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Public Engagement in Social-Ecological Systems Management: An Application of Social Justice Theory

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ABSTRACT

Public engagement is important for improving outcomes of social-ecological systems management. We used a social justice theoretical framework to measure residents' attitudes toward public engagement processes and satisfaction with outcomes of a restoration project in Western Montana. We predicted process control and decision control domains of procedural justice would significantly predict stakeholder satisfaction, with decision control partially mediating the relationship between process control and satisfaction. We tested these predictions using a path analysis of intercept survey data collected from residents within the project area. We found process control had a significant and positive effect on satisfaction but was fully mediated by decision control, suggesting that successful engagement requires opportunities for stakeholders not only to participate but to clearly shape decisions and outcomes. We discuss implications for public engagement, human dimensions research, and social monitoring of social-ecological systems.

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Introduction

Stakeholder engagement is well established as an effective and necessary means for improving social-ecological systems (SES) management (Higgs 1997; Reed 2008; Couix and Gonzalo-Turpin 2015; Metcalf et al. 2015; Virapongse et al. 2016). Ecologically, SES management is successful when it bolsters diversity and system function (Berkes, Colding, and Folke 2003; Wortley, Hero, and Howes 2013). Social success in SES management is multifaceted, and ranges from the degree of stakeholder support for management action to improved human well-being following project completion (Adger 2000; Palmer et al. 2005; Aronson et al. 2006; Woolsey et al. 2007). While both ecological and human dimensions are important to management success, there has been a disproportionate emphasis of research on ecological outcomes (Wortley, Hero, and Howes 2013). Recent efforts have sought to broaden the focus of research and management to include all SES elements and their interrelationships (Clewett and Aronson 2013; Virapongse et al. 2016).

Engaging stakeholders can bolster SES management outcomes by leveraging diverse viewpoints, facilitating learning, building trust among partners, and increasing support for project implementation (Olsson, Folke, and Berkes 2004; Palmer et al. 2005; Reed

2008). Public engagement also offers a promising means for increasing satisfaction and acceptance of SES management efforts (Lauber and Knuth 1999; Schultz, Folke, and Olsson 2007; Woolsey et al. 2007; Arnold, Koro-Ljungberg, and Bartels 2012). To achieve these outcomes, practitioners must meaningfully engage diverse stakeholders in fair decision making processes (Palmer et al. 2005; Woolsey et al. 2007; Reed 2008).

Means for effective public involvement differ in form and style, including face-to-face interactions, public forums, online interactions, or workshops (Chess and Purcell 1999); these tools engage stakeholders to various degrees along a continuum from informed to fully empowered (Arnstein 1969; Germain, Floyd, and Stehman 2001; Lukensmeyer, Goldman, and Stern 2011). Multiple methods of engagement can be employed in combination to incorporate myriad perspectives and values, and to broaden the scope of alternatives (Laird 1993; Smith et al. 1999; Druschke and Hychka 2015). Allowing flexible participation options may help facilitate ongoing engagement throughout projects' lifespans (Stringer et al. 2006; Metcalf, Metcalf, and Mohr 2017). Regardless of where they fall on this continuum, successful engagement methods help stakeholders to feel that their perspectives were represented and that they had acceptable opportunities for participation, even if they were not fully exercised. Interpersonal interactions and mutual understanding resulting from these opportunities enhance social learning and facilitate desired outcomes (Reed et al. 2010). Many authors have concluded that managers should ensure stakeholders' time is well spent, their ideas are heard, and opinions considered (Smith et al. 1999; Smith and McDonough 2001; Lukensmeyer, Goldman, and Stern 2011).

Despite this strong theoretical work, there have been few efforts to quantitatively investigate how participation and the subsequent influence of public input on decisions affect stakeholder satisfaction with SES management. For instance, is it sufficient for stakeholders to express themselves, or does their satisfaction depend on clearly understanding how their input was considered and used to shape decisions? In this article, we frame public engagement using social justice theory and quantitatively explore relationships among justice constructs and stakeholder satisfaction to inform SES management.

Social Justice

Legal and organizational scholars have long used social justice theory to identify and describe equity. Adams (1965) identified feelings of inequity which manifest when a person perceived an inconsistency in the ratio of inputs to outcomes between themselves and others. Subsequently, ideas of fairness became popular in psychology and philosophy, a domain often defined as "distributive justice" or the "fairness of outcome distributions or allocations" (Colquitt et al. 2001, 425; Adams 1965; Rawls 1971). Another domain, procedural justice, is defined as, "the fairness of procedures used to determine outcome distributions or allocations" (Colquitt et al. 2001, 425).¹ Distributive justice and procedural justice are distinct (Sweeney and McFarlin 1993) but strongly related concepts (Cropanzano and Schminke 2001) with complex interactions (Brockner and Wiesenfeld 1996). For example, fair procedures may mitigate reactions to less than ideal outcomes, whereas unfair procedures may undermine support for otherwise acceptable outcomes. Conversely, poor outcomes may increase retrospective critique of procedures, whereas good outcomes may alleviate legitimate process concerns (Van den Bos, Vermunt, and Wilke 1997). Except in extreme circumstances when outcomes violate moral convictions

(e.g., Bauman and Stitka 2009), perceptions of the process used to determine outcomes are usually positively related to perceptions of outcomes themselves.

Procedural justice was originally articulated and defined by Thibaut and Walker (1978) and Leventhal (1980). These authors established that divergent procedures affected perceptions of fairness in legal proceedings (see Bobocel and Gosse 2015 for a review). Two complementary yet distinct dimensions of procedural justice include process control and decision control. Justice in the process, or process control (PC), exists when “procedures provide *opportunities* to voice an opinion,” whereas justice of the decision, or decision control (DC), exists when participants are able to exert “*influence* over outcomes” (emphases added; Colquitt and Rodell 2015, 189). Although others have suggested additional complexity to the concept (e.g., Leventhal 1980; Colquitt et al. 2001), these two dimensions of procedural justice can be powerful mechanisms for understanding how public engagement efforts might influence perceptions of equity, particularly because they can be operationalized by managers to enhance outcomes (Colquitt and Rodell 2015).

Social Justice and Natural Resources

Although much of social justice theory has been developed in legal, organizational, and workplace fields, a few important contributions appear implicitly and explicitly in natural resource contexts. Some authors have investigated how fair processes (i.e., procedural justice) and equitable outcomes (i.e., distributive justice) impacted environmental management (e.g., Lachapelle and McCool 2005; Reed 2008; Leciejewski and Perkins 2015). Lachapelle and McCool (2005) illuminated the potential for equitable participation to bolster a sense of process “ownership” by stakeholders. Reed (2008) demonstrated how increased participation improved equity and empowerment, among other important outcomes. Leciejewski and Perkins (2015) showed how inequity in engagement processes led to disputes which undermined collaborative efforts.

Although these studies and others suggest that both dimensions of justice are important, and that equity is essential to collaborative projects (e.g., Dalton 2006; Chase, Decker, and Lauber 2004), others have emphasized the salience and primacy of procedural justice, deemphasizing the role of distributive justice. From this perspective, because equitable outcomes do not require equal division of resources among stakeholders, they can be described more simply as outcomes which affected parties agree are fair (Chase, Decker, and Lauber 2004; Dalton 2006; Leciejewski and Perkins 2015). For example, Germain, Floyd, and Stehman (2001) examined stakeholder perceptions of efficiency, effectiveness, and equity in procedures and outcomes associated with an appeal of one US National Forest’s management decisions. Their results showed a strong connection between perceived procedural inequities and stakeholder discontent, regardless of resource allocation (Germain, Floyd, and Stehman 2001). Smith and McDonough (2001) explored notions of justice using focus groups during two separate stages of a management project and found that participants were unsatisfied simply because engagement processes did not fully capture their voices and failed to represent their concerns (Smith and McDonough 2001). Still others have indicated that failed procedures lead to disinterested participants, and that increased fairness could have provided myriad benefits (Lawrence, Daniels, and Stankey 1997).

Although natural resource studies have emphasized the importance of procedural justice, they have not explicitly considered its unique dimensions (i.e., process control

and decision control), operationalized them as distinct measures, nor compared their independent and combined effects on outcomes. According to social justice theory, increases in either process control or decision control dimensions of procedural justice should lead to improved outcomes (Houlden et al. 1978; Lind, Kanfer, and Earley 1990). However, outcomes may not depend simply on one or the other, but rather on whether both are sufficiently provided. For example, without opportunity to voice an opinion (process control absent), it is difficult to influence outcomes (decision control unachievable; Tyler and Blader 2003; Lachapelle and McCool 2005). Exceptions to this logic may be found in instances where opportunities were limited at the individual level but robust at the group or aggregate level (i.e., strong representative decision making structures). Some research has suggested that outcomes can be negatively affected when people were allowed to participate (Process Control present), but their input was not considered (Decision Control absent; Firestone 1977; Burchfield 2001). Other researchers have raised similar questions but did not definitively answer them. For example, are people happy with processes where they were allowed to provide input, even if that input did not clearly influence the outcome, or are they *less* satisfied with outcomes when they feel their input was solicited, but not considered (Smith 1998)? Must people see how their comments shaped outcomes to be satisfied (Lachapelle and McCool 2005)? Past studies in this realm have been almost exclusively qualitative or descriptive, leaving a need for empirical work to establish reliable measures of justice constructs and test relationships among them, both in environmental management fields and the social justice arena more broadly (Konovsky 2000).

Public engagement processes for SES management may benefit from expanded consideration of these social justice constructs. For example, the National Environmental Protection Act (NEPA) requires opportunities for public comment but does not explicitly require demonstration of how or if stakeholder input influenced decisions (Hoover and Stern 2014a). When considering NEPA comments, regulations and planning documents guide decision makers to prioritize comments that are scientifically and legally sound, as well as substantive and able to improve management decisions (Predmore, Stern, and Mortimer 2011). Prioritizing comments may help decision makers to avoid legal battles by removing value-oriented comments in favor of scientifically sound ones, or by simply focusing on those comments they believe are relevant to management decisions (Hoover and Stern 2014a). Regardless, this process emphasizes process control without demonstrating a clear link to decision control (Hoover and Stern 2014b). Diminishing decision control, no matter the rationalization, may alienate stakeholders and reduce satisfaction (Burchfield 2001; Innes and Booher 2004; Lachapelle and McCool 2005).

To guide successful public engagement efforts, managers and researchers must understand more fully the effects of Process Control and Decision Control on SES management outcomes. Satisfaction can provide a useful measure of social outcomes of SES management. Satisfaction constructs developed in the marketing and customer service literature traditionally emphasized the importance of meeting and exceeding the expectation of the “customer” (Lee, Graefe, and Burns 2004). This concept has been widely used in other fields to understand the tension between people’s expectations and perceived outcomes. There is general acceptance that satisfaction is a multidimensional concept, based on an individual’s perceptions, and can be influenced by many factors. In natural resource settings, researchers used recreation visitors’ satisfaction to capture a range of their experiences (Manning 2011). Although SES management is inherently different than

traditional businesses or even recreation experiences, the idea that the public uses their expectations for how they should be engaged to evaluate their actual engagement can have implications for SES management goals. Satisfaction captures the idea of positive social impact, a foundation of SES management success. Satisfied stakeholders are more likely to support project outcomes politically and financially, reducing time and cost while increasing public ‘ownership’ of decisions (Lachapelle and McCool 2005; Thompson et al. 2005).

Hypotheses and Predictions

We sought to understand how process control (PC) and decision control (DC) dimensions of procedural justice related to stakeholder satisfaction with the outcomes of an SES management project. Specifically, we hypothesized that:

H₁: Engagement efforts must incorporate both the Process Control and Decision Control dimensions of procedural justice because Decision Control directly affects stakeholder satisfaction whereas Process Control affects stakeholder satisfaction both directly and indirectly through Decision Control.

Based on this hypothesis, we predicted the following (Figure 1):

Prediction 1 (P₁): Process Control will have a significant positive effect on stakeholder satisfaction.

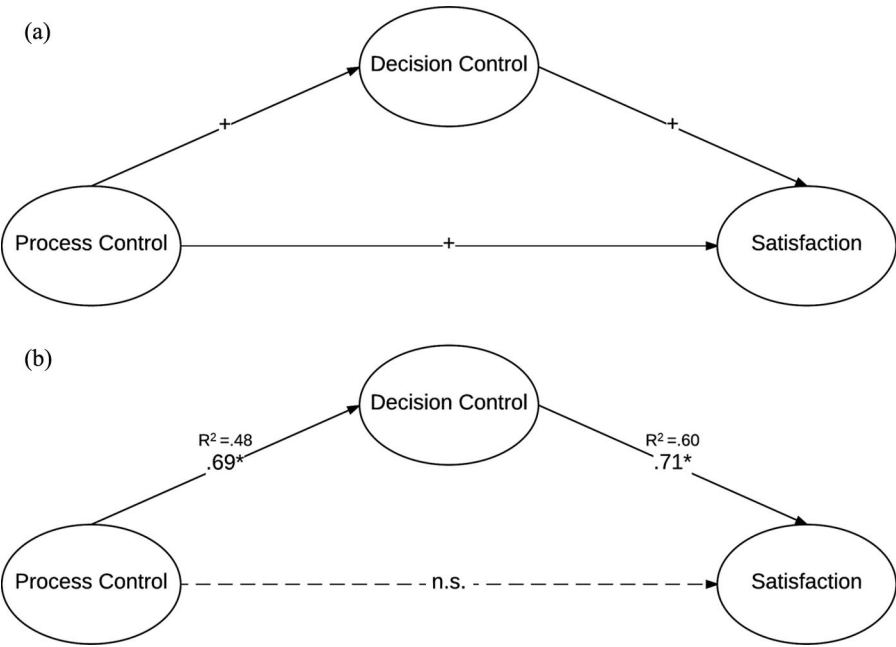


Figure 1. Conceptual diagrams showing (a) hypothesized relationships among process control, decision control, and stakeholder satisfaction, and (b) final path model. Solid arrows in (a) represent hypothesized relationships. Solid arrows in (b) represent significant paths between constructs. Dotted line in (b) represents a nonsignificant (ns) path. Paths in (b) are labeled with standardized path coefficients, R^2 , and p -value indications ($*p < 0.001$).

- P₂: Process Control will have a significant positive effect on Decision Control.
- P₃: Decision Control will have a significant positive effect on stakeholder satisfaction.
- P₄: Decision Control will partially mediate the relationship between Process Control and stakeholder satisfaction.

These predictions build from a proposition that stakeholder satisfaction with SES management depends on the provision of both the Process Control and Decision Control dimensions of procedural justice. From this, we predicted stakeholders' satisfaction would be positively related to the opportunities they had to provide input, and to substantively shape outcomes. Without the opportunity for participation in decision making (i.e., no PC), we predicted stakeholders would be less satisfied. If such an opportunity was afforded, but the input given was not clearly incorporated into final decisions (i.e., no DC), we predicted satisfaction may be improved, but only marginally. We predicted significantly higher satisfaction only when people perceived they were given opportunities to participate and that their voices shaped outcomes.

Study Area

The Clark Fork River flows north from its headwaters near Butte, MT through the Deer Lodge Valley and west to its confluence with the Blackfoot and Bitterroot Rivers near Missoula, MT. Near its confluence with the Blackfoot River lies the communities of Bonner, West Riverside, Pinegrove, Piltzville, and Milltown (hereafter: Bonner-West Riverside), home to approximately 1,717 residents (US Census 2015). In the late 1860s, gold discoveries throughout the watershed led to a century of extractive industries that polluted the watershed (Quivik 1998; Woelfle-Erskine, Wilcox and Moore 2012). In 1908, a need for energy to power homes, businesses, and a lumber mill in Bonner-West Riverside prompted construction of the Milltown dam, which disrupted the flow of the Clark Fork and created Milltown reservoir (Brooks 2015). Shortly after its completion, an historic flood washed mining contaminants 125 miles downstream from Butte to the dam (Moore and Luoma 1990). Along the way, contaminants accumulated in the flood-plains with several million cubic yards settling in the reservoir behind the dam (Moore and Luoma 1990). From 1908 until its removal in 2008, the iconic dam and reservoir provided recreation opportunities for nearby residents who swam, fished, and enjoyed viewing wildlife (Brooks 2015).

In 1980, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, colloquially known as Superfund) was passed, which allowed designation of sites requiring remediation due to industrial activities with expansive and destructive environmental impacts. The Clark Fork River upstream from Bonner-West Riverside was designated a Superfund site in 1983 and remains one of the largest Superfund sites in the United States (Woelfle-Erskine, Wilcox and Moore 2012). This designation aided remediation whereas restoration efforts have been supported by a \$260 million settlement awarded in 1999 to the State of Montana from BP-ARCO (which purchased the Anaconda mining company, originally responsible for much of the contamination). Restoration has entailed removing Milltown dam, draining Milltown reservoir, extracting contaminated sediments, and engineering a new river channel. The 2008 removal of the dam's

powerhouse allowed the Clark Fork and nearby Blackfoot rivers to run free for the first time in over a century (Brooks 2015). Numerous NGOs, state, federal, and private agencies/organizations, and tribes were involved in community outreach and restoration efforts (Metcalf et al. 2015). Among the goals of the restoration effort were community-focused items such as the installation of state parks on either side of the river. At the time of this study, the removal and restoration of the Milltown Superfund site are complete although certain goals, such as the state park on the Bonner-West Riverside bank of the river, remain unfinished.

Methods

Data were obtained using an intercept survey of randomly selected residents of Bonner West-Riverside, Montana. An address-based sample ($n = 894$) was purchased from Survey Sampling International (SSI). This initial sample size was selected to achieve approximately 200 responses based on the overall population, an anticipated completion rate of 20 percent, and a desired sampling error of 5 percent (Dillman, Smyth, and Christian 2014). Research questions and methods were approved by the University of Montana Institutional Review Board prior to survey administration. The homes at each address were visited in person from late January to the end of March 2016.

All respondents were at least 18 years of age and had lived in the Bonner-West Riverside area for at least 3 years; newer residents were not included due to limited experience with public engagement efforts throughout the restoration process. Respondents were provided cards detailing response options, whereas interviewers read questions and recorded responses on an electronic tablet using the Qualtrics survey package (Qualtrics 2016). Residents who declined the in-person survey were offered a postcard with a unique URL to allow online completion of the survey.²

Respondents were asked about their opportunities for engagement and satisfaction with outcomes regarding removal of the Milltown dam and the Clark Fork River cleanup. Process Control and Decision Control were measured with eight independent items, replicating previous authors' measures where possible and employing new measures developed from social justice literature where existing measures were unavailable or inapplicable (see Table 1 for all items). Overall satisfaction was measured with four items adapted from previous satisfaction research to fit our specific study area and context (Oliver 1980; Lee, Graefe, and Burns 2004; Burns and Graefe 2006).

Composite scores were calculated as the mean of the summed items within each construct. We used reliability analysis to assess the consistency of item responses for all composite variables (Cronbach 1951). We tested for multicollinearity using variance inflation factor (VIF) procedures with a cut-off of <5.0 for each explanatory variable (Craney and Surles 2002). We confirmed other regression assumptions by conducting residual analyses for each linear regression, testing for influential outliers using Cook's D with a cut-off of $D > 4.0/n$ (Cook 1977; Bollen and Jackman 1985) and with residual plots and tests, and confirming normality via normal quantile plots and Shapiro-Francia tests. We used factor analysis with multiple orthogonal rotations to verify the distinct dimensions of procedural justice.

To determine whether Decision Control partially or fully mediated the relationship between Process Control and satisfaction, we conducted a path analysis of our

Table 1. Item means, standard deviations, factor loadings, and Cronbach α for composite variables.

Composite variable and nested items ^a	Mean	SD	Factor loading ^b	Cronbach α
Process control	3.1	1.1		0.87
I had sufficient opportunity to comment on the river restoration process ^e	3.2	1.3	.890	
There were ample opportunities for public input ^e	3.4	1.2	.892	
The local community was involved in the decision making process ^f	3.0	1.2	.682 ^d	
I was able to participate in decisions about the river restoration ^f	2.7	1.2	.873	
Decision control	2.7	1.1		0.89
Public comments were seriously considered ^g	2.9	1.2	.901	
Minds were made up before the public had a chance to comment ^{e,f,c}	2.4	1.2	.858	
Public comment felt meaningless ^{f,c}	2.8	1.2	.903	
Final decisions balanced the concerns of all people ^f	2.9	1.2	.779	
Overall satisfaction	3.1	1.2		0.93
I am satisfied with the outcome we achieved here in the Milltown dam removal and river cleanup ^h	3.0	1.4	–	
Overall, I would describe the Clark Fork River cleanup as a success ^h	3.2	1.3	–	
I am satisfied with the Clark Fork River cleanup project as a whole ^h	3.1	1.3	–	
The outcome from the Milltown dam removal and river cleanup did NOT meet my expectations ^{h,c}	3.0	1.3	–	

^aExact question wording: “How strongly do you agree or disagree with the following statements?” All individual item wordings are presented here verbatim. Respondents were asked to indicate the extent to which they agreed or disagreed with each statement using a five-point Likert scale where 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; and 5 = strongly agree.

^bFactor loadings on Process Control and Decision Control components extracted using principal component analysis with Promax rotation and Kaiser normalization.

^cItem reverse coded for analysis.

^dItem loaded heavily on both PC (.682) and DC (.772) components.

^eAdapted from Germain et al. (2001).

^fAdapted from Smith and McDonough (2001).

^gAdapted from McComas, Trumbo, and Besley (2007).

^hAdapted from Oliver (1980), Lee, Graefe, and Burns (2004) and Burns and Graefe (2006).

hypothesized relationship by sequentially testing: (1) Process Control effect on satisfaction, (2) Process Control effect on Decision Control, and (3) combined effects of Process Control and Decision Control on satisfaction (Figure 1). We used a p -value of 0.05 to determine significance (Baron and Kenny 1986; Vaske 2008). We included a variety of covariates including education, gender, age, income, reported participation (i.e., attended meetings, wrote letter to the editor, and contacted elected officials), and importance of various management objectives. We also included an interaction term of Process Control by Decision Control. We used the Sobel (1982) test for indirect mediation effects to confirm the indirect effect of Process Control on satisfaction via the mediator, Decision Control. We completed all analysis in R using psych, psy, nortest, and udsrn packages (R Development Core Team 2014).

Results

Initial sample size was 894. Of these, 36 addresses were vacant lots (usually in trailer parks), 15 were unoccupied houses, 122 were inaccessible (e.g., due to locked fences, threatening dogs, or no trespassing signs), 238 had no physical address (i.e., PO Box only), and 66 were owned by residents who were not eligible for participation because they had lived in the area less than 3 years, resulting in a total possible sample of 417. Completed surveys totaled 123, resulting in an overall response rate of 29.5 percent (123/417). Survey mailings to nonphysical locations and follow-up contacts were not possible due to limited resources.

Table 1 shows item wording, mean scores with standard deviations, and Cronbach alpha scores for composite variables. Cronbach alpha scores were all well above the 0.65 cut-off

(Vaske 2008). Residual and quantile plots showed no departures from normality for any variables. VIF values for Process Control and Decision Control were 1.95 and 3.23, respectively, indicating no issues with multicollinearity. The Shapiro-Francia normality tests of each regression demonstrated a departure from normality in the third model (PC + DC = Satisfaction). Three outliers were responsible for the lack of normality; each had a Cook's D statistic above thresholds, so we confirmed the influence of these observations by removing them from the data set and repeating the Shapiro-Francia test. Without the outlier observations in the data, our tests showed no departures from normality. We chose to include the three observations as they did not change the outcome of any results.

We used principle component factor analysis to confirm the two distinct dimensions of procedural justice, Process Control and Decision Control. Across several rotational strategies, Process Control and Decision Control items loaded on distinct components, except for one Process Control item which loaded heavily on both but slightly higher on Decision Control (Table 1). Alternative Process Control and Decision Control composite variables were explored (i.e., including this item as a measure of Decision Control instead of Process Control) but found no substantive changes in results. Thus, we proceeded with our initial conceptualization of these variables for theoretical consistency.

Path Analysis

Consistent with P_1 , we found Process Control had a significant and positive effect on satisfaction ($\beta = .54$, $p < .001$) when Decision Control was not included in the model (Table 2). Process Control also had a significant and positive effect on Decision Control ($\beta = .69$, $p < .001$), confirming P_2 . However, when both Process Control and Decision Control were included in the model, only Decision Control had a significant, positive effect on satisfaction ($\beta = .71$, $p < .001$), thus confirming P_3 . Hence, in this final model with both Process Control and Decision Control included, Process Control had no significant direct effect on satisfaction; instead, Decision Control fully mediated the relationship between Process Control and satisfaction (Figure 1, Table 2). This final result meant that P_1 was disconfirmed in the presence of Decision Control, and in addition, rather than partial mediation as predicted in P_4 , the analysis demonstrated full mediation. Sobel's test confirmed the fully mediated model ($z = 6.402$, $p < 0.001$). No covariates were significantly related to satisfaction at any stage in our analysis, nor was the interaction between Process Control and Decision Control (i.e., PC \times DC); we excluded these variables from the final model.

These results provided evidence for rejecting our null hypothesis and accepting H_1 , with an important modification: For stakeholders to feel satisfied with outcomes, engagement

Table 2. Path analysis results.

Regression model	<i>N</i>	<i>R</i> ²	<i>F</i> -statistic	β	Standardized path coefficients	<i>p</i> -value
Satisfaction = PC	112	0.30	<i>F</i> (1,110)			
PC				0.614	0.54*	<0.001
DC = PC	114	0.48	<i>F</i> (1, 112)			
PC				0.714	0.69*	<0.001
Satisfaction = PC + DC	109	0.60	<i>F</i> (2, 107)			
PC				0.087	0.08	=0.370
DC				0.786	0.71*	<0.001

* $p < 0.001$.

efforts must incorporate both the Process Control and Decision Control dimensions of procedural justice because Decision Control directly affects stakeholder satisfaction whereas Process Control *indirectly affects stakeholder satisfaction through* Decision Control.

Discussion

Past research engaging social justice literature in natural resource settings has emphasized the importance of procedural and distributive justice (Lawrence, Daniels, and Stankey 1997; Smith and McDonough 2001). Distributive justice (distribution of resources) does not necessitate an equal distribution; instead, it only requires that parties perceive the allocation of resources to be equitable. Thus, some authors have suggested that distributive justice can be achieved procedurally (Chase, Decker, and Lauber 2004; Dalton 2006), although others strongly disagree, especially when outcomes violate moral convictions (Bauman and Stitka 2009). To realize procedural justice, many researchers have espoused the necessity of robust stakeholder engagement in natural resource decisions (Higgs 1997; Reed 2008; Couix and Gonzalo-Turpin 2015). According to social justice theory, increased participation is important but must be accomplished using fair processes that allow people to provide input and influence outcomes (Colquitt and Rodell 2015). The unique roles of Process Control and Decision Control have been acknowledged, yet their combined effects on satisfaction with project outcomes remained empirically untested.

We found a direct, positive impact of Decision Control on stakeholder satisfaction, underscoring the importance of ensuring stakeholder input is clearly used to shape decisions. The opportunity to influence decisions does not exist without an opportunity to participate; however, the effect of the Process Control on stakeholder satisfaction was fully mediated by Decision Control. Contrary to our hypothesis, we found no direct effect of Process Control on satisfaction when controlling for Decision Control. The opportunity to participate did not significantly affect satisfaction on its own. Instead, satisfaction was significantly improved only when stakeholders believed their input had helped shape decisions.

These results suggest the Process Control and Decision Control elements of procedural justice do not independently relate to satisfaction but are instead hierarchical. To achieve satisfactory outcomes, stakeholders must have been given an opportunity to participate; however, the opportunity to participate will not affect satisfaction unless stakeholders also see how their participation shaped decisions. It is possible that scenarios where Process Control is present, but Decision Control absent, risk undermining other social aspects, such as project acceptance, trust, support for management actions, and willingness to participate in future collaborations, although we did not directly test for these relationships in this study.

Differentiating the effects of Process Control and Decision Control on satisfaction may seem trivial to some, but the implications for public engagement processes in SES management are profoundly important. Managers should not merely provide opportunities for stakeholders to be present and comment on decisions. Instead, effective engagement requires that stakeholders are meaningfully engaged and feel that their participation is valued and influential. When people are excluded, their concerns are not adequately addressed, or it is not clear how their feedback was considered and/or used, satisfaction with the process and outcomes may suffer, as others have qualitatively observed (Innes

and Booher 2004). For example, if decisions are already made before stakeholders are asked to provide input (or stakeholders perceive as much), satisfaction may be undermined. Opportunities to voice opinions about preconceived decisions are unlikely to bolster satisfaction (Lachapelle and McCool 2005). SES management projects which offer public engagement opportunities yet limit or fail to communicate the resulting influence(s) on decisions, have the potential to sour stakeholder attitudes and suppress future participation (e.g., Cheng and Mattor 2006). Successful public engagement depends on effective and frequent communication among project managers and stakeholders (Druschke and Hychka 2015). To achieve just outcomes, managers should strive for transparency and open communication with stakeholders which can help demonstrate how stakeholder input was used to shape decisions, as well as explain why other input was not used. Preferably, decisions about whether or not and how to incorporate stakeholder input will be done through deliberation with stakeholders, not behind closed doors (Leach 2006). Lack of either communication or transparency may lead stakeholders to conclude that their input was ignored, even if it was in fact fully considered. Stakeholders who perceive low levels of Decision Control may become disillusioned, making them less likely to participate in the future. Decreased participation may erode trust and threaten future collaborative efforts (Metcalf et al. 2015).

Social and ecological outcomes may be improved when collaborative approaches are employed, which emphasize democratic processes. Inclusive and representative processes which empower stakeholders while being deliberate, impartial, and transparent may be key to shaping positive stakeholder perceptions of the process (Leach 2006). Furthermore, sustainable ecological outcomes may be directly related to stakeholder participation in management decisions (Persha, Agrawal, and Chhatre 2011). Process and Decision Control, as forms of procedural justice, should be embedded throughout adaptive management cycles to improve social and ecological outcomes. At each stage in of decision making and implementation, from problem assessment to implementation and monitoring (e.g., Druschke and Hychka 2015), stakeholders should be invited to participate and provided clear evidence demonstrating how their participation has shaped decisions. Opportunities to cocreate problem definitions, identify desired outcomes, and implement alternatives can increase both dimensions of procedural justice simultaneously. Such a commitment to justice may require managers to engage people in difficult dialogue regarding messy and wicked problems (King 1993), and clearly demonstrate how the discussion-shaped final decisions.

Monitoring social variables, as well as ecological, following implementation of any management alternative is crucial for subsequent adaptation (Virapongse et al. 2016). Managers should strive to adjust future decisions to ensure fair social and ecological outcomes. Specifically, monitoring the degree to which participants perceive different dimensions of procedural justice may help guide future efforts by encouraging social learning and adaptive governance (Stroh 2015). If Process Control is deemed absent, or low, work can be done to provide or improve engagement opportunities. If Process Control is present, but Decision Control is low, efforts should be made to allow more, or communicate existing, stakeholder influence. Future work might investigate more fully if or how perceptions of justice constructs relate to or interact with actual participation. Across all types and levels of participation, demonstrating the collective nature of decision making can facilitate trust and partnership toward common goals and effective change (Kuenkel 2016).

Conclusion

Successful SES management achieves both social and ecological outcomes. Social justice theory can assist SES managers and researchers by better explaining dynamics driving social outcomes. Our results demonstrated that the influence of stakeholder input on decisions fully mediated the effect of stakeholder participation on satisfaction. To be satisfied, stakeholders needed to be afforded opportunities for participation, and clearly understand how their input influenced final decisions. The opportunity to provide input was insufficient on its own for increasing satisfaction.

This is not to say input from stakeholders should or can always be easily incorporated into management decisions. Instead, our results emphasize the importance of communicating with stakeholders to ensure that they see how their input was fully considered. This may be of particular importance when input is rejected; although stakeholders may easily see how input was used when outcomes reflect their input, they may be understandably confused when input was deemed unacceptable or irrelevant, even if it was fully considered by decision makers. Future work should explore these dynamics directly and test whether communication in these instances (i.e., input rejected) can alone buoy stakeholder satisfaction, or if rejected input undermines satisfaction regardless of rationale.

We developed reliable, quantitative measures of process control, and decision control based on natural resource literature and social justice theory. These scales may prove useful for researchers seeking to quantify public perceptions of engagement, measure attitudes regarding SES management, or incorporate social justice constructs into more robust models of SES dynamics. Managers may also find these scales valuable for monitoring key human dimensions variables during adaptive management processes. Future work could expand these measures to fully differentiate justice dimensions and address the dual factor loadings we found on one Process Control item.

Future research may also benefit from a more in-depth investigation of procedural justice dimensions and potential complements between social and environmental justice. Leventhal (1980) suggested that just procedures are consistent, unbiased, accurate, correctable, representative, and ethical. Applying these criteria may help identify other procedural elements which affect social outcomes. In addition, SES management may benefit from a more comprehensive integration of social justice theory with environmental justice. For example, although social justice scholars often equate distributive and procedural justice, environmental justice theory clearly asserts distributive justice as the equitable distribution of ecosystem services (or risk) across different segments of society (Schlosberg 2004). Expanded investigation of collaborative processes may help clarify the relative impacts of different justice constructs, including possible interactions (e.g., Van den Bos, Vermunt, and Wilke 1997) or post hoc rationalization of study participants (e.g., Brockner and Wiesenfeld 1996) on perceptions of social and ecological outcomes, the latter of which is not possible in cross-sectional studies such as ours.

Our research explored these concepts in a small community in western Montana. Work is needed to understand if and how our findings differ in other SES management contexts. Replication of this work in diverse settings will aid in assessing the reliability of our measures and generalizability of results. With corroboration, these findings may provide expanded, actionable insights about public engagement for improved SES management grounded in social justice theory.

Notes

1. Another domain, interactional justice, or the “quality of interpersonal treatment people receive when procedures are being implemented,” has been developed and debated throughout organizational research, but is not central to our research questions (Colquitt et al. 2001, 426).
2. The majority of respondents completed the survey in person; only nine were completed online.

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