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A Conceptual Framework for Social, Behavioral, and Environmental Change through Stakeholder Engagement in Water Resource Management

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ABSTRACT

Incorporating stakeholder engagement into environmental management may help in the pursuit of novel approaches for addressing complex water resource problems. However, evidence about how and under what circumstances stakeholder engagement enables desirable changes remains elusive. In this paper, we develop a conceptual framework for studying social and environmental changes possible through stakeholder engagement in water resource management, from inception to outcomes. We synthesize concepts from multiple literatures to provide a framework for tracing linkages from contextual conditions, through engagement process design features, to social learning, community capacity building, and behavioral change at individual, group, and group network levels, and ultimately to environmental change. We discuss opportunities to enhance the framework including through empirical applications to delineate scalar and temporal dimensions of social, behavioral, and environmental changes resulting from stakeholder engagement, and the potential for negative outcomes thus far glossed over in research on change through engagement.

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Introduction

As the limitations of top-down approaches to managing complex environmental problems are exposed, participatory approaches to environmental management including stakeholder engagement are on the rise (Halvorsen et al. 2019). Stakeholder engagement in environmental management is a process where stakeholders, i.e., those directly or indirectly affected by and able to affect a decision, take active roles in research, planning, and actions impacting their lives (Lockwood et al. 2010; Plummer et al. 2017). While engagement serves diverse goals including fulfilling a bureaucratic requirement, advocates of stakeholder engagement posit that empowering stakeholders to join experts in decision-making enables learning, builds relationships, strengthens capacities, and fosters the coordination required to address complex environmental problems (Armitage, Marschke, and Plummer 2008; Pahl-Wostl 2009). Yet how, and under what conditions, stakeholder engagement processes relate to social and environmental change outcomes remains poorly understood (Koontz and Thomas 2006; Gerlak et al. 2019). Without unpacking this black box, we risk undertaking stakeholder engagement processes without clear knowledge of the type of change that may be obtainable, how change is catalyzed, and how we can causally link engagement processes and outcomes.

The core challenge in understanding the transformative potential of stakeholder engagement is identifying the mechanisms through which it can lead to social and environmental change (Gerlak et al. 2018; Newig et al. 2018). There is no comprehensive framework for investigating and understanding the social and environmental changes wrought through engagement (though see Emerson, Nabatchi, and Balogh (2012) for a more general framework). There are, however, theoretical and empirical studies dispersed across different literatures that, when integrated, form a coherent framework to describe critical components of the process. This framework incorporates research on (1) contextual conditions and (2) engagement process design features (Ansell and Gash 2007; Emerson and Nabatchi 2015; Talley, Schneider, and Lindquist 2016), and (3) engagement outcomes including learning (Pahl-Wostl 2009; Armitage et al. 2018), community capacity building (Davenport and Seekamp 2013), individual and collective action (Muro and Jeffrey 2012), and environmental change (Koontz and Thomas 2006). However, linkages across these and related components remain underdeveloped (Plummer et al. 2017; Gerlak et al. 2018; 2019). Researchers have made strides here, for example, with systematic reviews (e.g., Newig et al. 2018; Feist, Plummer, and Baird 2020) and empirical studies (Plummer et al. 2017) that conceptualize connections across engagement processes and engagement driven outcomes. Yet a coherent framework that recognizes the contingency of contexts, processes, scales of social change, human behavior, and ultimately change in environmental conditions, remains to be seen.

In this paper we outline just such a framework. In doing so we draw from existing collaborative governance frameworks (Emerson, Nabatchi, and Balogh 2012), apply them specifically to place-based natural resource cases, and unite disparate literature that has identified linkages among discrete components of the process. For example, we know engagement processes may change a participant's perception of problems and their ability to take action, which may enable individual behavior change (Morton and

Brown 2011). We know less about how engagement leads to collective change that, in aggregate, may lead to broader socio-ecological changes. No single discipline has fully worked out such a process. Thus, we take a multidisciplinary approach in building this framework. We select concepts that can help answer our question and draw on their various strengths without constraint to disciplinary boundaries—but recognize doing so entails theoretical grounding and reconciling assumptions.

The conceptual framework may be applied to stakeholder engagement across multiple environmental management arenas including rangeland, forestland, and coastal areas. However, as practitioners and researchers from the social and natural sciences and law, we draw from our common experience working on water quality and quantity challenges in the U.S. context in the examples that follow. Next, we define key terms, introduce, and then describe our conceptual framework. We then turn to further discussion of the literature behind each component of the framework. We conclude the paper by identifying opportunities uncovered by the framework for future research.

Conceptual Framework for Change through Engagement

Engagement refers to processes where stakeholders are involved in making decisions that affect them. Engagement includes modes of social interaction ranging from one-way interactions (communication and consultation) to two-way collaborations (deliberation and empowerment) driven either from the "bottom-up" (community-led) or the "top-down" (agency or expert-led), all of which depend on institutional mandates and structures as well as stakeholders' authorities, capacities, needs, and wants (Reed et al. 2018; Matarrita-Cascante, Sene-Harper, and Ruyle 2019). Our interest with this conceptual framework is to guide research on change resulting from engagement processes, where, in response to threats or opportunities (Beckley et al. 2008), new groups consisting of diverse stakeholders including members of established groups convene (Wenger 2000) and engage in deliberation, planning, and decision-making to affect the problem/opportunity at hand (Muro and Jeffrey 2012).

Investigating engagement's transformative potential requires consideration of potential promise and peril. On the one hand, engagement aiming for deliberation and empowerment may induce social reform (Arnstein 1969)—e.g., power sharing, learning, capacity building—that may further enable transformative outcomes including socio-ecological change going beyond the individual and the local scale (Berkes 2009). On the other, engagement inherently involves tradeoffs and challenges. Engagement surfaces or acknowledges if not attempts to unsettle or remake relationships of power including access to and control of natural, knowledge, political, or other resources (Cook and Zurita 2019). Engagement processes that fail to address and manage power inequities—such as when only a minority within a community decide over the majority—or fail to secure and support participation from affected parties encourage negative outcomes; for example, heightened distrust and unsustainable environmental practices (Cleaver 2001; Bluhdorn and Deflorian 2019).

To inform inquiry into how and under what conditions positive or negative change may unfold, our conceptual framework (see Figure 1 below) identifies elements of and relationships among contextual conditions, stakeholder engagement processes, and engagement outcomes (cf. Ostrom 2011). Engagement processes—pictured on the left

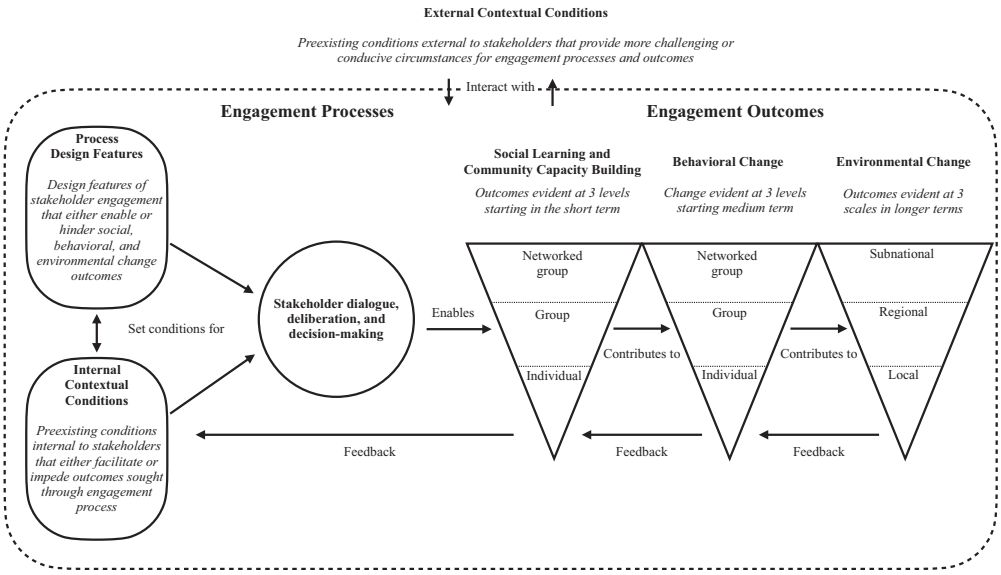

Figure 1. Conceptual framework for change through stakeholder engagement.

side of Figure 1—describe internal contextual conditions and process design features that influence the quality of stakeholder interaction and likelihood of social and environmental change through engagement. The right side of the figure describes social (i.e., social learning, community capacity building, and human behavioral change) and environmental outcomes of engagement processes and their hypothesized relationships and feedback loops. External contextual conditions, pictured outside engagement processes and outcomes, reflect the broader context within which engagement processes and outcomes unfold. Where previous research on engagement outcomes has tended to be narrowly construed toward either social or environmental change (Koontz and Thomas 2006; Newig et al. 2018), our framework integrates both, challenging researchers to trace these relationships and connect processes evident on short- (social) and medium- (behavioral) terms to environmental outcomes evident in the longer term (Genskow and Prokopy 2009). Focusing on social processes in this way also allows questions of values, (in)justice and (dis)empowerment to be addressed (Lukasiewicz and Baldwin 2017) alongside biophysical dimensions of environmental challenges.

Change in these outcome categories may become evident at three nested levels. We draw from sociological research on communities to conceptualize these levels (Wilkinson 1991). While consensus on how best to conceptualize community remains elusive, our framework recognizes communities as comprised, in essence, of people (along smaller and larger levels of social organization), physical space (including biophysical environmental conditions), and the institutions that govern their actions (Agrawal and Gibson 1999; Matarrita-Cascante, Sene-Harper, and Ruyle 2019). This progression in levels reflects Giddens' (1984) structuration theory that sees individual actors as embedded within the broader contexts (i.e., rules, resources, biophysical attributes) that they draw from, interpret, and influence in everyday interactions.

Change evident at the individual level includes skills, cognition, values, beliefs, or behaviors developed or transformed through social interaction (Muro and Jeffrey 2012).

Individual level change is important but insufficient for bolstering cross-scale organizational and programmatic capacity (Davenport and Seekamp 2013) and coordination needed to affect environmental outcomes.

A second level assesses change as a property of a small group of stakeholder individuals (Webler, Kastenholz, and Renn 1995; Reed et al. 2010) that convene and engage in dialogue and deliberation to undertake research, planning, or decision-making. We conceptualize stakeholder groups as collectives or communities of practice comprising "social fields" of individual stakeholders who collaborate (more or less formally) around place-based topics of interest, and through their interaction, learn with and from one another (Wilkinson 1991; Wenger 2000). Group level social outcomes may be evident, for example, with improved relationships within the group, or the emergence of shared understanding of the cause, solution, and reason for taking action (Muro and Jeffrey 2012). Relationships within the group can be leveraged for future action and activation of resources (Chaskin 2001).

A third level identifies change evident across multiple stakeholder groups that converge to address a shared concern that surpasses the capacity of any one group. This includes either a broader geographic scope (e.g., moving from local to regional watershed restoration efforts) or groups collaborating to address a more geographically specific vexing problem (Matarrita-Cascante, Sene-Harper, and Ruyle 2019). Drawing from the community theories described above, we conceptualize networked stakeholder groups as "community fields" that provide "structure to the whole of the community as an interactional phenomenon" (Wilkinson 1991, p. 90). Engagement processes that build networked groups create opportunities to identify, combine, and activate tacit resources to bring about change (Beckley et al. 2008). Organizing these resources toward a collective goal is known as community capacity building (Davenport and Seekamp 2013), which in turn can affect environmental outcomes.

Environmental change outcomes from engagement processes can be understood as falling along nested geographic scales, from change in environmental conditions that may be evident locally (streams or creeks), regionally (rivers and their tributaries, subbasins), and at subnational scales (basins, lakes, bays). In positing social and behavioral change through engagement as contributing to environmental change, our framework opens inquiry into changes evident both through time and across levels (social and behavioral change) and scales (environmental change) where change can be observed.

Engagement Processes

Contextual Conditions

Engagement processes do not happen in a vacuum but instead affect and are affected by the political, historical, sociocultural, and environmental contexts in which they unfold (Ansell and Gash 2007; Delli Carpini, Cook, and Jacobs 2004; Rodela 2011). We define contextual factors as preexisting conditions external or internal to a group that facilitate or impede outcomes sought through engagement processes (Medema, Wals, and Adamowski 2014).

External Context

External contextual factors include institutions, legal frameworks, political opportunity structure (e.g., funding, political regimes), socio-economic conditions, technological conditions, climate or water resource conditions, as well as crises (e.g., COVID-19) or disasters (e.g., fires, floods) that fall beyond the immediate control of engagement participants (Emerson, Nabatchi, and Balogh 2012). As Figure 1 illustrates, the influence of external conditions may cascade through engagement processes and outcomes. Flooding events, for instance, may catalyze new stakeholder engagement when constructed as opportunity to enhance something of value (Beckley et al. 2008). At the same time, events like flooding or drought structure possibilities for engagement to enhance environmental conditions. Thus, our framework suggests researchers weigh relationships they identify in light of potentially influential external contextual conditions; for example, by assessing how process design contributes to the environmental performance of engagement efforts in light of biophysical limitations and influence beyond the control of any one particular group.

Internal Context

Internal contextual factors are the place-specific baseline or preexisting conditions evident at the onset of engagement efforts that facilitate or impede collaboration amongst the group (Ansell and Gash 2007) and fall more within the scope of influence of local stakeholders. These factors include individual level characteristics, for instance, technical skills and capacities in assessing dimensions of environmental problems (Popa, Guillermin, and Dedeurwaerdere 2015). This also includes civic skills including willingness to learn (Knowles, Elwood, and Swanson 2011), the ability to listen to perspectives that may conflict with one's values, ability to effectively communicate one's own perspectives (Kearns 2012), emotional skills such as knowing and feeling how others experience a situation and responsiveness to other's needs (Goodin and Niemeyer 2003; Rodela 2014), leadership skills (Burbach and Reimers-Hild 2019), willingness to trust others (Popa, Guillermin, and Dedeurwaerdere 2015), and boundary spanning (i.e., linking to external sources of information) (Cash et al. 2006). Beyond individual characteristics, this category of preexisting conditions also incorporates local context and historical relationships among stakeholders including (a) asymmetries in power, resources, and knowledge; (b) incentives and constraints on participation; and (c) the history of cooperation or conflict within particular locales (Ansell and Gash 2007).

This research posits that more balanced power/resource arrangements, fewer constraints, and successful prior experiences with collaborative efforts will increase the likelihood of positive outcomes (Reed et al. 2018). In practice, however, engagement convenes stakeholders with varied experiences, civic skills, access to knowledge/resources, and willingness to learn about contested topics. Thus, understanding local context has potent implications, e.g., for designing processes capable of managing power imbalances and developing strategies for building capacities for less powerful or adept stakeholder groups to more fully participate (Popa, Guillermin, and Dedeurwaerdere 2015). Unfortunately, the evidence base for how these factors condition social interactions remains scant (Cundill and Rodela 2012). Capturing indicators of internal contextual conditions at the onset of new engagements may shed light on whether and how those

preexisting conditions actually change as a result of one's participation or how these conditions contributed to outcomes.

Process Design Features

Process design features describe an ideal set of conditions for social interaction within engagement settings. When present, these features—including transparency, diverse participation, managed power inequities, and others described below—may enable effective dialogue, learning and understanding, agreement on decision-making processes, and commitment to a shared vision across diverse stakeholders with varying degrees of skills and experiences, thus enabling engagement outcomes (Emerson, Nabatchi, and Balogh 2012; Innes and Booher 2003).

Yet, given the reality of stratification across stakeholders, none of these conditions is likely to be achieved in an absolute sense (Innes and Booher 1999), nor are all such conditions appropriate in every engagement setting (Schusler, Decker, and Pfeffer 2003). Even so, tracking the presence and potential influence of these features are critical for identifying factors influencing process outcomes including learning (Innes and Booher 1999; Gerlak et al. 2019).

Contributions from Theories of Dialogue and Deliberation in Engagement

At the core of engagement is communication among stakeholders. Scholarship on engagement process design and social learning draws heavily from Habermas' (1987) theory of communicative rationality. Habermas tells us all acts of speech share an inherent goal of mutual understanding or agreement, and that collective action is coordinated through that agreement. In engagement settings, the presence of particular design features—e.g., affording opportunity for all participants to help determine objectives—creates conditions favorable for dialogue and deliberation. Dialogue and deliberation are concepts with distinct functions (Yankelovich 1999). Dialogue refers to civil exchanges of information, knowledge, and perspectives where participants construct meaning and learn about one another and the problem topic. Deliberation involves surfacing and debating latent public values and producing new shared values through argumentation and justification (Innes and Booher 1999; 2003). For Habermas (1987), such dialogic exchange may yield "emancipatory" knowledge that transcends private interests, is directed toward public values and issues, presents the most reasonable and just perspective on the problem at hand (Newig et al. 2018), and is collectively embodied in shared understanding that can secure agreement on and commitment to a course of action (Innes and Booher 2003).

There are, however, good reasons to question whether stakeholder engagement yields shared understanding as envisioned by Habermas. For example, deliberation and authentic agreement are perennially challenged by unequal power relationships or distrust that preclude the normative goal of empowering marginalized stakeholder groups to share in steering research directions or environmental management decisions (Mosse 1994; Kothari 2001; Hickey and Mohan 2004). Thus, the extent to which engagement processes, including deliberation, unsettle and remake status quo power arrangements and build trust remains a pressing empirical question (Sullivan, White, and Hanemann

2019). Indeed, research on factors that foster learning and other outcomes remains underdeveloped (Gerlak et al. 2018). Design features described below provide a roadmap for future research aiming to fill these gaps.

Diverse Participants

Systematic inclusion of a representative mix of a community's social, epistemic, livelihood, and other identities in engagement processes is posited as enabling robust and effective decisions by engaging those who will be responsible for acting on outputs from the outset (Reed et al. 2018). With enhanced epistemic diversity, the consequences of one decision that may exist in the blind spot of one area of expertise may become visible to another, thus expanding the view of possible solutions and limiting "trial and error" approaches that waste resources and time.

In practice, achieving diversity is challenged by entrenched power dynamics, silencing, lack of trust, and fear that participation may legitimize unfair outcomes, and can make including diverse participants difficult, especially racial minorities and other historically marginalized groups (Pulido 2000; Cornwall 2004; Treffny and Beilin 2011). Moreover, stakeholder participation skills vary widely within diverse groups, and engagement processes will need to compensate (Yang and Pandey 2011). Managing power inequities will require organizers to confront existing power dynamics as well as practical (funding or other resource limits, professional norms), cultural (expectations for inclusion, sense of value to the community), organizational (bureaucratic nature of large-scale participatory efforts) and other participation barriers (Colvin, Witt, and Lacey 2016). Ineffectively engaging diverse groups can serve to entrench inequalities and stymie innovation that can come when diverse stakeholders confront multiple, competing perspectives (Lukasiewicz and Baldwin 2017).

Dialogic Exchange

Providing consistent opportunities for all participants to share and listen to each other's perspectives and weigh the perspectives of community members not in the room, in both formal and informal settings, can enable learning (Sharma-Wallace, Velardea, and Wreford 2018). Scholarship on engagement highlights the importance of "listening deeply" as a practice necessary for coproducing problem frames (Lewicki 2002). This is particularly true with issues of water, which invoke strongly held values (Wolf 2017). When a diverse array of stakeholders share their perspectives, "the assumptions of some are inevitably challenged by others, assuring that the status quo is examined," thereby reopening negotiation of previously settled knowledge (Innes and Booher 1999 p. 418).

Constructive Conflict

Constructive conflict—or divergent group facilitation (Kaner 2014)—within the deliberation process can catalyze progress on areas of agreement even in the face of longstanding differences.

This entails being intentional about providing opportunity for stakeholders with a history of conflict to differentiate between, on the one hand, contentious positions, and on the other, common ground (Schusler, Decker, and Pfeffer 2003).

Democratic Structure

Democratic structure refers to having participants set the agenda and procedures of engagement processes, including selecting topics and rules for interaction and decision-making (Koontz 2014). This includes an openness to welcoming newcomers to join; finding space for "unrestrained thinking" and "structured unpredictability"; being open to new, emergent ideas; providing opportunities for informal network interaction and extended engagement; and ensuring that mandates and results remain transparent, flexible, and accessible (Schusler, Decker, and Pfeffer 2003). The presence and management of such conditions in participative processes—given inevitable power imbalances—can help enable legitimacy, a sense of commitment to the process, and social learning.

Process Equity

Process equity refers to the equal participation of all stakeholders (Koontz 2014). Perfect equity is not likely given power balances or resource disparities, but a genuine commitment to achieving equity helps ensure greater parity of influence by all participants, and representation of the range of perspectives evident within a given community. The degree to which a process is deemed equitable is evident in participant perceptions of fairness or being taken seriously by other participants (Koontz 2014). When present, these conditions may enhance one's sense of commitment to process outputs and engender a sense of group solidarity (Webler, Kastenholz, and Renn 1995).

Knowledge Coproduction

Knowledge coproduction describes the integration of scientific and technical knowledge with practical, local, traditional or other ways of knowing (Eden et al. 2016) to improve the scientific basis of decision-making (Wyborn et al. 2019)—a critical process for improving management of complex environmental problems. In engaged settings, this involves generating opportunities for participants to collectively draw from multiple sources of knowledge. New stakeholder groups can serve as boundary organizations enabling diverse participants to "retain their own cultural perspectives while coming to appreciate those of others" (Carr and Wilkinson 2005 p. 256). In practice, however, techno-scientific knowledge and goals—while a critical component of decision-making—tend to dominate problem framing and agenda setting (Cook and Zurita 2019). Knowledge coproduction demands an intentional effort to manage power imbalances across stakeholders, including scientists, with different claims to epistemic authority.

Skilled Facilitation

Responsibility for brokering power dynamics, building capacities among stakeholder participants, seeking diverse representation within the group, as well as advocating for other process design features falls largely to facilitators and conveners. Facilitators play numerous roles including helping establish norms for interaction, ground rules, and commitment, convening new groups, guiding issue identification and value clarification, managing relationships, framing questions to be answered or research gaps needing

attention, and managing administrative tasks and planning (Schusler, Decker, and Pfeffer 2003; Kaner 2014).

Scalar Fit

Spatial, institutional, and temporal fit between environmental problems and stakeholder engagement processes is critical for problems like water quality that operate on ecological scales crossing traditional administrative or political boundaries. Engagement should be conducted "at a spatial scale that is relevant to the issue, and the jurisdictions of authorities or institutions that can tackle it" (Reed et al. 2018 p. 9). Temporal dimensions are also important. Water problems, like other environmental disasters, may vary from slow onset (nitrogen pollution in groundwater) to acute events (flooding). The duration of engagement processes should be matched with the magnitude of the problem, the temporal scale of the trajectory over which goals need to be realized, and be adaptive to modulations in the intensity of the situation (Reed et al. 2018).

Engagement Outcomes

Thus far we have described contextual conditions and process design features that set the conditions for social interaction in engagement settings. We now turn to the outcomes these features may enable. We first highlight concepts from social learning and community capacity building literatures that can be operationalized to assess social changes evident through engagement social interaction processes.

Social Learning

Social learning refers to information sharing and learning, via dialogue and deliberation, that allows actors within an expanding network to change, or at least call into question, common knowledge about the problem/solution at hand and related stakeholders (Pahl-Wostl 2009; Herrero, Dedeurwaerdere, and Osinski 2019). Earlier we described process features conducive for dialogue and deliberation—the social learning *process*. Here we focus on social learning *outcomes* evident at individual, group, and broader levels (Reed et al. 2010; Koontz 2014). Individual level social learning outcomes include the transfer of knowledge among individuals leading to skill development and cognitive change, while group level outcomes refer to change in relationships and trust, and normative change including shared vision and commitment to that vision (Muro and Jeffrey 2012). While such outcomes are by no means inevitable, learning outcomes may create conditions conducive for behavioral change including collective action needed for improved management of complex environmental problems (Pahl-Wostl 2009). We describe key social learning outcomes below.

Skill Building

Experience weighing evidence, developing plans, and making decisions in engagement settings—where one's perspectives on and justifications for preferred options are subject to the scrutiny of other stakeholders—can transform individual participants' skills.

These include the technical, emotional, and practical skills and capacities described above as internal contextual factors.

Cognitive Change

Deliberation processes structure and enable cognitive change at the individual level (Mezirow 1991) including the development of new and transformation of existing understandings of environmental problems (e.g., their cause or potential solution) or the needs and wants of other stakeholders (Reed et al. 2010). Drawing from earlier work on transformational learning (Muro and Jeffrey 2012), this literature theorizes cognitive change as resulting from a disruption to settled knowledge—a seed of doubt introduced through deliberation—that triggers further discourse and critical reflection on earlier assumptions (Argyris 1978). This research provides a robust theoretical framework that describes phases or loops of cognitive change researchers can operationalize as indicators of social learning outcomes of engagement processes (Medema, Wals, and Adamowski 2014).

Single loop learning describes an initial phase of learning, evident when participants ask, "are we doing things right?". This may take shape as learning new facts about problems, assessing the feasibility of group actions (e.g., political, economic, or technical feasibility), or other information about stakeholders or the process (Armitage et al. 2018), without questioning rules or norms. Double loop learning happens when participants reach frustration with limits of current approaches or understandings (Pahl-Wostl 2009). Here inquiry among engagement participants calls into question status quo understanding, evident when participants begin asking, "are we doing the right things?" Triple loop learning is evident with the question "how do we decide what is right?" Here inquiry moves from asking whether the rules ought to be changed to reflexivity on those rules—i.e., learning about how people learn and inquiry into why individuals and groups learn the ways they learn (Medema, Wals, and Adamowski 2014).

The cognitive changes described above may precipitate a shift from multiple cognitions among diverse stakeholders to collective cognitions within the stakeholder group (RöLing 2002). At the onset of a new engagement process, individual stakeholders hold differing perceptions and understandings of problems and of other stakeholders. Examining cognitive change at the group level thus entails assessing whether processes of dialogue, deliberation, and loops of learning transform individuals' perspectives, and the degree to which those new perspectives merge into a shared vision (Muro and Jeffrey 2012).

Relational Change

Relational dimensions of social learning include development of new and transformation of existing relationships, i.e., change in how engagement participants interact with, trust, and understand one another. Interpersonal trust describes the extent to which one believes others will follow through on their commitments, take others' welfare into account, and offer and return favors, and is essential for forming agreements across stakeholders whose interests may be in direct conflict (Wondolleck and Yaffee 2000). Relational change is also evident with change in networks extending beyond

direct participants. This includes enhanced cooperation (Baird et al. 2014), shifts in views on the credibility of or confidence in other stakeholder groups and increases in social capital (Lubell 2005). Thus, successful relationship change is evidenced by an upturn in information or resource sharing (e.g., data, technical assistance) within and among stakeholder groups, and other forms of cooperation including new partnerships, learning networks, and sustaining long-term participation beyond one's existing cluster of strong ties (Bodin and Crona 2009; Berkes 2009).

Normative Change

Normative dimensions of learning include shifts in subjective norms (expectations of what ought to be done), injunctive norms (approved of behaviors), and descriptive norms (what is being done) that can emerge when new referent groups are built (Warner and Hobbs 2020). Referent groups are collectives of individuals that provide standards for self-comparison. Norm shifting is relevant at two levels in our framework. First, in assembling a new group of diverse stakeholders, individual participants may compare, reflect, and shift existing norms and associated environmental behaviors relative to the norms of others in their new community of practice (McGuire, Morton, and Cast 2013). Second, through relationship building, the new stakeholder group may itself become a referent group for others in the area. Publicly visible land management practices illustrate norms as environmental behaviors; for example, growing trees in riparian zones, adopting no-till management practices, cover crops, fencing cattle from streams, or rotational grazing.

Normative change includes three additional concepts. First, moral development consists of the honing of a sense of responsibility to protect other people or nature (e.g., land, air, water) (Czap et al. 2018) that can occur as participants learn how their actions are connected to problems and how behavioral change may mitigate them. Second, social interaction may transform one's belief about their own ability (self-efficacy) or the group's ability (collective efficacy) to act to effect change, as well as their belief that taking action is truly beneficial (response efficacy) (Wilson et al. 2018). Third, short term results, e.g., success in accomplishing a group's goal, may engender a sense of group solidarity that can sustain motivation, mobilization, and persistent action in the face of difficulty, risk, and uncertainty (Webler, Kastenholz, and Renn 1995).

Community Capacity Building

Research on community capacity building locates social learning and cognitive change outcomes as facets of a broader set of interlinked dimensions of a community's capacity that can be built through stakeholder engagement. Thus, in our framework, social learning among individuals, groups, and networked groups feeds into and supports a broader dynamic of community-capacity building. Like the learning theories described above, community capacity is both a process and product. As a process, community capacity building involves the "interaction, mobilization, and activation" of a range of capitals or assets available within a community—including social, political, financial, and natural capital (Davenport and Seekamp 2013, p. 1104). This integration of asset categories provides new capacities communities can draw on in times of need (Chaskin 2001)—for

instance, in response to flooding, fire, or landslides. Beckley et al. (2008) describes this asset activation process as happening through the merging of spheres of social relations within a particular community (e.g., markets, public service, shared interests and relations based on shared identities) in response to some catalyst (e.g., natural or technological disasters). In our framework, relationship building through social interaction among engagement participants and the broader community provides the catalyst for merging and activating a community's assets.

Capacity Outcomes

If successful, the mobilization of assets through relationship building provides end results, or identifiable capacity outcomes. These outcomes include new capacities to protect, maintain, or enhance something of value to a community and take a number of forms (Beckley et al. 2008), for instance, as strengthening in community livelihoods, health, a place's participatory or civic culture, the ability to subsist or persist following environmental disruptions, ecological integrity (Morton and Brown 2011), biodiversity protection (Koontz and Thomas 2006), or sacred land preservation (Banerjee 2012). Building relationships with the state (e.g., national, provincial, state, county level apparatus of government) in order to access financial, legal, political, or other resources is often crucial in stakeholder engagement. For instance, ensuring compliance with and action on decisions arrived at through participatory processes often requires action on behalf of state actors who possess formal decision-making capacity and related resources external to the stakeholder engagement process (Mandarano 2008). Examples here include removing dams or roads or maintaining irrigation infrastructure.

Behavioral Change

Moving further right in Figure 1 presenting our framework, accomplishing desirable biophysical change with complex environmental problems fundamentally requires change in human behavior. Though social learning and community capacity building may contribute to behavior change, empirical understanding for whether, how, and for whom this happens remains poor (Armitage et al. 2018). Below we conceptualize behavioral change at individual, group, and networked group levels and suggest how scholars can assess the effects of these changes on environmental outcomes.

Individual Level Behavior Change

Social psychological theories can help link engagement processes with behavioral outcomes at the individual level. For example, Theory of Reasoned Action (Fishbein and Ajzen 2010); Theory of Planned Behavior (Ajzen 1991); Value-Belief-Norm Theory (Stern et al. 1995), and Protection Motivation Theory (Rogers 1983) posit how attitudes, beliefs, identities, threat and coping appraisal, and norms inform pro-environmental intentions and adaptive actions at the individual level. We can postulate that one's participation in engagement activities may reshape how they understand particular environmental problems confronting their community—for instance, bringing awareness to degraded surface water quality threatening recreational or sacred spaces they value.

Through learning about organizations addressing these challenges and opportunities for supporting those efforts, individual participants may reassess their own abilities and choose to take action. The environmental performance of individual level action, however, is limited compared with coordination within and across groups.

Group Level Behavior Change

Group-level behavioral change is evident with a stakeholder group's tangible products or environmental outputs (Koontz and Thomas 2006). These include developing and acting on plans (e.g., for addressing a problem, improved coordination, raising funds, monitoring implementation, enforcing compliance), reports, local policy or programmatic changes, or environmental protection projects that, in time, may contribute to environmental outcomes (Emerson, Nabatchi, and Balogh 2012; Feist, Plummer, and Baird 2020). Collaboratively produced recommendations that justify why action is needed and identify a clear approach for implementation bear potential to convince other audiences to act, including officials (Mandarano 2008), funders, or private industries that control resources needed especially for large-scale projects (e.g., dam removal, infrastructure or technology development).

Networked Group Level Collective Action

Stakeholder engagement may diffuse behavior change across diverse stakeholder groups through relationships forged during engagement processes (Smith, Christie, and Willis 2020). Social learning outcomes (e.g., collectively defined problems and solutions) can diffuse across those new networks of relationships to a broader set of social fields, providing impetus for merging and activating assets across the community field (Wilkinson 1991). Efforts to mitigate water quality challenges at the watershed or basin scale provide classic examples (Balazs and Lubell 2014). New networked groups can contribute to long-term environmental change through formation of new organizations (e.g., endowed foundations) where policies and programs for addressing problems, needs, or opportunities are institutionalized.

Environmental Change

Linkages across locally spearheaded engagement efforts and local and broader environmental changes are not self-evident, but instead, need to be actively constructed. Establishing causality between environmental outcomes and behavior change resulting from stakeholder engagement is challenged by time lags (between implementation and observable impacts), inconsistent data collection, and intervening factors (Koontz and Thomas 2006). But large numbers of interconnected, moving parts also reflect the reality of the world encountered by practitioners working to address complex problems. Scholars interested in drawing linkages between stakeholder engagement and environmental outcomes must find ways to incorporate rather than reject such complexity into their research (Ostrom 2011). As a step toward embracing complexity, we suggest assessing how environmental outcomes of engagement may register differently at different scales (Eaton et al. 2019).

Scales for conceptualizing environmental processes need to fit the problem and proposed responses. Identifying the problem scale (e.g., local versus regional groundwater contamination), temporal components that may affect it (e.g., seasonality, large storm events, droughts), and accompanying indicators of change, including both change in perceptions (e.g., via surveys) and environmental conditions (e.g., via sampling and analysis plans, and plans for communicating findings) (Koontz and Thomas 2006), should be decided upon in participatory fashion and in light of the group's ability and authority to implement those plans (Reed et al. 2018). Moreover, natural systems display considerable heterogeneity, including the rate of change that occurs as a consequence of both anthropogenic and biogeochemical drivers of change on the landscape (Lovell, Mandondo, and Moriarty 2002). Thus, recognizing and estimating temporal scales (short term, longer term environmental change) over which the stated goals can be realistically achieved can inform a group's goals for assessing success in obtaining outcomes.

Local Level Environmental Change

In lieu of broader coordination, one individual's behavior change—for example, installing riparian buffers after learning with other participants—will have environmental impact of limited geographic scope. However, two caveats point to the nested nature of socio-environmental change. First, while individual actions may spur environmental impact limited to local scales, ultimately local changes are linked to higher level impacts (Bringezu et al. 2016). Second, research on disproportional impacts of individual actors on the environment suggests that "disproportionate contributions," rather than the average behavior of many actors, "may be driving the output of the system" (Nowak, Bowen, and Cabot 2006). This is to say that individual contributions are conditioned not only by behavior, but by the time and place such behavior occurs. A focus on individual level behavior change and local environmental change therefore points to a distributed approach to promote adoption of the "right" management practices in the "right" places (Preisendanz et al. 2021).

Regional Level Environmental Change

By 'regional,' we mean a level encompassing numerous localities (e.g., multi-watershed or basin scale). The specific boundaries here are contingent on how the scale of the environmental issue in question is constructed. For instance, improving water quality impairments at the sub- or watershed scale can be accomplished through community-based action networks that connect several localities and involve or influence behavior of diverse stakeholders within those watersheds (Morton and Brown 2011).

Environmental Change at Subnational Scales

Accomplishing environmental change at levels that span states or regions requires corresponding scales of coordinated change in human behavior interfacing with complex, global environmental processes including water cycles (Gleeson et al. 2020). Change across watersheds again provides an apt example, where pollutants accumulate most visibly at downstream endpoints. Thus, taking effective action for addressing hypoxia or

harmful algae blooms in the Great Lakes USA or polluted stormwater runoff in the Chesapeake Bay entails coordinating human behavior change in diverse sectors across multiple community fields.

Discussion and Conclusion

The conceptual framework we offer here was developed to guide research on stakeholder engagement by specifying and integrating contexts and processes, social learning, and community capacity building outcomes, and behavioral and environmental change. It represents our effort to open the black box of how and under what circumstances stakeholder engagement yields change in response to calls for a greater evidence base for change through engagement. In reviewing and bridging varied literatures, we have surfaced gaps in understanding that our framework can help address in future empirical work.

First, the outcomes that may result through stakeholder engagement unfold over time. While this is implied, how long it takes for these changes to manifest and become observable remains an open question—one of interest to research administrators, for example, whose calls for increased engagement should be coupled with research plans capable of contributing to the evidence base for change through engagement. Future research should develop longitudinal approaches (e.g., Lewis 2007) for studying linkages across framework components to capture evidence for engagement outcomes proposed here. Novel approaches include case-comparison studies, counterfactual design studies (e.g., what would have happened if no engagement had taken place) (Wyborn et al. 2019), mixed methods research allowing for triangulating particular facets of change, and participatory approaches that contribute to both the science of engagement and stakeholder identified goals.

Second, our framework highlights the role of scalar dimensions for stakeholder engagement research. Future research should explicitly assess and seek to draw causal lines across change on individual and collective levels as well as multiple spatial and temporal scales. This will address key knowledge gaps including: learning for whom? Behavioral change at what level? Environmental change at what scale? Beyond theoretical interest, these scalar dimensions have practical importance: they can help explicitly connect individual and group capacities for managing complex environmental challenges, thus offering a vision for change that can inspire both research and praxis.

Third, our framework suggests inquiry in the limits of stakeholder engagement for addressing environmental problems (Cleaver 2001). Engagement has its challenges—including intra-community power asymmetries and (dis)trust in external institutions and actors—that can create barriers or disincentivize participation. Further, engagement may sometimes propel rather than mediate environmental degradation and create new challenges for social justice, equity, and well-being (Bluhdorn and Deflorian 2019). Future research applying this framework should investigate the bounds of stakeholder engagement as means for fostering positive social and environmental outcomes.

Fourth, literature reviewed (e.g., on collaborative governance, social learning, behavior change) for the core of our framework focuses largely on positive change, glossing over potential for negative outcomes. Future research should identify instances of both engagement successes and failures as well as blind spots and unintended outcomes

including, e.g., outcomes that stabilize inequities or anti-democratic or science denialism learning and behavioral outcomes.

Finally, we invite others to apply, critique, and extend this conceptual framework in the spirit of building a more robust and empirically grounded understanding of how and under what circumstances engagement yields social and environmental change.

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