley & McGinnis, 1999). A stronger institutional design that better supports these types of decision-making processes is needed at all governmental scales (Imperial, 1999). Particularly needed is institutional support for social science aspects of integrated management (Endter-Wada, 1998) and recognition that social and ecological environments reciprocally shape each other and this necessitates that their networks and relationships be understood as part a complex system. This conceptualization of "social-ecological system" is that any delineation or separation between the human and environmental system is artificial (Folke et al., 2005).

Ecosystem-based management has gained traction in land-based management initiatives prior to its influence on marine management because of its focus on integration of governmental agencies and of social and ecological interactions. Interpreting EBM theory for implementation is an ongoing constraint. The Gordon and Betty Moore Foundation and the Lucille and David Packard Foundation have taken an interest in ecosystem approaches at a regional scale and international scale, respectively. Through a grant from the Packard Foundation, The University of Michigan did extensive research on ecosystem-based management case studies throughout the world. The result is an informative, interactive website for practitioners to learn from the mistakes and successes of others trying out this new approach (<http://webservices.itcs.umich.edu/drupal/mebm/?q=node/68>).

The focus of this research, however, wasn't in the nuts and bolts of how to implement ecosystem-based management. We were interested in the mental and emotional capacities of people to engage in this process of personal and institutional change. Because EBM processes require more coordination among management sectors, decision-making becomes more collaborative and thus, more complex. Taking an EBM approach means intentionally bringing together individuals from diverse interests to discuss the trade-offs associated with management

decisions. Using Robert Kegan's model of adult mental complexity, we wanted to understand the meaning-making of those involved in these cross-institutional collaborations.

A comprehensive literature review revealed studies within the last decade that have studied collaborative natural resource policymaking as referred to in the beginning of this section. Few, however, use adult developmental frameworks that focus on the individual's capacity to participate in such policymaking. However, there has been an influx of studies using mental models of environmental knowledge and reasoning (Jones et al., 2011). In the marine management field, these studies are gaining credibility as rigorous methods for revealing gaps in systems thinking. Some studies do use a developmental lens such as Daniel and Walker's work, which weaves ideas from conflict resolution, public participation, experiential learning, and adult development to create a user manual with concrete recommendations for practitioners to work through environmental disagreements (Daniel and Walker, 2001). We found one study that used Kegan's model of adult mental complexity. Robbins et al. (1994) used Kegan's model to study women's pro-environment behaviors and their perception of their relationship with the natural environment. The need for these women to conform and align themselves with their friends with shared values was influential in causing pro-environment behavior (Robbins & Greenwald, 1994). We were curious if these characteristics were similarly important in natural resource management decision-making. Next, we present a brief explanation of Kegan's theory.

Adult Development and Learning

The role of individual learning in group settings has been extensively researched within the adult development literature (Fisher et al., 2003; Kegan et al., 2001; Phillips et al., 1998). This study contributes to that literature through its focus on environmental policy processes and the strengths and limitations of any individual to contribute to the process.

This research used constructive-developmental theory or how an individual takes in, organizes, and makes sense of his/her experiences. Developmental Psychologist Robert Kegan's sequential stage model of adult development was used to uncover and describe the regular, predictable, and recognizable continuum of how participants constructed meaning from their experiences.

Kegan's theory describes cognitive and social-emotional growth along a continuum on which there are key mindsets. Each mindset reflects a qualitatively different way of knowing. These mindsets are often compared to metamorphosis in that one builds upon another, they are recognizably different, and the content of each is a unique system of logic that determines the way one understands and makes sense of his/her experiences (Baumgartner, 2001; Kegan & Lahey, 2009).

Each meaning-making system, or mindset, describes specific and discrete patterns that govern how an individual makes sense of his/her experience at any given time. Each mindset reflects a different relationship between what a person is *subject* to and what he or she can take as *object*. At each subsequent mindset, what *was* subject is now object. In simpler terms, what a person is subject to can be thought of as the lens through which he or she sees and understands the world—the lens itself cannot be seen, but it brings what *is* seen (what is “object”) into focus.

What is object, then, are those aspects of the person's experience that he or she sees, can take a perspective on, and see as separate from him or herself. Each subsequent stage transcends and includes the last, continuously constructing more complex systems of meaning and logic. The continuum of meaning-making complexity includes the following elements (Taken from Kegan & Lahey, 2009, pg. 14 - 15):

- There are qualitatively different, discernibly distinct meaning-making systems; that is, the demarcations between levels of mental complexity are not arbitrary. Each represents a different way of knowing the world.
- Development does not unfold continuously; there are periods of stability and change.
- The intervals between transformations to new meaning get longer as time goes on.

Individuals are constantly engaged with their environment and organize meaning and interpret information based on their meaning making system (Kegan, 1994; Popp & Portnow, 2001; Robbins & Greenwald, 1994). An individual moves beyond his/her meaning making when their current assumptions no longer fit a given experience, and in response they experience an internal conflict about the way that they know - not *what* one knows but *how* one knows. Meaning-making is distinct from what we understand as "personality," in that personality is the expression of one's self. Meaning-making is not about personality or what a person does in the expression of their personality. It is about the *complexity* of the ways in which a person understands and describes (the expression of) their own personality, and the complexity of their perspective on their relationship to others and the world.

Kegan's theory identifies four mindsets found in adulthood with four transitional phases between each one of them (1994). A person in transition between two mindsets may exhibit a mix of the two mindsets, and their reasoning will be held within these two structures. The following are general characteristics that reflect individuals operating fully at one of three overarching mindsets found in this study: the Socialized mind, the Self-authoring mind, and the Self-transforming mind (Kegan, 2009).

Qualities of a Socialized Mind (Adapted from McGuigan & Popp, 2007)

1. Literal, descriptive understanding of processes.
2. Unquestioned conformity to peer, social, or legal norms.
3. Guilt, hyper-awareness of others needs even if those are imagined, e.g. "I am responsible for your feelings and vice versa."
4. Differences threatening.
5. Invisible and unquestioned assumptions.
6. Ambiguity challenging.
7. Criticism as destructive to self – need a sense of belonging, driven by need to be understood, aligned with, validated by and connected to a person, group or philosophy.

Qualities of a Self-authoring Mind (Adapted from McAuliffe, 2006)

1. Aware and sensitive to others feelings but not responsible for them.
2. Differences respected and valued.
3. Former assumptions examined, accepted or rejected.
4. Concern with consequences for personal integrity and meeting one's own standards.

5. Integrates others perspectives including criticism as one perspective among many.
6. Self-initiating, correcting and evaluating rather than dependent on others to frame problems and determine if things are going well.
7. Conceives of processes from the outside - can see one's part in relation to the whole.

Qualities of a Transforming Mind (Adapted from Rooke & Torbert, 1998)

1. Engages with others to self-evaluate.
2. Experiences internal paradox, contradiction, and ambiguity as normal.
3. Allegiance to larger principles not rules.
4. Embraces the tension of not knowing something to purposely take on multiple perspectives on issues.
5. Recognizes that ambiguity is the norm and that standards and methods are constructed in a world in which dialogue is the only foundation for knowing – understands that all knowledge is constructed through human interaction – more comfortable engaging in collaborative inquiry where meaning emerges.

The Case Study - SeaPlan

In June 2008, the Oceans Act was enacted and Massachusetts became the first state in the United States to “pursue ecosystem management of offshore waters through federal, regional, and state coordination and cooperation” (EOEEA, 2010). The Oceans Plan offers a guiding framework for individual sectors to work more collaboratively to manage human activities in Massachusetts State waters. While the Plan is comprehensive, it does not explicitly account for stakeholders' different interpretations of the charge or interpersonal challenges associated with management trade-offs or taking on new responsibilities.

Prior to the Oceans Act, there was no direct mechanism to connect disparate sectors on a regular, on-going basis. SeaPlan created this necessary mechanism for cross-sector interactions as a safe way to hash out individual and/or sectoral differences. Their first goal was to create a five-year strategic plan to identify how they would support the development and implementation of an integrated multi-use ocean management plan for Massachusetts waters. One primary strategy was to expand stakeholder understanding of integrated multi-use ocean management issues to increase effectiveness and durability of a plan. SeaPlan strived to create a stakeholder engagement process in which participants came to the table as independent individuals who represented various sectors but were not bound by them with an understanding that motivations, intentions, and complexity of understanding ocean management would be diverse.

SeaPlan was chosen as a case study because it provided a setting in which to investigate the interplay between learning about EBM and participants' current perspectives (Fazey & Fazey, 2005). The more people participating, the more meanings, perspectives, and behaviors existed. The unsaid is that when people come together around a single sector mandate, they likely share an implicit background of assumptions, values, expectations, and routines for decision-making. All of this is lacking when participants come together in an EBM process. This lack of shared/taken for granted background makes the process less stable / more dynamic.

In this paper, we focus on the finding related to perspective-taking, or the degree to which stakeholders can and do author their own perspective, i.e. the degree to which a stakeholder can create his or her own perspective, ideology or identity, manipulate it in their minds, weigh it against others, and set standards for themselves based on an internal authority (DeLauer, 2009; Kegan, 1994).

Methods

Overarching Research Question:

Do the implicit expectations and mental demands of EBM practices require a complexity of logic and reasoning that outweighs participants' capacities?

Procedures

DeLauer spent 16 months embedded within the SeaPlan decision-making process. She attended bi-monthly, two-day meetings as an observer. SeaPlan members agreed to let her observe, copy meeting transcripts, and conduct interviews.

Sampling

All 41 participants were recruited by email invitations. More than 20 responded favorably. Respondents were compared based on their affiliation and expertise until it was determined which of them reflected the demographics of the group at large. All participants signed informed consent forms with an understanding that published data would remain anonymous.

Materials

The Subject Object Interview guidebook (Lahey et al., 1988) was used to assess some of the data. A qualitative coding research program (HyperResearch) was used to organize and assess another part of the data.

Participants

SeaPlan participants lived and worked throughout the Massachusetts coastal watershed. Participation in SeaPlan was by invitation from an organizing committee. Participation was voluntary and consisted of scientists, resource managers, industry professionals, and not-for-profit organization employees. Participants in this study included fifteen men and seven women reflective of the gender ratio of the broader group. Half of the participants had PhDs and half had a master's or bachelor's degree, which was also representative of the broader group.

Data Collection

Triangulation was critical to this research whereby three data sources were used as three forms of evidence to prove and support findings. DeLauer collected data using the Subject Object Interview, an EBM Interview, and meeting transcripts.

Subject Object Interview

The Subject Object Interview (Lahey et al., 1988) was first introduced in the early 1980s to understand the developmental complexity of psychiatric patients. It consists of a semi-structured interview that invites participants to describe the meaning behind their experiences using a series of 10 provocative, subject cards which include Angry, Anxious/Nervous, Success, Strong Stand/Conviction, Sad, Torn, Moved/Touched, Lost Something, Change, Important to Me. Data that exhibit meaning making characteristics are hypothesis-tested. Some of the questions asked to test hypotheses include: How does a person defend their position? Is their position flexible? What does it cost to maintain it? What does the person take responsibility for? Researchers using this technique are not as concerned with the what, the content of information, but how each participant organizes his/her experiences.

The Ecosystem-based Management Interview

A semi-structured interview was used to explore ways in which the SeaPlan participants thought about and understood ecosystem-based management and their relationship to the SeaPlan process and other participants.

Meeting Transcript Content Analysis

Transcripts were copied and meeting observations were recorded. This was useful to have real-time data illustrating the dynamic group process as opposed to one-on-one interviews.

Data Analysis

Phase 1: For the EBM interview, DeLauer used a grounded theory approach (Schram, 2006) which included an inductive and iterative data collection and analysis process that led to working theories that described the data. Details of that process are as follows:

1. Writing Field Notes. A bound journal was kept throughout data collection and analysis for personal notes that were not considered data but rather hunches, questions, and emotional reactions.
2. Creating Episodic Threads. A workable data set was developed through the meeting transcripts and EBM interviews. Preliminary codes were developed given what the data were showing. Excerpts from the data sources were pieced together to form themes.
3. Open Coding. Key themes were identified and defined toward the development of working theories (based on threading together excerpts). It became clear that the SeaPlan process itself was very important for participants. Hence, the participants' understanding of the SeaPlan process was explored. A brainstorm began of all of the potential paths that could lead to understanding this better. Ninety themes or analytic possibilities were created. At this point, themes were broad and static. Eventually, they became specific and active.

4. Marking Potential Paths of Inquiry. Several paths of inquiry were explored with the understanding that the working theories might eventually change and would certainly evolve.
5. Writing Initial Memos & Questioning Them: This time was spent toward journaling that was retrospective, interpretive, and analytic.
6. Selective Coding. Three themes emerged as significant, perspective-taking, dealing with change, and understanding the decision-making process. To determine what was significant, either the data expressed which themes encapsulated others to describe what was occurring or particular attention was paid to pieces of the data that were paradoxical or beyond what was expected. Once a good chunk of the data was conceptually eliminated, significant pieces were tested by tracking thematic variation found across data sets, to see if they were truly comprehensive. Data were examined across the three data sources (Subject Object Interview, EBM Interview, meeting transcripts), chronologically across meeting transcripts, and across participants.

Phase 2: Developmental Linkages

Subject/Object data were analyzed using *A Guide to the Subject-Object Interview: Its Administration and Interpretation* (Lahey et al., 1988). It is used to score bits of cognitive structure underlying meaning making. Due to its uniqueness, it has its own specific protocols for being administered and analyzed. DeLauer and Popp analyzed the Subject Object data. The three themes described in Phase 1 were cross-analyzed with the subject-object scores to uncover distinctions of meaning-making among all participants.

Results

SeaPlan participants generally understood the EBM concept and described it in similar ways using similar terminology. However, how they made sense of its implementation and their role and others' roles within it differed substantially among participants. For example, some participants wanted to have joint ownership of decisions made through Partnership discussions. Others wanted to defer to a selected governing body. Some believed consensus was crucial for success. Others didn't think consensus was possible nor did they feel it was important. Some saw SeaPlan as a safe meeting place to hash out individual differences. Others saw it as an ill-defined mechanism that worked better in theory than in practice. Such wildly different perspectives among participants called to attention the differences in how they made sense of the directives of SeaPlan. We explored whether these were merely differences in opinion or fundamental differences about the very way in which participants understood the task at hand.

The following is a chart that summarizes the mindset of each research participant. These mindsets are previously described in this paper. These mindsets are not value judgments about participants; they are characteristics of how individuals made meaning of SeaPlan and EBM.

- Socialized
- Socialized with some Self-authoring

- Socialized (Dominant) and Self-authoring
- Self –authoring (Dominant) and Socialized
- Self-authoring with some Socialized
- Self-Authoring
- Self-Authoring with Self-transforming

Key:

Socialized Mind = 3

Transitional between Socialized and Self-authoring = 3/4 or 4/3

Self-Authoring = 4

With Transforming Mind = 4(5)

Table 1: Chart of Mindset Scores

Participant	Mindset	Age	Education	Gender
One	3/4	34	PhD	F
Two	4(3) - 4	56	MS	M
Three	3	33	MS	M
Four	4	51	PhD	M
Five	4-4(5)	64	PhD	M
Six	3	33	MS	F
Seven	4	54	PhD	M
Eight	4	52	PhD	F
Nine	4-4(5)	49	MS	F
Ten	4/3	49	PhD	M
Eleven	4-4(5)	54	PhD	M
Twelve	4/3	37	PhD	M
Thirteen	3/4 - 4/3	54	PhD	M
Fourteen	3	56	BS	M
Fifteen	4-4(5)	50	PhD	M
Sixteen	4	N/A	PhD	F
Seventeen	4	72	PhD	M
Eighteen	4	66	MS	M
Nineteen	3/4 - 4/3	46	MS	F
Twenty	3-3(4)	40	MS	M
Twenty-One	4	54	MS	M
Twenty-Two	3(4)	43	BS	F

Next, we discuss the significant findings related to the theme of *perspective-taking*. See DeLauer, 2009 to read about the other significant findings.

Discussion

The theme *perspective-taking* was broken down into four sub-themes. These sub-themes resulted from the coding process described above. Once themes were identified through the qualitative coding process, they were examined by mindset for each participant. The sub-themes

are Connection to Affiliation, Self-authoring, Capacity for Self-reflection, and Perspective of other. Each is analyzed below by mindset.

The following is one of the more prominent definitions of marine EBM:

Ecosystem-based management is an integrated approach to management that considers the entire ecosystem. The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need. Ecosystem-based management differs from current approaches that usually focus on a single species, sector, activity or concern; it considers the cumulative impacts of different sectors. (McLeod et al., 2005)

By breaking down these sentences, one discovers additional meaning inherent in the definition. “Ecosystem-based management is an integrated approach to management that considers the entire ecosystem.” Underlying this sentence is the sentiment that the human perspective of coastal oceans must be broadened. “The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need.” Underlying this sentence is the perspective that it is a responsibility to conserve and sustain ecological value in order for humans to continue to benefit from ecosystems. “Ecosystem-based management differs from current approaches that usually focus on a single species, sector, activity or concern; it considers the cumulative impacts of different sectors.” Implicit in this sentence is the need for dialogue and deliberation among sectors and reflection within sectors about impacts to ecosystem goods and services. As the terminology used to describe EBM is broken down, more explicit meanings emerge. In short, the definition of EBM is calling for decision-makers to take and hold three perspectives at the same time: a holistic perspective on the marine environment, an introspective perspective on one’s responsibility to it, and a reflective perspective on one’s actions and interactions in relation to others during decision-making.

Sub-theme 1: Connection to Affiliation

The following are excerpts from participants who saw the relationship between their professional affiliation and SeaPlan in unique ways. These excerpts were primarily responses to questions asked during the EBM interview. Each mindset is discussed separately.

Socialized Mind. Participants exhibiting a predominant Socialized mindset came to their perspectives about SeaPlan and their roles within it largely through the authority of their professional affiliations. These affiliations were with their organization or agency or another person, usually someone whom they regarded as an expert on the subject. Others came to SeaPlan because of their affiliations, but the difference was in the ways they “held” their affiliation, i.e. how identified they were with it and how they made sense of it. Here is one participant’s response to the question about why she was engaging in this process.

I think just because I serve more of a coordinating role in the region and can have a good sense, a good bird’s eye sense of what (my affiliation) can bring to the table and also sort of high-level politics that might be brought to their partnership in a positive light, and also

because, well (Personal affiliation) asked me and she is one of my all time favorite mentors so the bottom line is that is why I did it. But, I think the reason why she asked me is because of my multi-faceted role within (my affiliation) in the region and sort of what I represent there.

“Because I was asked” and personal affiliation to someone involved were both important reasons to participate.

These participants talked about acting from a need not to be excluded from something perceived as influential. The thought of exclusion led to a fear that one’s affiliation and consequently, one’s self would be the victim of changes in marine policy. “You’re either at the table, or on the menu,” said one participant. There was a sense that one’s role in a process like SeaPlan was to ensure there was inclusivity, specifically of one’s particular affiliation. The need for equality was a strong value for those with a Socialized mindset. They needed to feel that in exchange for their participation, others would reciprocate by considering their interest. SeaPlan and EBM-type processes were something they join or get on board with; these processes were a new kind of affiliation. However, they must first trust that their interest was being heard and accepted by others in order to consider something an affiliation.

Socialized – Self-Authoring Transition. In the transition to a Self-authoring mindset a tension started to exist between someone’s affiliation and his or her new capacity to see themselves and their ideas as distinct from their affiliation. Where they were in that transition determined how they defined their responsibility to that affiliation. Participants who exhibited both the Socialized and Self-authoring mindsets felt comfortable separating SeaPlan and the legislation but were concerned with balancing the needs of the State government and the needs of other interests.

“We need to balance both science and management with the legislation. It’s critical that we integrate all.”

This demonstrated a new capacity to consider two possibly opposing perspectives. In general, Socialized/Self-authoring participants might have mentioned affiliation but also mentioned more personal reasons for getting involved with SeaPlan such as, “I am someone who is interested in policy work. I am someone who is interested in trying to get a better idea of how you would actually do EBM.” Or “I am sort of fascinated by the intersection of science and policy and seeing how that comes together and how scientific information actually gets used or not in making decisions. It is a personal interest.” There also started to be a tension between competing priorities and personal and professional boundaries started to emerge. They no longer allowed someone in authority to be the sole determiner of their time or values; They began to realize some of their own internal authority. Yet, they also had a profound and fundamental sense of loyalty and obligation to their affiliations.

Self-Authoring Mindset

I’ve spent a lot of time in the public policy arena and in the Atlantic and Pacific watching the evolution of oceans...I’ve watched the decline of marine life and coastal oceans and that’s exactly what SeaPlan addresses. SeaPlan is trying to build a community of interests

that recognizes that there are a variety of competing interests for the use of the oceans and we have to work out common grounds as to how the interests can work together rather than all individualistically trying to pursue selfish interests. I look at it as a commons situation.

Note the use of the word *community* in the excerpt above. The idea of community was a strong thread throughout the Self-authoring interviews. Community meant a group of diverse individuals coming together to learn. This type of learning community became an affiliation of sorts where difference rather than similarity was valued, expected, and was the underlying principle for coalescing. They didn't "belong" to a particular affiliation rather they created their own affiliation; they were creating it via the SeaPlan process. Consider an exchange at a SeaPlan meeting between Socialized and Self-authoring participants. The Socialized participant was concerned with fitting in and ensuring that the interest of her affiliation was not forgotten. The Self-authoring participant responded indirectly with her belief that there was concern for small businesses and that she hoped a budding partnership would begin.

Socialized participant: I hope that this is a balanced initiative that supports all stakeholders and values small businesses along the waterfront. I want to make sure that there is access for everyone and everyone can continue to make a living.

Self-Authoring response: I believe in what local communities are all about. I want to forge local community and government partnerships. I hope we can set the benchmarks for success and that all other groups start following us.

Both individuals used the word hope. The individual with the socialized mindset was reacting to an initiative she saw as "out there," and defined by/created by someone else. She did not yet have a sense that she could manipulate and own the process. The Self-authoring person stated her belief as a personal conviction, as someone who felt a sense of ownership of the process; she was responsible for contributing to its creation.

Differences in how someone related to the idea of affiliation were powerful motivators or disincentives for collective change. The strength of those exhibiting Socialized mindsets was that they got the idea of connection and thrived on it. Their limitations existed in being able to separate from and differentiate among the various connections and embrace their differences as a means to self-growth. It was difficult for them to step back from their own affiliation and embrace a different, and perhaps competing, affiliation. If they were to make a connection, they wanted it to be harmonious and agreeing. Disagreement and conflict tended to be very difficult for them, which led them to try to avoid it.

The strength (from an EBM perspective) of those exhibiting a Self-authoring mindset is that they were interested in learning in connection with others who were different. They were interested in actively seeking out and constructing new knowledge and understanding through dialogue with others. These individuals were interested in developing a new kind of affiliation, a community of discourse. Within this community, they were comfortable with making room for things to evolve which, in turn, helped to create a whole new process and understanding for everyone. Their limitations were reflected in their identification with their own set of values and beliefs in how things "should be." They were too invested in their own perspective and unwilling

to change their minds, which often caused the process to stall and ironically, negated their strengths.

There were no significant findings from the Transforming mindset within this sub-theme.

Self-Authoring

The following are excerpts from participants with different mindsets discussing their perspectives about their role in SeaPlan or the role of SeaPlan generally. What's unique was the way in which participants saw the process as either prescribed or open to interpretation. Those with a Socialized mindset saw the process as created "out there" by someone else. Those of a Self-authoring mindset saw it as an open-ended process awaiting the group's actions.

Socialized Mindset. SeaPlan's Socialized meaning makers tended to create their sense of reality through another's frame of reference such as a leader they respected. There was a need to hold others' perspectives to a test, which resulted from seeing themselves and their roles in the process as loyalists of and protectors of their own affiliation and interests. Their loyalty to and identification with their particular affiliation was the guide to their participation in SeaPlan. They entered into the SeaPlan process as one that was prescribed for them and they wanted to ensure their interests fit the prescription. They played more of a reactive role – one in which they reacted to others and the process rather than actively creating it. This way of making sense of the SeaPlan process caused one to act with trepidation. This participant is responding to a question about endorsing the SEAPLAN process and strategic plan.

So we're behind it, we just don't wanna have the XX make a knee-jerk plan that ends up causing all kinds of havoc for small businesses that already have to go through just dozens and dozens of layers of permitting and regulation to do the smallest thing on the water front. I fear that the die may already be cast and words like EBM suggest that we just want marine protected areas everywhere. I want to make sure that there is access for everyone and everyone can continue to make a living.

For others a prescribed process lessons one's responsibility.

I am very comfortable in the (SeaPlan) dialogue. I haven't been put on the spot but again it is state waters and I have the luxury of being a (AFFILIATION). How separate is the SEAPLAN process from the legislative piece, I can imagine that makes others much more uncomfortable than me because it is not really my business. I can't lobby for that, I can't work toward it. As a (AFFILIATION), I would be reacting to that legislation passing.

Self-Authoring Mindset. As the Socialized meaning maker's capacity grew, a kind of personal theory or sense of reflection on SeaPlan began to take shape. The content was described as well as their conception of it. This Self-authoring participant talked about something as his perspective.

So in my view if this is a successful effort, it will actually begin to push the envelope on what gets done from a management perspective. There will be more integration, more

analysis of cumulative impacts. But that will only be partly success. If it did just that, it would fail in my mind if it didn't also try to advance the science behind this and try to understand how you would not just practically do it but try to think about it and use it as a way to inform other processes.

This participant identified multiple aspects of success and comes with multiple, diverse ways to put it to use – implement and apply it - regardless of his own affiliation's interests. Individuals exhibiting Socialized mindsets had a deep interest in their own sector's issues and concerns but had difficulty critiquing those concerns or stepping outside them to embrace competing concerns. They experienced doing that as being disloyal to their own affiliation.

The strengths of Self-authoring meaning makers could also be considered limitations depending on the context of the situation and the mix of individuals involved. Self-authoring individuals brought their own perspectives to the SeaPlan process and continued to develop their own perspective in response to new information and understanding. They recognized that others had their own interpretations and biases and they advocated for these other views in pursuit of the mission of SeaPlan. Socialized meaning makers reacted to the many perspectives put forth which allowed them to maintain loyalty to affiliation. In conversation, those differences in mindsets often played out as passive and active discussion participants, e.g. those with a Socialized mindset spoke up to ask questions, give examples, or clarify something about their affiliation's interest while those with Self-authoring mindsets, offered new theories for the group to explore. Those new theories were not always fully understood by all the participants. This significant point was often missed by Self-authoring participants who implicitly assumed that they were understood, which resulted in confusion and sometimes, defensiveness.

Self-Authoring with Transformative Mindset: Lastly, there were four participants who exhibited the Self-authoring mindset yet also exhibited the transition towards the Transformative mindset. In some instances, this made a difference in terms of the capacity with which they reasoned about a situation or idea. For example, in the case of actively generating theory, there was a strong sense of personal responsibility, theory and reflection on that theory yet there was a hint of something more. There was uncertainty weaved into their theory about SeaPlan's purpose, yet, with a clear understanding that ambiguity would be part of the experience.

We don't really know what MOP is yet and that's been a repeated discussion at every meeting. People are there to some extent out of curiosity. If it's going to happen, you want to be there when it happens and want to be able to influence it and make sure it comes up with what you want it to be. I think that's what keeps people coming but I also think it keeps people away and on their guard. We don't really know how open people have been because we haven't gotten to anything tough. It would be great to see all of the thought bubbles behind all the nice words. We haven't been challenged yet. It's been hard in that it's been grueling and there's been a lot of uncertainty but ...

Capacity for Self Reflection

The following are excerpts of participants with different meaning making complexities discussing their own perspectives on the SEAPLAN process.

Socialized Mindset. Participants with a predominant Socialized mindset primarily reflected on how others perceived their input or their role. When asked about their voice in the process, they referred back to the collective voice of their affiliation, e.g. agency, sector. Whether through an affiliation or the SeaPlan process itself, they tended to be keenly aware of what they believed to be the effects of their participation through the eyes of others. They judged the process by how they thought others responded to them and their affiliation's interests.

They internalized the many perspectives of others in the group. Consequently, they were very aware and focused on how their thoughts and opinions were the same as or different from others. Self-reflection was described in relation to sameness or difference. Differences were generalized to "other(s)" when reflecting on the motivation of participants.

Everyone's obviously interested in their own thing (in SeaPlan). It's diverse. There are social scientists. Me and the social scientists have of course very little in common with how we see the world.

Over time once perceived differences evolved to feelings of connection for some. This connection was often due to an initial trust of those perceived as authority and eventually transferred to others.

I didn't walk in that room (SeaPlan meeting) at all initially and feel comfortable. I was surrounded by people who were senior to me and certainly more educated. The room was dominated by scientific types which I'm not. It was initially an intimidating environment. I came to see over time that through the facilitation and leadership, a lot of my fears went away and my comfort level grew. And that's partly their style of soliciting opinions from quiet people and also getting to know the expertise in the room.

Self-Authoring Mindset. Those exhibiting a Self-authoring mindset reflected that it might be necessary to move beyond one's personal comfort zone when the process conflicted with one's personal theory.

I assumed that since I'm on a science advisory panel, I was there for that reason and that makes sense. But it seems it hasn't been thought out yet what exactly is going on. I have been pushing for some context in these meetings and once I understand the context, it is much easier to say okay this is what we should do. I am a little uncomfortable with that because I am comfortable with myself as a (PROFESSION) and I am not comfortable with myself as a big thinker but in order for me to get to the point where I'm comfortable participating as a (PROFESSION), I need to understand the context.

Some of the participants with Socialized mindsets were able to broaden their perspectives because of supportive challenges from trusted others. One participant described how she felt out of her element at first and was very skeptical of the whole process. Yet, because of the kindness of the facilitator and the inclusion from other members, she started to reflect on her fears and discomfort and open up to new possibilities. This, however, took time – nearly a year of on-going interactions. Individuals of all mindsets created meaning that enabled them to feel safe and familiar. With supportive challenge, individuals could extend themselves to new ways of

knowing – not necessarily a full transformation from one mindset to another but a glimpse at what could be. From an outside perspective, the transition from Socialized to Self-authoring seemed quite rewarding as one started to see oneself in completely new ways. It also seemed daunting and difficult for these individuals to make sense of the conflicting sides of the self. The SeaPlan Facilitator played an important role for the Socialized meaning makers. They trusted her and saw her as a neutral authority with their best interest in mind. She was a conduit for them to experience different ideas and uncomfortable exchanges.

There were no significant findings from the Transforming mindset within this sub-theme.

Perception of Other

Throughout both the EBM and the developmental interviews, participants commented on motivation of other SEAPLAN partners, co-workers, state authorities, family, and friends. How participants perceived someone's underlying motivations differed among mindsets.

Socialized Mindset. The strong link to affiliation and authority was a recurring theme when those exhibiting a Socialized mindset discussed their perspectives of others involved with SEAPLAN.

And so, even though they (SEAPLAN facilitators) asked and said you (participants) are not signing your office up to support this document. This is you personally. I think for most people who work for agencies and XXX, they go into meetings with the mindset of their agency, not just them personally. I think they are there to see what this is. They are not mandated to do this so they are not going to speak up. If they were mandated, they would speak up but because we are getting together and trying to create this, they are there to listen.

Similarly to the Socialized excerpts under the affiliation theme, affiliation came up again as a motivating factor for them – influencing how they acted and reacted. There was not clear differentiation between one's personal feelings and ideas and the ideas perceived to be upheld by the affiliation.

Socialized / Self-Authoring Transition. In the excerpt below, a participant who was just starting to exhibit some Self-authoring started to see that differentiation and still saw others suppressing personal feelings and ideas to uphold the relationship to the affiliation.

I think the partnership was blessed to have adept facilitators who were able to keep conversations on topic and identify areas of friction, entertain them but not wallow in them. I don't think that resulted in further polarization. I'd like to think that some of these barriers are starting to come down and people were not on the defensive by the end of this and really starting to feel like there was a level of trust that was being built and shared. I do think some parties basically remained entrenched in the party line. Whether that party line was the message they were forced to carry and maybe they believe differently personally or professionally, I don't know. I'd like to think that would be the case and they were doing what they thought they had to do.

With participants who were in transition from Socialized to Self-authoring mindsets, upholding a responsibility to an affiliation was a fine balance between responsibility to other and responsibility to self. A responsibility to the self and its perspective, as well as understanding the “truth” of others from their own perspective, was the balance beam.

It’s like two channels I’m thinking of. One is developing a substantive rapport with the group so there’s a mutual respect. They understand what I bring to the table and I value their expertise because of the role they fill. But to me equally as important is establishing a personal, professional connection because I really care about how these people do in their jobs because it affects the overall success of what we’re trying to do together so I try to take an interest in understanding their challenges, their road blocks.

Simultaneously, this participant upheld her Socialized need for mutuality among participants but equally as important was her Self-authoring need to understand others’ differences and define her own differences. To do this, she must hold both her need for mutuality and her need to form a realistic picture of the others’ different perspective. This was a balance for her.

Self-Authoring Mindset. Balancing the needs of self and other was described differently in Self-authoring individuals. When discussing barriers to SEAPLAN’s success, they reflected on others as though they, too, were juggling many variables.

One of SEAPLAN’s challenges will be convening groups as they’re working toward harder positions or consensus on tangible things – find ways of setting the table so people will feel that they really have to be there – that they’re going to miss out on something if they’re not there. Because some obviously haven’t been attracted enough to come and it’s tough because everybody is busy and these are long meetings and a lot of conference calls. It’s a lot if you’re not bought in. You have to really believe in the concept, the big picture – not just that it’ll be a value to you.

There was a concern about paying attention to the underlying needs and interests of others instead of the concrete standpoints of others.

Self-Authoring Mindset with some Transformative Mindset. Similarly, those with some Transformative mindset were intrigued by the many variables that made people tick and were particularly interested in better understanding those as a path toward self-understanding. This next excerpt was from one of the participants who wanted to get a different perspective from his own on the logging happening in the old growth forests of the Olympic Peninsula. To do this, he engaged a logger in conversation. While this excerpt is about a different theme, it was taken from his Subject Object interview and is interesting to note. Unlike those participants straddling the Socialized/Self-authoring balance beam, there was no line to be drawn. He was “available” to have his thinking re-oriented by another. Those parts of himself were integrated. Note also that he was speaking about difference as interesting not threatening.

(Talking with him) completely re-oriented my thinking about the issue because I’d never had direct contact with anybody in that part of it.” Interviewer: What compels you to put yourself in these positions to be reoriented? “People are much more irrational and hard to

follow and complex but I believe it's possible to model their dynamics and to predict how they will react to a change in state of the rest of the natural system. I view this as essential preparation for doing anything innovative or useful in conversation. I really want to know every nuance of every single person so I can understand how they work. People are interesting. It's rewarding to learn about how people deal with the world. It's better than television. I don't know where to draw the line professionally.

Pertinent differences between Socialized and Self-authoring mindsets included the extent to which they reflected on why another person did what he/she did, the extent to which they recognized another's underlying reasons for acting in such a way, and the extent to which they recognized and readjusted their own interpretations, needs, motives, and reaction patterns to another.

For Self-authoring mindsets and beyond, there was an increasing ability to step outside oneself or one's perceptions and separate from one's own view to observe and reflect on all the subtleties of what was happening. When this happened, the conclusion one formed about another wasn't entirely framed by one's own feelings and interests (Jordan & Lundin, 2006).

The participant in the last excerpt considered his counterpart's reasons for his/her attitude to imagine and understand someone else's reality. He was aware that his reality was separate from another's and that they were both whole pictures of reality. This participant's Transformative mind peeked through as he reflected upon his own motivation. What's interesting about this next excerpt is that as he reflected on his own motivation, he not only noticed his own internal contradiction that he believed people mean well but could also have a dark side but he actively and explicitly makes a decision about how he was going to think. As he began to see and accept the many sides within him and his contradictions, he began to see and accept others and their contradictions (Sinnott, 2006).

I've decided to believe that most people mean well. I have many, many experiences to the contrary. It's interesting to know what motivates people in my profession to do this kind of stuff. And I'm wondering how many others have had to face that same decision to deliberately exercise faith in humanity and in people...I think it's a prerequisite for accomplishing anything like bringing communities together to discuss how they're going to relate to the world, setting up systems for stewardship. It just requires a general trust that people share certain values. They value their children's lives. They value the future. They value that life remain glorious in its diversity and complexity. You have to otherwise, it's pointless but that said, that ambition leads people like myself toward humungous projects that can really only be approached with immense cynicism. And in those projects, which I'm still not sure why I get involved in, I have been double-crossed, been hurt very badly, become very ill - had horrible experiences. It's always because of a real minority of people, like one or two in a region the size of east Africa or North America. Those individuals are so bad that they restore my faith in one other thing - evil. They're really genuinely are evil people and it only takes a couple to make these challenges that we're involved in seem sometimes insurmountable.

Particularly important to note about the last two excerpts is the empathic voice that comes through in his words. Each of us engages with other people all the time, people who are different from us. Throughout most of these engagements, perspective-taking capacities stay intact. However, there are some interactions that are so powerful that they become transformative, i.e. a new way of making meaning is constructed. He explicitly faces and acknowledges contradictions in his own way of knowing. It was only within the interviews with participants who exhibited some Transformative structure where these internal contradictions were mentioned.

Interviewer: What are the barriers within SEAPLAN to creating a new paradigm?

Participant: Well, I think preconception is certainly one. I have plenty of preconceptions it is not that I'm out of that loop but certainly, preconception and its handmaiden -fitting within existing structures -they kind of reinforce one another, and there are the absolute realities that we have governmental structures and funding structures, both of which are the foundations of any action that can be taken and those structures change slowly so it is not surprising that those concepts keep coming up. It is why I say maybe there is not another way and I think that's why those people that guide us with their own concepts and don't put down any good ideas that don't fit with their views are very facile. Maybe there is no other way than to use the old concept sort of rethreaded. I think that if anyone, particularly some of the organizers, heard me say that, they would say -geez, let's throw him off. But, I am an enthusiastic supporter, I just worry that things are declining faster than any of these processes can really make any difference, maybe that is just a fact of life on this earth.

Ongoing dialogue and exchange of different ideas, within an emotionally safe meeting space, was important for those with Socialized mindsets in order to buy-into cooperating with diverse interests and to start separating oneself from other. Dialogue for nearly all participants was a sort of education about oneself and one another. For Socialized individuals whose conceptions of other were more closely tied to oneself, open dialogue helped them to reflect on how their initial perception of someone might have been reconceived. They became less defensive. Differences didn't seem as threatening to one's sense of self as one began to separate oneself from other.

Summary

One cannot pick and choose who manages the marine environment. EBM is about cross-sector interactions and progress is achieved by communication among and between decision-makers of different mindsets. More insight is needed into how different mindsets interact with one another and how those interactions affect policy formation processes.

Perspective-taking on self and others takes on many forms. What does this all mean for environmental decision-making? At the very least, understanding "where someone is at" with their capacity to have and take on new perspectives is helpful for setting expectations for which EBM tenets are achievable given existing learning mechanisms. SEAPLAN facilitators can build a learning community by setting up processes that speak to participants where they are and acknowledge differences in meaning making. In addition, there is a tremendous opportunity with processes like SEAPLAN that are focused on cross-sectoral decision-making to become venues for developmental growth. Time, continuity, support, and practice are essential elements for

developmental growth. SEAPLAN's structure currently supports these elements. There is time, outside of government, for participants to hash out individual differences. There is continuity among members and they are continuously courted to remain involved. The meetings provide a supportive environment to "leave your affiliation at the door" and speak openly. The nature of SEAPLAN is to provide capacity for these diverse individuals to practice trying out new perspectives, get clearer about their own, and/or understand others'. SEAPLAN can become a model for other EBM-like processes by being even more intentional about these elements. Kegan calls this type of environment a "holding environment" in which an individual's environment has three functions: 1. To support them where they are developmentally, i.e. how they interpret and reason about the situation (Kegan et al., 2001; Popp & Portman, 2001). 2. To challenge the individual to stretch the limits of one's current meaning making system. 3. To provide a stable space an individual needs to integrate new ideas and feelings into his/her current meaning making system that will transform his/her way of knowing. This transformational learning can, in turn, benefit the stakeholder engagement process itself. The process becomes a classroom for learning rather than a courtroom for debating, winning and losing.

Conclusion

The following are research considerations for SeaPlan and other stakeholder engagement processes whose main purpose is to manage marine resources more holistically. Our overarching question was: Do the implicit expectations and mental demands of EBM practices require a complexity of logic and reasoning that outweighs participants' capacities?

Considerations for EBM Stakeholder Engagement Processes

1. The complexity of an EBM decision-making mandate requires attention to the complexity of the adult mind. Developmental psychology has a role to play in creating more optimal stakeholder engagement processes that are more relevant and therefore, meaningful for the individual stakeholders.
2. Decision-makers must be acutely aware of the act of decision-making, i.e. the process itself must be intentional. Optimal stakeholder engagement must be part of the decision-making process from the onset and not relegated to a supporting role.
3. Research partnerships should be developed between developmental psychologists and social scientists studying public participation and engagement.

Consideration 1: The complexity of an EBM decision-making mandate requires attention to the complexity of the adult mind: Developmental psychology has a role to play in creating more optimal stakeholder engagement processes. It is not necessary nor is it feasible for managers or professional process facilitators to be experts in developmental psychology in order to consider the mindsets of decision-makers. It is necessary, however, for them to learn how to facilitate processes that effectively invite all of the mindsets into the room. There are ways in which one can recognize developmental traits and adapt and/or create a process that works with and for a range of developmental capacities. If the complexities of meanings which individuals bring to the process of engagement continue to be ignored, processes will be created and policies enacted that are not truly and comprehensively EBM. To accomplish EBM's primary tenet of managing across sectors, the stakeholders across all sectors must be engaged. They cannot be optimally

engaged without attention to how they make sense of the process and its intended goals. And if they are not engaged in ways that meet them where they are, the process will fall short of fully integrating all stakeholders into decision-making. From a developmental standpoint, a stakeholder engagement process must be created with the people in mind. It needs to speak to them, where they're at developmentally. The process does not and cannot stand alone separate from its participants. The process itself cannot have a direction or a goal separate from what its participants understand it to be.

How someone makes sense of the process translates into what and, more importantly, how they learn. A person with a Socialized mindset may come to the process to gain knowledge about EBM because they feel responsible for their affiliation's interest. As one participant said, "This is going to happen. It's just a matter of how and when and I want to make sure I understand how it affects my affiliation." These participants come to a learning process asking "What am I supposed to know?" A person with a Self-authoring mindset may come to a learning process thinking about what they want to learn and accomplish. Stakeholder engagement processes, when looked at developmentally, are ripe classrooms not only for developmental growth but for creating processes or reworking existing ones to more fully connect with participants' capacities.

Consideration 2: Decision-makers must be acutely aware of the act of decision-making, i.e. the process itself must be intentional. Stakeholder engagement must be part of the decision-making process from the onset and not relegated to a supporting role. It must support deliberative characteristics. Throughout the research process, it became apparent how important stakeholder engagement was in order to obtain EBM objectives, particularly those related to making trade-offs more explicit. Decision-making must move away from an interest-based discourse to a deliberative discourse that takes into consideration the inherent interaction and interdependence between the individuals involved and the context in which they find themselves. EBM literature on stakeholder processes offers considerations aimed only at upholding an ideal rather than simultaneously considering who the stakeholders actually are. By intentionally considering developmental capacities when creating a stakeholder engagement process and by using deliberative characteristics, EBM processes can become mechanisms for a new kind of learning which in turn enhances the EBM process.

Stakeholders must be optimally engaged from the onset through an official mechanism that is connected to, but not directly from, government (such as a public/private partnership). The engagement process should start long before the mandating process starts, if possible, and become a permanent mechanism for ongoing dialogue across sectors. EBM stakeholder engagement processes should not be predetermined. There must be intentionality about the process development and ongoing recognition of process traits as the process unfolds. And most importantly, participants should be aware or made aware of these process traits. With awareness, there is a better chance that some participants can help enable the process to adapt.

Consideration 3: EBM stakeholder engagement processes, as described above, are inherently excellent learning organizations. Many stakeholder engagement processes are not necessarily created with actual participants in mind. They are not created to meet the needs of a range of participants. They promote informational versus transformational learning. They encourage dialogue and deliberation but fail to understand and/or acknowledge when participants can't

achieve these ideals. Cross-disciplinary collaborative research can teach us how to address the cognitive, emotional, social, and political variables that EBM stakeholder engagement processes inherently demand. And in doing so, create and sustain processes that do, in fact, consider and include the whole of the ecosystem.

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