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Pathways to Implementation: Evidence on How Participation in Environmental Governance Impacts on Environmental Outcomes

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Abstract

There is much enthusiasm among scholars and public administrators for participatory and collaborative modes of governance as a means to tackle contemporary environmental problems. Participatory and collaborative approaches are expected to both enhance the environmental standard of the outputs of decision-making processes and improve the implementation of these outputs. In this article, we draw on a database of 305 coded published cases of public environmental decision-making to identify key pathways via which participation fosters effective environmental governance. We develop a conceptual model of the hypothesized relationship between participation, environmental outputs, and implementation, mediated by intermediate (social) outcomes such as social learning or trust building. Testing these assumptions through structural equation modeling and exploratory factor analysis, we find a generally positive effect of participation on the environmental standard of governance outputs, in particular where communication intensity is high and where participants are delegated decision-making power. Moreover, we identify two latent variables—convergence of stakeholder perspectives and stakeholder capacity building—to mediate this relationship. Our findings point to a need for treating complex and multifaceted phenomena such as participation in a nuanced manner, and to pay attention to how particular mechanisms work to foster a range of social outcomes and to secure more environmentally effective outputs and their implementation.

Introduction

Confronting contemporary environmental problems, scholars and public administrators are increasingly engaging with participatory governance in order to generate and implement policy solutions (Koontz 2016; Wesselink et al. 2011). However, the actual capacity for such governance approaches to improve environmental conditions remains disputed (Gerlak, Heikkila, and Lubell 2013; Young et al. 2013). Few studies provide empirical evidence about the links between participatory processes and environmental outcomes (e.g., Biddle and Koontz 2014; Biddle 2017; Newig and Fritsch 2009a; Scott 2015), and important questions remain as to the specific mechanisms that drive these relations (Bodin 2017; Emerson, Nabatchi, and Balogh 2012; Scott 2015). Several studies provide insights into the proliferation of intermediate social and collaborative outcomes, such as conflict resolution (Emerson et al. 2009; Fisher and Sablan 2018), acceptance (Birnbaum 2016), or learning and belief change (Gerlak et al. 2018; Koebele 2015; Leach et al. 2013), suggesting that such outcomes may in turn also lead to more

environmentally effective policy solutions and improved implementation. However, little is known about whether or under what conditions this actually occurs, or how these intermediate outcomes interact. In fact, empirical research on the link between participatory governance and environmental outcomes is largely limited to single or small-N case studies.

In this study, we examine whether and how participation contributes to the environmental performance of public governance, analyzing, in particular, the mediating effect of several social and collaborative outcomes. We explore the causal paths through which different dimensions of participation (Fung 2006; Newig et al. 2018) impact differently on environmental outputs and implementation in practice. To that end, we draw on a unique dataset of 305 cases of environmental decision-making with varying degrees of public and stakeholder participation—the "SCAPE" database (Newig et al. 2013). The data was derived from a meta-analysis of published case studies (case survey), in which qualitative case study data was transformed into numeric data through a coding process utilizing a comprehensive, theoretically informed coding scheme. The method thus combines the richness of case study research with the rigor of large-N comparative analysis (Larsson 1993). We employ structural equation modeling (SEM) to test and examine the causal paths by which different dimensions of participation impact on environmental governance outputs and their implementation, mediated through intermediate social outcomes such as learning or trust building.

We expect that insights from this study will be of value for scientists and practitioners alike. Our analysis of pathways linking dimensions of participation with intermediate social and collaborative outcomes, and ultimately with environmental outcomes, provides a broader perspective on the role of participatory and collaborative approaches in the governance of environmental resources. Further, a deeper, evidence-informed understanding of such causal pathways should be of great value for organizers of participatory and collaborative decision-making processes.

The article proceeds as follows: The subsequent section lays out the conceptual foundation of this study, defining participation in public governance, identifying collaborative and intermediate outcomes, and specifying the main pathways through which these are hypothesized to improve the performance of environmental governance. The "Data and Methods" section describes our research design, the method of generating the database through the case-survey methodology, and our statistical approach to data analysis using exploratory factor analysis and SEM. In the following sections, we present and discuss our results. We close by drawing conclusions for further research and policy-making.

Concepts and Theoretical Background

Our analytical focus is on the participation of non-state actors in public environmental decision-making (which we use synonymously with environmental governance) and how these actors exchange and collaborate with governmental actors in order to reach collectively binding decisions on environmental issues. Such decision-making processes include planning, licensing, rule-making, mediation, and other forms of public policy-making. However, we do not assume decision-making processes to be generally participatory or collaborative. In fact, these may range from classical political-administrative decision-making processes to highly inclusive instances of co-governing. We are interested in *what difference* the various degrees and forms of participation and collaboration are making for environmental outcomes.

Decision-makers are often able to design the specific format and setting, including the extent to which a process is designed to be participatory and collaborative. Such design choices on governance modes are understood as strategic interventions that can help to achieve certain goals (Scott and Thomas 2017a). As an umbrella term, we use "participatory governance" to refer to "the processes and structures of public decision-making that engage actors from the private sector, civil society and/or the public at large, with varying degrees of communication, collaboration, and delegation of decision power to participants" (Newig et al. 2018, 273). We use the term "participation" to refer to the specific features and dimensions of—more or less—participatory governance that together form the set of independent variables chosen to explain environmental governance outcomes.

Below we discuss our conceptualization of the relationship between participation and environmental outputs and outcomes, and identify hypothesized causal paths via which participation is expected to improve the effectiveness of public environmental decision-making.

Participation and Collaboration in Environmental Governance Processes

In order to understand precisely how, and by what particular paths, participation influences governance outcomes, we conceptualize participation as comprising three dimensions (Fung 2006; Newig et al. 2018). First, participatory processes vary in terms of the *breadth of involvement* of stakeholders and other actors. Any given process may involve actors from government, the private sector or civil society, or from among the citizenry. These participants may comprise a relatively small group of selected experts, citizens, or representatives of organized groups, or they may comprise a wide cross-section of the general public. Second, processes differ in the nature and intensity of *communication*

among participants (Rowe and Frewer 2005). In terms of communicative dynamics, processes may exhibit one-way flows of information in the case of information provision or consultation processes, or by more intensive two-way exchange of information supporting collaborative dynamics. Third, participation can imply more or less delegation of decision-making power to participants (Arnstein 1969). *Power delegation* here refers to the extent to which participants can influence the decisions to be taken and the outputs produced.

Hypothesized Pathways From Participation to Environmental Outputs and Implementation

Figure 1 represents our conceptual model of the relationships between participation and environmental governance outcomes. The three dimensions of participation outlined above figure as independent variables, which are assumed to produce a number of intermediate social outcomes, and eventually environmental outcomes.

Analytically, we distinguish between the governance output, a set of intermediate social outcomes as well as acceptance and implementation of the governance output. A *governance output* is usually produced at the conclusion of a (participatory) decision-making process, and comprises a collectively-binding decision, program or plan. Depending on the provisions and measures contained in the governance output, this decision can embody a higher or lower *environmental standard*, that is, implying various consequences for the environmental problem at hand, ranging from tolerating severe environmental degradation to strong environmental improvements. Putting this governance output into action is understood as *implementation* (van Meter and van Horn 1974). This involves both the translation of more abstract programs into operational rules and measures, as well as compliance in the sense of "the specific obedience or lack thereof to a law or directive" (van Meter and van Horn 1974, 454). Environmental standard of the output and implementation together form what we broadly term "environmental outcomes" of governance.

Acceptance of the governance output provides an important link between governance outputs and implementation (Newig et al. 2018). On the one hand, acceptance means a reduction in opposition to a decision. Decisions arrived at through participatory processes, especially through successful negotiations, may reduce the risk of noncompliance and open opposition (e.g., through litigation), thereby facilitating implementation (Bulkeley and Mol 2003; Innes and Booher 1999); on the other hand, acceptance, particularly in contexts with high social capital, will increase the likelihood of implementation as stakeholders may be motivated to comply with or even (co-)implement decisions (Layzer 2002). As such, acceptance is understood to play multiple roles, as a component of the quality of the governance output and a means towards swift implementation.

The links between participation and environmental governance outcomes are mediated and shaped by intermediate outcomes on an individual or collective level that are assumed to foster improved decision-making and implementation. These *intermediate social outcomes*, such as social learning (Heikkila and Gerlak 2013) or conflict resolution (Emerson et al. 2009; O'Leary and Bingham 2003), constitute causal steps linking participation to the environmental standard of the output, its acceptance and its implementation. Drawing on the literatures on participatory and collaborative governance, we identified the following intermediate outcomes as relevant to the environmental standard of the output and its implementation: Social learning and individual capacity building; identification of mutual gains for participants and conflict resolution; trust building and development of shared norms; and network formation.

Social Learning and Capacity Building

Scholars of social learning broadly perceive learning to take place both on the individual and the collective level (Gerlak and Heikkila 2011; Reed et al. 2010). On an individual level, participants in a decision-making

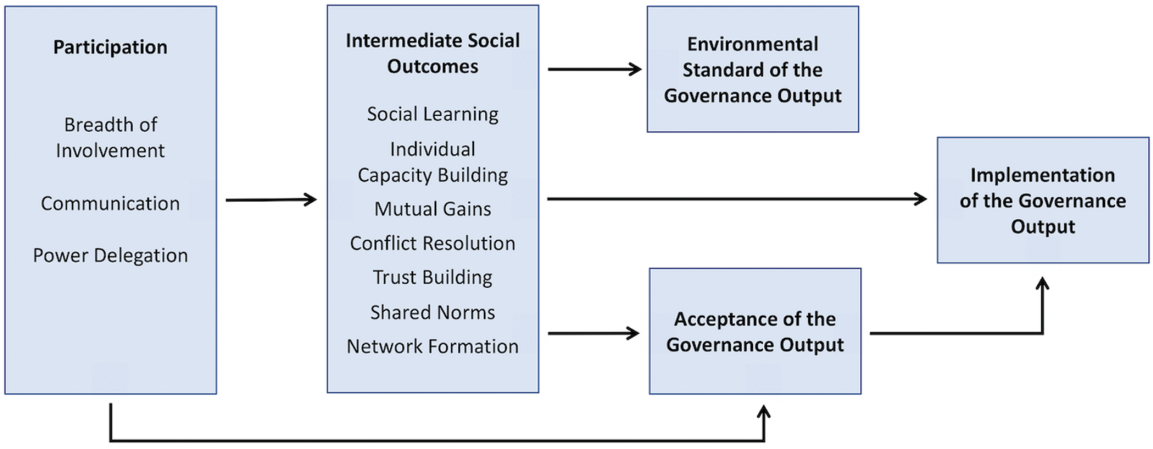

Figure 1. Conceptual Model Linking Participation to Outcomes.

process may acquire new information from within or from outside of the group, and translate this into new knowledge applicable to the issue at hand (Heikkila and Gerlak 2013). Deliberative processes and open dialogue among a broad range of actors play a particular role in this, as individuals are exposed to different kinds of knowledge (Lejano and Ingram 2009), such as lay-local, or context-dependent expert knowledge (Kochskämper et al. 2016). Through the incorporation of this knowledge, which can also relate to new transferrable skills and procedural capacities for participating in public decision-making processes more generally (Emerson and Nabatchi 2015), participants may be empowered in their capabilities to understand the problems at hand, to provide relevant input and "act collectively to implement change" (Beierle and Cayford 2002, 13).

Social learning goes beyond the individual and involves a group process of dissemination where knowledge becomes shared knowledge situated within a wider group (Heikkila and Gerlak 2013; Reed et al. 2010). The exchange of knowledge, ideas, and perspectives within a group can build a shared understanding, allow better diagnosis of the problem at hand, or transform views and beliefs via critical reflection, which in turn might prove beneficial for creating joint purpose and collective action (Emerson and Nabatchi 2015; Muro and Jeffrey 2012; Van Bommel et al. 2009). In this process, again dialogue and information exchange among a wide array of stakeholders usually play an important role.

Collective learning processes may impact positively on the environmental standard of the output through the shared knowledge attained in this way, but also through the emergence of new and innovative solutions (Fazey et al. 2012; Mandarano 2008). On the basis of enriched knowledge and a shared understanding of the ecological and social environment, the competencies of stakeholders and society more widely may be enhanced, along with their ability to contribute to collaborative decision-making, problem solving, and implementation of solutions. In this way, learning and capacity building has the potential to improve the environmental standard of governance outputs and collective action (Beierle and Cayford 2002).

Mutual Gains and Conflict Resolution

Participation may provide an institutional space allowing for intensive communication and negotiation among concerned stakeholders that can help identify *positive-sum solutions* (Delli Carpini, Cook, and Jacobs 2004). Transparent exchange of priorities and interests through intensive dialogue in relation to an issue may result in improved mutual understanding of respective stakes and preferences, and the identification of common ground among participants (Ansell and Gash 2007; Emerson and Nabatchi 2015). "Win-win" solutions, in the sense of Pareto-optimal adjustments that make no party worse off, may emerge and may be reflected in the governance output. Such solutions can include measures providing for compensation to those who would otherwise suffer losses, including side payments with regards to other issues and competing interests that are party to the process or not, as well as to future decisions and options (Wondolleck and Yaffee 2000). Hence, discretion to actually shape the content of resulting agreements is a precondition for mutual gains to be meaningfully negotiated.

Closely related to the identification of mutual gains and win-win solutions are processes of mediation and *conflict resolution* in participatory settings (Emerson et al. 2009; O'Leary and Bingham 2003). Where participation and exchange are supported by professional facilitation or mediation, participants may be enabled to exchange arguments and positions, identify common understandings, values and priorities, to overcome or at least address protracted conflicts (Emerson et al. 2009). This can prove instrumental in breaking stalemates and enabling more constructive, collaborative interaction, and genuine cooperation towards a solution that is acceptable to all parties (Dukes 2004).

Compared to a non-negotiated outcome, a "win-win" solution derived through negotiation or conflict resolution can be regarded as an improved allocation of the resources at stake, with benefits for all or many of the affected parties, including the environment (Brody 2003). Such a solution may also foster acceptance of the negotiated output, as ultimately participating parties will be better off than they would without the agreement (Susskind, McKearnan, and Thomas-Larmer 1999), which is, in turn, likely to have a positive effect on its implementation.

Building Trust and Shared Norms

While learning and win-win solutions may provide an immediate benefit for the environmental standard of governance outputs, the strengthening of trust and development of a shared sense of purpose through participation may rather be seen as a foundation underpinning successful environmental governance (Bryson, Crosby, and Stone 2006; Getha-Taylor et al. 2018).

Many argue that *trust* is a key outcome of collaboration in participatory processes (cf. Emerson, Nabatchi, and Balogh 2012; Siddiki, Kim, and Leach 2017). At the same time, trusting relationships are seen as the "lubricant and the glue—that is, they facilitate the work of collaboration and they hold the collaboration together" (Bryson, Crosby, and Stone 2006, 47). It has even been argued that all factors enabling effective participatory processes can ultimately be reduced to trust (Senecah 2004). Trust is built through repeated interaction and reciprocation, such as through sharing of

information, and underpinned in particular by communication (Albrecht and Travaglione 2003; cited in: Getha-Taylor et al. 2018). Establishing trust may serve to moderate interpersonal behavior, strengthen confidence in partners' competences, and generate mutual understanding and commitment, which in turn facilitate further collaboration and exchange (Chen and Graddy 2010). Ultimately, these benefits may add to the legitimacy of processes and generate collective commitment for action (Emerson, Nabatchi, and Balogh 2012).

On a more fundamental level, sustained interaction and common experiences among those engaged in participatory processes can lead to the development or strengthening of *shared values and norms* conducive to collaboration and reciprocity (Oh and Bush 2014; Thomson and Perry 2006).

The building of trust and shared norms is believed to contribute to solving environmental problems as it creates a shared sense of purpose and provides favorable conditions for effective problem solving (Connick and Innes 2003; Heikkila and Gerlak 2013; Oh and Bush 2014), and acceptance of the final decision (Webler and Tuler 2000), ultimately facilitating collective action among actors (Ostrom 1990).

Building of Networks for Collaboration

Repeated interaction and intensive communication within a participatory process fosters the development of more stable relationships among actors that may lead to the formation or strengthening of *governance networks* (Isett et al. 2011; Klijn and Koppenjan 2016). These networks allow participants and stakeholders to realize common interests and share knowledge (Oh and Bush 2014), and ultimately to engage in collective action and joint problem solving (Innes and Booher 2004; Sayles and Baggio 2017).

In this way, networks may prove instrumental for realizing some of the above-mentioned intermediate outcomes, but they can also spark problem solving and collective action in other ways. They provide the structural means for social learning (Newig, Günther, and Pahl-Wostl 2010), conflict resolution (Klijn, Steijn, and Edelenbos 2010), and trust building (Schneider et al. 2003), and in this way mobilize and exchange resources between dispersed actors, and produce robust solutions to complex problems through collective innovation (Hartley, Sørensen, and Torfing 2013). Networks can further aid implementation and compliance through monitoring, and providing a web of social control to aid collective action and detect noncompliance (Alexander et al. 2018; Leach and Pelkey 2001).

While these intermediate outcomes describe distinct pathways to effective environmental governance, we do not assume that they work in isolation. Instead, it can be assumed that they form a web of interlinkages influencing each other (cf. Newig et al. 2018). Our empirical analysis will address the interrelations and patterns of co-occurrence among these factors.

Data and Methods

Data: Case-Survey Meta-analysis

Data for this analysis is derived from a case-survey meta-analysis of 305 cases of public environmental decision-making, for which published case studies are available.[1] This type of case study meta-analysis (case-survey method) (Larsson 1993; Newig and Fritsch 2009b) entails the interpretation of narrative case studies and the conversion of the rich qualitative information therein into quantitative data. The method is particularly apt for our research aims, as it allows to synthesize emergent findings in a field where existing empirical evidence is mainly restricted to single or small-N case studies.

In line with our conceptual understanding above, we define a "case" as a public environmental decision-making process oriented towards reaching a collectively binding decision. A case can be to a lesser or greater extent participatory, ranging from classical political-administrative decision-making to highly inclusive instances of collaborative co-governing. However, as they provide only formalized choice and limited room for participation, we excluded pure elections and referendums. We also excluded acts of protest and unrest without constructive attempts for collective decision-making.

In order to be able to test specific hypotheses on the links between participation and environmental outcomes, we quantify for each case (1) the "degree" of participation and (2) the environmental standard of the output, each in multiple dimensions and thus via a number of different variables. In addition, we capture a range of intermediate social outcomes, implementation-related aspects.

In conducting the case-survey, we took the following steps:

1. *Case study identification and selection:* We conducted a thorough search of several online scientific databases and library catalogs[2] for studies published up until 2014 in English, German, French, or Spanish language, which describe binding environmental decision-making processes characterized by varying degrees of

1 Data available upon request from J. Newig (newig@uni.leuphana.de).

2 Sources searched include: BASE; Google Books; Google Scholar; GVK+; Science Direct; SciVerse Hub; Scopus; SpringerLink; SSRN; Web of Science; Wiley Interscience.

public or stakeholder participation, including non-state actor initiated as well as agency-initiated processes. We limited our search to cases from Europe, North America, and Australia and New Zealand. This was done in an attempt to hold the political-cultural context of collaborative governance constant to a certain degree, focusing on western, democratic countries. The assumption behind this was that the scope of participation, and the uptake of governance outputs, would vary considerably across very different political systems and cultures. We utilized multiple combinations of diverse search terms, in several iterations, in order to capture as complete a range of processes studied from a variety of disciplinary perspectives. We searched for environment-related terms (e.g., ecosystem-based; landscape management; wetlands; waste-siting), for participatory governance-related terms (e.g., collaboration, participatory, decision-making, deliberation, stakeholder involvement, controversy, planning) and for concrete process forms (e.g., citizen jury, public hearing, town meeting, task force, consensus conference) in various combinations. We targeted a variety of publication types, including peer-reviewed journal articles, books, edited collections and chapters therein, theses, working papers, conference papers, reports and other forms of gray literature, so long as these were publicly available. This variety of publication sources is recommended as a means to mitigate publication bias and the over-representation of "success stories" (Banks, Kepes, and McDaniel 2015; Mahood, Van Eerd, and Irvin 2014).[3] The search identified over 2,000 cases, described in more than 3,300 texts. Having continued the search to the point of saturation where no new cases were being discovered with any new search effort, we assume that we have covered a nearly complete set of relevant, publicly available, published cases. These were screened for suitability, and those containing insufficient information for our purposes were eliminated. From the resulting database of 639 "codeable" cases we randomly sampled 305 cases for full coding. Figure 2 summarizes the case identification and selection process. Cases in this database range from standard administrative decision-making to highly inclusive and collaborative processes, and cover 22 western democracies, mostly from across North America and Europe. Cases include a wide range of environmental issues, including land use, biodiversity, and freshwater resources, but also particular topics such as waste facility siting, transport infrastructure, and energy planning. Further details and descriptive statistics on the database of 639 cases, as well as the 305 cases of this sample, can be found in the Supplementary Material.

2. *Coding scheme development:* We developed a coding scheme (Newig et al. 2013) on the basis of our conceptualization of participatory decision-making processes (described above), and the hypothesized links between process attributes, environmental outputs, social outcomes, and implementation, as well as relevant contextual variables. These components were broken down into multiple variables—259 quantitative, and additional qualitative variables—each with an accompanying measurement scale and detailed coding instructions. Most variables were coded on a five-point quantitative scale (from 0 to 4). In addition, each variable was assigned a second code capturing the reliability of the information (from 0 to 3) upon which the coding decision was based.
3. *Case coding:* Each case was independently read and coded by three trained raters. Three raters were deemed sufficient to achieve high data quality (Libby and Blashfield 1978). Apart from the actual codings, raters specified for each variable the reliability of the information underpinning their coding decision, using a 3-point scale (with 1 indicating enough information for an informed guess, and 3 indicating explicit, detailed and reliable information) (Newig et al. 2013).[4] After initial coding, raters met to address technical errors and explore divergent interpretations; however, raters were explicitly not asked to force convergence or consensus. In this way, the method accommodates different interpretations of the texts by individual raters (Kumar, Stern, and Anderson 1993). Despite this explicit allowance of divergent codings, data validity is considerably high: interrater reliability,

3 As a robustness check in this respect, we repeated our analysis excluding all cases that solely relied on gray literature. Results remained stable.

4 Variables were also allowed to be coded as "missing data." Through separating variable coding and information reliability, we intentionally aimed to prevent the assessment of the actual variable being influenced by the detail of the underlying case information.

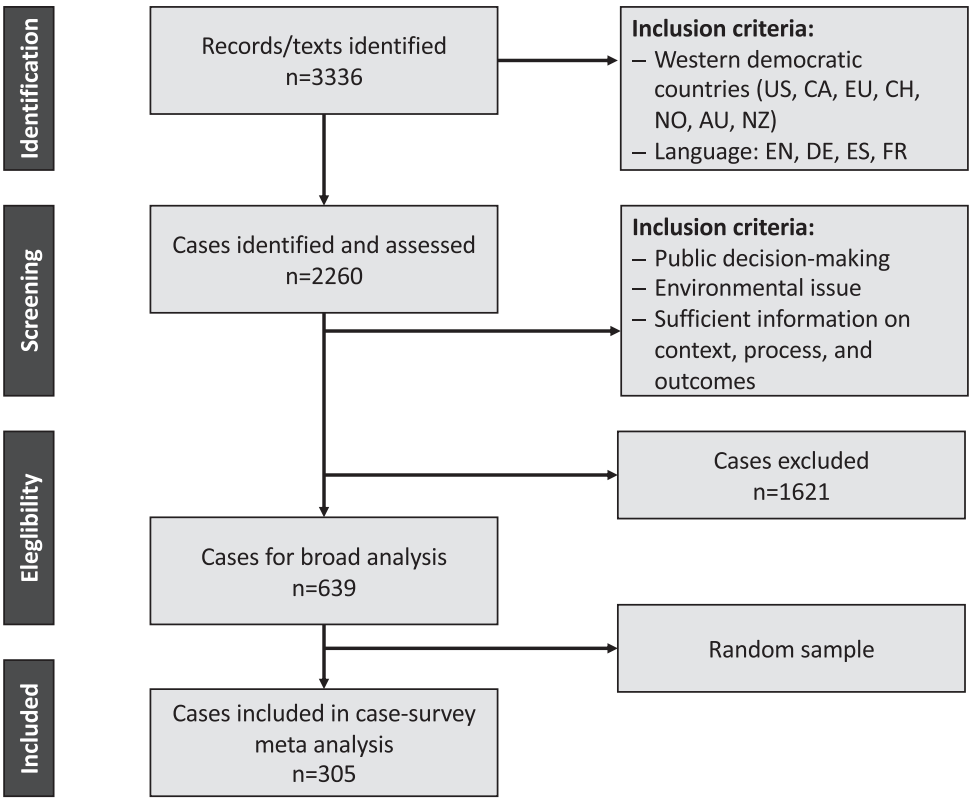

Figure 2. PRISMA Flowchart of Case Identification and Selection (Moher et al. 2009). Country codes: AU = Australia, CA = Canada, CH = Switzerland, EU = European Union member states (including United Kingdom), NO = Norway, NZ = New Zealand, US = United States; Language codes: DE = German, EN = English, ES = Spanish, FR = French.

measured through $G(q,k)$ (Putka et al. 2008) lies at 0.79, whereas interrater agreement (r_{WG}, James, Demaree, and Wolf 1984) was at 0.79.

4. *Data preparation:* Beyond the calculation of interrater reliability, we explored our data for the influence of distorting factors, such as the influence of rater drift or publication type (Jager et al. 2015). As we did not detect any undue distorting effects, we prepared the final dataset by aggregating raters' variable assessments, using information reliability-weighted means (Van Bruggen, Lilien, and Kacker 2002). The resulting dataset forms the basis for the analysis conducted here.

Specification of Variables

Independent Variables

As outlined in section 2, we understand participation as a three-dimensional construct comprising communication, the breadth of public and stakeholder involvement, and power delegation. These dimensions serve as independent variables for our analysis.

We measure the involvement of non-state actors as the average representation of civil society actors, private business actors, and individual citizens in a given case. Detailed definitions of all variables together with some descriptive statistics are given in table 1.

In our measurement of communication, we rely on the distinction between one-way communication flow from and to participants, and two-way dialogue between organizers and participants, and among participants. Each of these variables was measured on a 0 to 4 scale, with 0 meaning no such communication took place, and 4 indicating a maximum degree of communication in this sense. These three variables were then aggregated into a single, composite scale ($\alpha = .91$) by means of a principal component analysis (PCA, factor loadings were .93, .91, and .91, respectively) to be used in the subsequent analyses.

Finally, power delegation to participants was measured through the "*degree to which the process design provided the possibility for participants [...] to develop and determine the output*" (Newig et al. 2013, 37), for which we also employed a 5-point scale as calibrated above.

Dependent Variables

Our main dependent variables are the environmental standard of governance outputs and the implementation of outputs. The output of a governance process refers to the decision made, typically set down in

Table 1. Description of Intermediate Social Outcome Variables

Variable Name	Description	Scale	Mean (SD)
Participation			
Representation	Extent to which the composition of participants in the process mirrors the interest constellation in the public. Full representation is reached when there are a sufficient number of representatives and when those representatives are fully accepted as such by their constituencies.	0–4	1.06 (0.51)
Communication: Information	Degree to which participants [...] received all relevant information (i.e., actual flow of information in the direction of participants), in relation to the amount of information the process organizer had or could easily access.	0–4	2.36 (0.85)
Communication: Consultation	Degree to which participants [...] gave all the input they considered relevant.	0–4	2.45 (0.81)
Communication: Dialogue	Degree to which a two-way dialogue and information flow, and direct interaction among participants and between participants and the process organizers, took place. Dialogue implies more than just extensive communication and/or consultation but requires responsive on-going interaction, so that the relevant information is exchanged (i.e., assumes the possibility to ask questions and respond to comments).	0–4	2.23 (0.96)
Power Delegation	Degree to which the process design provided the possibility for participants [...] to develop and determine the output.	0–4	1.90 (1.11)
Intermediate Social Outcomes			
Social Learning	Degree to which participants, stakeholders or broader society learned about the issue such that they gained new or improved understanding or knowledge of the issue, enabling them potentially to contribute to future joint problem solving efforts ("social learning" in the sense of Reed et al. (2010)).	0–4	1.83 (0.80)
Individual Capacity Building	Degree to which the skills and capabilities of individual participants or stakeholders were enhanced through involvement in or engagement with the decision-making process. These skills and capabilities may be specific to the issue at hand, or incidental and applicable to a range of social situations.	0–4	1.54 (0.82)
Trust Building	Degree to which trust relationships were created or strengthened among participants (and potentially beyond), which can be expected to "facilitate coordination and cooperation for mutual benefit" (Putnam 1995: 67, see also Ansell and Gash 2007). "Trust is the willingness to accept vulnerability based on positive expectations about another's intentions or behaviors" (McEvily, Perrone, and Zaheer 2003).	–4–4	0.59 (1.40)
Network Formation	Degree to which social networks were created or built up (or undermined) among participants and beyond […]. Networks are defined here in the sense of social capital building, which can be expected to "facilitate coordination and cooperation for mutual benefit" (Putnam 1995: 67) regarding capacity to address the problem or similar issues	–4–4	1.11 (0.92)
Building Shared Norms	Degree to which social capital among participants (and potentially beyond) was created or strengthened in the sense of "informal values or norms shared among members of a group that permit cooperation among them".	–4–4	0.59 (0.78)
Conflict Resolution	Degree to which an existing conflict was resolved or worsened or a new conflict developed, considering also the nature of change in any preexisting conflict of values and/or distribution.	–4–4	0.68 (1.42)
Mutual Gains	Degree to which win-win solutions were developed during the decision-making process (i.e., degree to which the output provided mutual gains). Win-win (or Pareto optimal) solutions are those that provide gains (or at least: no losses) to all involved parties. These are always positive-sum solutions compared to the non-collaborative alternative. Win-win solutions include solutions where compensation is provided to those who would otherwise suffer losses. Win-win solutions are not necessarily limited to the environmental issue at hand, but may be linked to alternative issues and competing interests on and off the table, as well as to future decisions (Wondolleck and Yaffee 2000, 50).	0–4	1.46 (0.95)

Table 1. Continued

Variable Name	Description	Scale	Mean (SD)
Outcomes			
Environmental standard of the output	Degree to which the environmental output aimed at an improvement (or tolerated a deterioration) of environmental conditions [...]. This is to be assessed moving from the "business as usual" scenario (projected trend) towards a hypothetical "optimal" (or "worst case") condition.	–4–4	0.85 (1.34)
Acceptance	Did stakeholders oppose, accept or support the decision? 0= opposition, or acceptance with reservations; 1= acceptance and support of decision This variable is an average over all stakeholders identified in the case.	0–1	0.63 (0.28)
Implementation	Degree to which environmental outputs [...] were being (or would most probably be) implemented, taking into account everything we know from the case material. Implementation - as opposed to compliance - means putting a more abstract plan or rule into operation by making it more concrete or developing specific measures (i.e., implementation is a process). This is typically done by government sector actors.	0–4	2.79 (0.85)
Compliance	Degree to which environmental outputs were being (or would most probably be) complied with, taking into account everything we know from the case material. Compliance - as opposed to implementation - means to do what the rule prescribes (rule conformity). This includes more or less simple tasks, including to refrain from doing something. Whereas implementation implies actively (and creatively) designing a solution, compliance simply means adherence to the rule (i.e., compliance is typically a single or repeated action, rather than a process)	0–4	2.67 (0.81)

Note: Definitions are derived from Newig et al. 2013. The right-hand column displays the arithmetic mean overall cases, with SD in parentheses.

writing, in the form of a management plan, a permit, a law, etc. In case of multiple outputs, the "final decision" discussed in the case material is identified as the most legally binding output described, excluding subsequent changes through litigation. In 286 of 305 cases, decision-making produced an output, and in 19 it did not. Only for these 288 cases were output variables coded.

Comparing the environmental standard of governance outputs across a variety of processes and contexts is not straightforward and inevitably requires a degree of abstraction in order to be able to compare across a variety of cases covering different sectors. We treat environmental standard as analogous to "regime effectiveness" as conceptualized by Underdal (2002), who proposes to evaluate regime effectiveness against a hypothetical collective optimum, "one that accomplishes [...] all that can be accomplished—given the state of knowledge at the time" (Underdal 2002, 8). In this vein, we defined the environmental standard of the output as the "*Degree to which the environmental output aimed at an improvement (or tolerated a deterioration) of environmental conditions [...]. This is to be assessed moving from the 'business as usual' scenario (projected trend) towards a hypothetical 'optimal' (or 'worst case') condition*." (Newig et al. 2013, 49). We measured this variable on a scale for –4 to 4, where 0 meant no divergence from a hypothetical business-as-usual scenario, whereas –4 implied that the governance output under consideration corresponded to a "worst-case" scenario, and 4 to a hypothetical optimum. Hence, we do not measure absolute "progress" towards environmental goals—even in a business-as-usual scenario, environmental improvements are possible. We are interested in the effect of governance interventions and the question of what difference they make.

The advantage of this approach, comparing the baseline standard of the business-as-usual scenario with the optimal (or worst) case scenario to assess the degree and direction of change, is that it offers a coherent means to gauge environmental effectiveness across multiple contexts. However, there are several drawbacks (see also Underdal 2004): First, estimating both standards is not trivial, but requires informed extrapolation and a good understanding of the context of the case. We tried to mitigate this challenge and improve reliability and intersubjectivity by requiring raters to discuss and agree on the baseline standard before assessing environmental standards of the output. Further, while it is important to consider both standards, they are not necessarily independent. Using one implicitly means also making assumptions about the other. For example, claiming that something improved implies a

notion of what constitutes positive change. This may also mean that a favorable business-as-usual scenario narrows the space for improvements. However, while it is pertinent to consider these challenges and limitations, the approach appears useful here, as it is explicitly geared towards assessing the environmental effectiveness of specific governance interventions and comparing these across a variety of cases and contexts.

In order to allow for some nuance within what is commonly regarded as "environmental protection," we distinguish two dimensions of environmental output standard: a more eco-centric perspective of *conservation* and a more anthropocentric perspective of *natural resource protection*. The former we define as aiming "to preserve, protect or restore the natural environment and ecosystems [...] largely independently of their instrumental value to humankind" (mean = 0.74). The latter is defined as aiming "to protect, preserve, enhance or restore stocks and flows of natural resources that are of instrumental value to humans, and provide for their sustainable use" (mean = 0.96; Newig et al. 2013, 10). As both dimensions were highly correlated ($r = 0.89$, $p < .001$), they were averaged to form a single scale ($\alpha = .94$). In the following, we will call this variable *Environmental Standard of the Output*; it has an observed range from −3.36 to + 3.25, with a mean value of 0.85.

Implementation, as understood here, includes, on the one hand, the process of putting a more abstract plan or rule into operation by developing concrete measures, and on the other hand, rule conformity on the part of implementing actors. Both dimensions were measured separately and compiled (PCA) into an aggregated scale ($\alpha = .86$).

For the measure of acceptance, we asked whether stakeholders accepted the governance output. This variable represents the average acceptance judged across all stakeholder groups identified within the case.[5]

Intermediate Outcomes

Variable description, measurement scales, and some descriptive statistics on the intermediate outcomes, identified in section 2, are shown in table 1.

Data Analysis

To address our research question of how participation contributes to the environmental performance of governance and through which pathways intermediate outcomes shape this relationship, we combine exploratory factor analysis with SEM (for a similar approach, see Bollen 2000; Thomson, Perry, and Miller 2009).

As outlined above, we assume that intermediate social outcomes do not develop in isolation but form a complex web of mutual support and interlinkages. Our data supports this claim, with correlation coefficients between our seven intermediate social outcomes scoring between 0.29 and 0.78 (mean = 0.55). In order to reduce the dimensionality among these seven variables, we conduct an exploratory factor analysis. To derive an adequate number of factors, we inspected the scree plot of eigenvalues and ran a parallel analysis (Hayton, Allen, and Scarpello 2004), which suggested two factors. As it is reasonable to assume mutual relations among the two resulting factors, we use oblique rotation (*oblimin*), which allows factors to be correlated. The resulting latent variables (factors) were then used for subsequent analysis.

One of the particular methodological challenges of the conceptual model outlined above is that we assume indirect and mediated relationships between variables. Such relations can easily be overlooked in standard regression analysis. Hence, we rely on SEM that explicitly allows for testing such relationships. We employ a piecewise SEM approach (Lefcheck 2016; Shipley 2009), which shifts from a global model estimation, where all equations are solved simultaneously, to local estimation solving each equation separately. This allows for fitting a wide range of distributions and sampling designs, and smaller data sets, and further incorporates an exploratory component as the local estimation helps to identify misspecifications and overlooked paths. In this way, it serves our purpose in combining theoretically informed path analysis with an exploratory component to detect new and unexpected relations.[6] Finally, to test the robustness and assess global fit, we reconstruct the final model, including the factor analysis, using a global estimation approach.[7]

Results

Specifying Intermediate Outcomes

Through the exploratory factor analysis, we derived two factors as adequate representation of the intermediate outcome variables. The results of this analysis, including reliability values, are depicted in table 2.[8]

5 This variable represents a dichotomization of a previously 3-point variable, distinguishing between opposition, acceptance despite some reservation, and full acceptance and support. However, as this more detailed scale has resulted in highly skewed distributions, we considered this scale to be less reliable and opted for a conservative re-coding of our data.

6 One limitation of the approach is that it does not allow for latent variable modeling, hence, we add the latent variables we derived from the exploratory factor analysis separately as such.

7 This global model may be found in the Supplementary Material.

8 The Kaiser-Mayer-Olkin index verified the sampling adequacy (KMO = 0.86, i.e., "meritorious"). Bartlett's test for sphericity also indicated that correlations were sufficiently large ($\chi^2(21) = 1{,}322$, $p < .001$).

Table 2. Intermediate Social Outcomes—Results of the Exploratory Factor Analysis, Oblique Rotation (Oblimin), Factor Loadings >.4 or <–.4 in Bold

	Factor 1	Factor 2
Variable	"Convergence of Stakeholder Perspectives"	"Stakeholder Capacity Building"
Conflict Resolution	**0.93**	–0.11
Trust Building	**0.84**	0.14
Mutual Gains	**0.73**	–0.03
Building Shared Norms	**0.58**	0.29
Individual Capacity Building	–0.04	**0.92**
Social Learning	0.08	**0.77**
Network Formation	0.12	**0.58**
Eigenvalues	2.63	2.06
Per cent of variance	0.38	0.29
Reliability (Cronbach's alpha)	0.89	0.83

The analysis revealed two distinct but correlated factors (table 2). Factor 1 mainly includes the variables Conflict Resolution, Trust Building, Identification of Mutual Gains, and Building Shared Norms, whereas Social Learning, Individual Capacity Building and Network Formation score high on Factor 2. Factor 1 underlies those variables that express the degree to which actors' viewpoints, values and mutual understanding in a decision-making process converge or diverge. We label this latent variable "*Convergence of Stakeholder Perspectives*." The second factor underlies the variables which relate to the extent to which participants learn and build capacities during the process, and the extent to which networks conducive to resolving the issues at hand are built (or deteriorated). All of these variables are strongly associated with the concept of individual social capital (Portes 2000). Social capital supposedly enables actors to more meaningfully participate in decision-making processes, to defend their own interests, but also to contribute to joint problem solving and implementation of agreed outputs. We, therefore, term this variable "*Stakeholder Capacity Building*."

With these newly derived factors, we refine our conceptual model for specification in the subsequent SEM analysis (figure 3). We assume that the factors serve as intermediate variables, mediating the effects that the three dimensions of participation will have on governance outputs, their acceptance and implementation.[9]

9 A graphical representation of the model equations can be found in the Supplementary Material.

SEM Analysis

On the basis of this revised conceptual model, we ran a piecewise SEM, also exploring plausible alternative pathways between participation and governance performance beyond the ones identified in this conceptual model. This exploratory phase, relying on local estimation, suggested only one additional path to the model, namely the direct link between Power Delegation and the Environmental Standard of the Output.

The structural model (N = 204)[10] demonstrates a good fit. The robust root mean square error of approximation (RMSEA) was 0.02, which is below the cutoff value of 0.06 (Hu and Bentler 1999). Robust comparative fit index (CFI) of 0.997, Tucker-Lewis index (TLI) of 0.992 and a χ^2 value of 9.621 (p = .38) indicate a satisfactory fit. Overall, the model explains between 8 and 37% of the variance in the intermediate and substantive outcomes.[11] The final result is displayed in figure 4.

Results highlight that the three dimensions of participation show varying effects on intermediate outcomes and environmental performance overall. Strong effects can be observed for communication on both convergence of stakeholder perspectives (β = .32, p < .001), and stakeholder capacity building (β = .34, p < .001). The representation of non-state stakeholders and power delegated to participants, on the other hand, only show a moderate significant effect on stakeholder capacities (β = .21, p = .003), whereas power delegation shows a slightly higher effect on the convergence of perspectives (β = .29, p < .001).

The environmental standard of the output is, in turn, only significantly positively influenced by convergence of stakeholder perspectives (β = .21, p = .02), but not by the stakeholder capacities built up within the process. Also, the indirect effect of stakeholder capacity building through the highly correlated convergence of perspectives is rather weak (indirect effect = .11, p = .04).[12] The highest values were identified for the direct, unmediated effect of power delegation

10 Smaller N results from missing data, especially for the implementation variable. We checked the results for robustness in this respect, by running the model without implementation. Results remained stable.

11 The reported fit measures were derived through global, robust estimation in R with the package *lavaan* using the same data as in the piecewise SEM. Additionally, as a robustness check, we re-ran the model through global estimation, also replicating the results of our exploratory factor analysis through a confirmatory factor analysis approach. The resulting model had an RMSEA of 0.06, a CFI of 0.96, and a TLI of 0.95, indicating an overall satisfactory model fit. χ^2 was at 87.56 (p = .001) though, suggesting a poor model fit, but this is less important in larger samples. Also, beta coefficients and R^2 in the resulting model were very similar to those derived through our initial approach, which together support the robustness of our results. This model is added to this article in the Supplementary Material.

12 Indirect effects were assessed using the recommended bootstrapping approach (Zhao, Lynch, and Chen 2010).

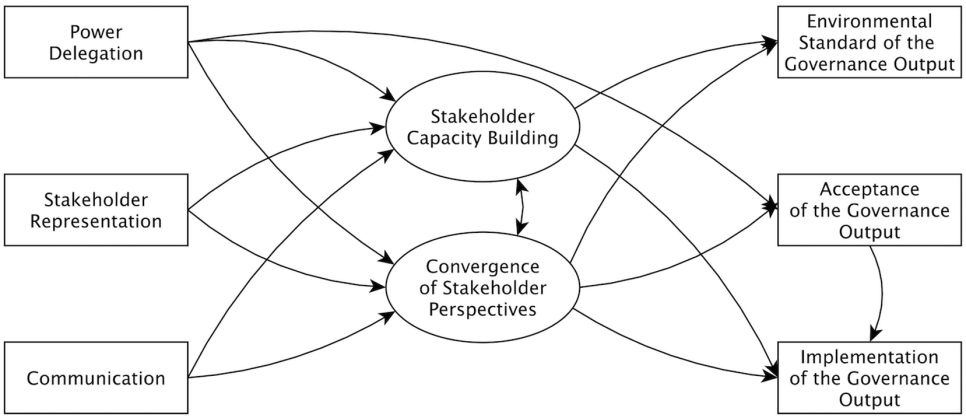

Figure 3. Conceptual Model Linking the Three Independent Variables (Dimensions of Participation, on the Left-Hand Side) to the Intermediate Social Outcomes (Derived From the Exploratory Factor Analysis), and both to the Three Dependent Variables (Right-Hand Side).

on the environmental standard of the output (β = .32, $p < .001$), indicating that there are more ways in which empowering participants improves the environmental output beyond the particular pathways we tested here. In this vein, we also tested the indirect effects for the other dimensions of communication and stakeholder representation through both our intermediate factors. Both cumulated indirect effects are very small (indirect effect of communication = .10, $p = .01$; indirect effect of stakeholder representation = .04, $p = .06$).

The acceptance of the environmental output proves to be strongly connected to the convergence of stakeholder perspectives (β = .51, $p < .001$) attained during the process, indicating that collaborative outcomes affect both the content and the political fate of environmental governance outputs.

Finally, the only factor with a significant effect on implementation is the degree of acceptance of the governance output (β = .22, $p = .01$). Convergence of stakeholder perspectives shows only an indirect effect, which is small but significant (indirect effect through acceptance = .10, $p = .03$). However, with an R^2 of 0.08, the explanatory power of our model is rather low in this respect, suggesting that there may be different factors at work when it comes to translating political plans and programs into action.

Discussion

With this analysis, we set out to shed light on underexplored links in the study of participation and environmental governance, namely on the question of *how* participation may enhance the performance of environmental governance and which role intermediate social outcomes play in this relationship.

First, we assessed the interlinkages among intermediate outcomes, resulting in two aggregate factors, one underlying stakeholder capacities built up during a decision-making process (including capacity building, social learning and network formation), and one indicating the convergence of stakeholder perspectives developed among participants and beyond (conflict resolution, trust building, mutual gains, building shared norms). This analysis highlights, as expected, that intermediate outcomes are interlinked and clustered. Yet, the way these variables clustered was not fully expected. Network formation, that is, establishing structural ties among actors, appears to co-vary strongly with learning outcomes, rather than with factors of social convergence such as trust or shared norms. This emphasizes the important role of structural aspects of connectivity in the process of collective learning, but also is in line with the notion of learning as an increase in the number and density of connections in an actor network (Newig, Günther, and Pahl-Wostl 2010). At the same time, more tangible benefits of conflict resolution and mutual gains appear in the same factor with cognitive aspects of social capital, building of trust and social norms. This result is in line with much of the literature on conflict mediation, which maintains that trust and capacity for collaboration are an essential component and result of conflict resolution (Emerson et al. 2009; Innes and Booher 1999).

Using SEM, we traced the pathways between participation and environmental effectiveness, using the two intermediate social outcomes as mediating variables. Overall, results support the general hypothesis that participation positively influences the environmental standard of governance outputs, both directly and mediated through intermediate outcomes. On closer inspection, it becomes apparent that only specific aspects of participation appear as strong predictors for specific outcomes, whereas for others no evidence could be found. In line with our conceptual assumptions, communication proves to be a strong influencing factor for both intermediate outcome factors, highlighting the central role of exchange among stakeholders for arriving at negotiated outcomes,

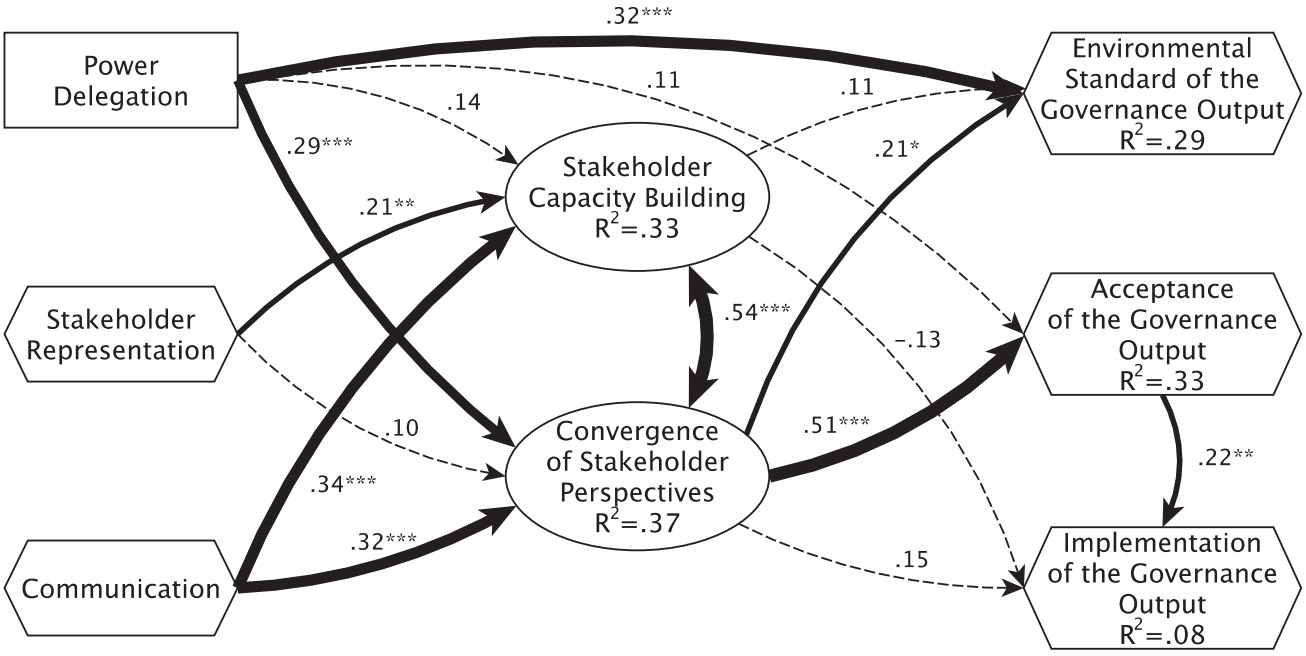

Figure 4. Structural Equation Model Results. *Note*: Rectangles Represent Measured Variables, Ellipses are Latent Variables, and Hexagons Represent Composite Variables. Arrows Depict (Standardized) Beta Values, Arrows are Weighted by the Size of Beta Values. Dashed Lines Represent Insignificant Effects. Significance Thresholds: $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

learning, and social capital building. In our model, the breadth of stakeholder involvement, only significantly impacts on stakeholder capacity building, but not on the convergence of stakeholder perspectives. This highlights the importance of broad stakeholder representation for learning processes, potentially acting as multiple and diverse sources of information and knowledge, but also as knowledge producers throughout the process (Bodin and Crona 2009; Siddiki, Kim, and Leach 2017). A complementary pattern emerges with regards to power delegation, which shows no significant effect for stakeholder capacity building, but only for the convergence of stakeholder perspectives. This suggests that stakeholder capacity building is fostered by broad representation or communication-intensive processes, whereas the development of shared understanding and win-win situations depends rather on participants having space to interact and being able to make decisions.

Considering how intermediate social outcomes affect the environmental standard of governance outputs, we see—in line with contributions to the literature on consensus building and collaborative governance (Ansell and Gash 2007; Innes and Booher 1999)—that convergent perspectives attained within the process make an output of a high environmental standard more likely. Stakeholder capacity building, however, does not show a significant effect. This can be interpreted as evidence that win-win solutions, trust and a shared understanding generated within participatory processes also contribute to environmentally beneficial outputs. At the same time, these results indicate that learning and cognitive changes among participants are not necessarily sufficient for changing decisions or behavior (Heikkila and Gerlak 2013; Newig et al. 2019; Wood 2006), which does not mean that these effects are without societal and collaborative value (Ansell and Gash 2018; Scott and Thomas 2017b). Despite these benefits in stakeholder capacities, other factors may shape participants' behavior, for example, strategic considerations or institutional ground rules (Koebele 2019; Ostrom 2011), that may be better moderated in situations with higher mutual understanding (Siddiki, Kim, and Leach 2017).

The strongest effect on the environmental standard of governance outputs was observed for the degree of power delegated to participants to shape the output. Communication and the representation of non-state stakeholders in turn only show smaller, indirect effects. The surprisingly strong role of power delegation suggests that taking participants seriously as agents over their environment is an important factor in realizing, among other things, strong environmental outputs (Biddle 2017; Emerson, Nabatchi, and Balogh 2012; Kochskämper et al. 2018). From the perspective of public administrators who organize decision-making processes, this implies that if strong environmental outputs are sought, participatory formats that leave room for participants to explore alternatives and take decisions should be utilized. In our sample of cases, such formats included processes of collaborative negotiation, round tables, work groups, councils or steering

groups, whereas processes with little power delegation included formats such as pure administrative decision-making, public hearings or consultation fora, with process formats such as advisory groups falling somewhat in between.

Turning to the implementation of governance outputs, we find support in our analysis for the assumption that converging stakeholder perspectives, including win-win situations, trust and shared norms, make the acceptance of those outputs more likely. Indeed, we see one of the single strongest effect in our model between these variables. This highlights that where decisions are taken under circumstances where mutual benefits are realized and trustful relationships are established, we find significantly higher acceptance among stakeholders, leading potentially to increased social legitimacy of these decisions (cf. Birnbaum 2016). However, when inspecting the effect of "decision ownership" (here measured through power delegation) fostering acceptance, we do not find conclusive evidence.

While we found that our model has considerable explanatory power for intermediate outcomes, the environmental standard of governance outputs, and their acceptance, it accounts for much less variance when it comes to implementation of decisions. Acceptance proves here to be a significant predictor, as was expected conceptually. Yet, we do not find evidence for a direct effect of either stakeholder capacity building or convergence of stakeholder perspectives on implementation and collective action, but merely a small, but significant indirect effect of convergence through acceptance. This resonates with findings from earlier studies, both qualitative and quantitative (Beierle and Cayford 2002; Kochskämper et al. 2018), which warn that a link between participation and implementation may not be taken for granted.

The present analysis is not without limitations. First, while we put considerable effort into an exhaustive case search and screening process, the generalizability of findings based on the resulting sample is, of course, contingent on the representativeness of the wider field of literature. A majority of cases in this sample takes place in North America (United States and Canada), with the rest coming from across Europe, Australia, and New Zealand. Generalizations beyond this western-democratic context could only be done with great care. Thematically, the included cases cover a variety of environmental issues, with land use, biodiversity and freshwater management being the most prevalent topics. We, therefore, expect that our findings display a strong external validity as concerns variation in environmental topics. While one might suspect that geographical and sectoral context matters with respect to both prevalence of variable values and to covariance relations between variables, initial tests for this, however, found very few significant effects. Processes of information elicitation and data coding through raters may be a further source for bias, given that case coding can be seen as a numeric interpretation of the case material. In a comprehensive analysis of these biases we did not find significant distorting effects in our data (Jager et al. 2015), but these limitations may nonetheless be important to note. Second, some of the constructs we employed are not without problems. Generally, measuring and quantifying complex social process characteristics is not straightforward, as they often consist of multiple conceptually and empirically interdependent dimensions. We encountered these difficulties especially with the variables for representation and acceptance. For others, such as implementation, the information basis in the underlying case studies was often imperfect, adding to the low explanatory power of our model for this variable.

Ultimately, the results of a meta-analysis such as this one are highly dependent on the richness and quality of the available case study data. We mitigated these challenges by employing three raters for each case, by controlling for biases and reliability, by making conservative choices in cases where data appeared less reliable, and by making our approach transparent. Third, in the analysis presented here, we were particularly interested in the pathways through which participation impacts the environmental standard of outputs and their implementation. However, our approach did not allow us to test for the influence of control variables or contextual conditions, which likely will also be of importance.

Conclusions

With this research, we seek to improve the evidence base on how participation impacts the environmental standard of governance outputs, their acceptance, and their implementation, as well as which intermediate outcomes mediate this relationship.

The empirical results from our case-survey meta-analysis of published case studies suggest that participation overall has a positive effect for the environmental standard of governance outputs, in particular in cases where participants were granted considerable influence over decisions and outputs. Aspects of intensive communication, on the other hand, are seen to be highly influential in the realization of social and collaborative intermediate outcomes. Notably, of the two intermediate social outcomes, only the factor "Convergence of Stakeholder Perspectives" (comprising social aspects of conflict resolution, trust building, mutual gains and the building of shared norms) has a measurable effect on environmental output standard and, much more strongly, on acceptance, and thus indirectly on

implementation. "Stakeholder Capacity Building" (including aspects of societal learning, individual capacity building and network creation), by contrast, while of value in and of itself, was not found to significantly impact on environmental outcomes.

More generally, this analysis demonstrates the insights to be gained by treating a complex and multifaceted phenomenon such as public and stakeholder participation in a nuanced manner, exploring the mechanisms through which its different facets may advance various social and collaborative outcomes and potentially improve the environmental outcomes of public decision-making processes. This opens up avenues for further research in multiple directions. First, data employed in this analysis covers a wide spectrum of environmental and institutional contexts. Future studies might disentangle these contextual conditions in order to gain deeper insight into "what works how and when" in participatory and collaborative governance. Second, this study yielded several unanticipated findings, such as the strong direct effect of power delegation on the environmental standard of the output. Follow-up research may examine this relationship more closely in order to explore the mechanisms that are at work here, and develop further hypotheses regarding these links. Third, this research may be extended by incorporating additional outcome categories. Our model yielded the least strong results when it came to implementation. Future research will need to tackle the challenging task of providing better explanations for on the ground implementation of and compliance with agreed outputs, and the role of participatory and collaborative governance processes therein. One first step to do so may be complementing our analysis through follow-up data gathering such as media analysis or interviews, allowing more informed analysis of implementation.

Supplementary material

Supplementary material is available at the *Journal of Public Administration Research and Theory* online.

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