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Does reading scenarios of future land use changes affect willingness to participate in land use planning?

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ABSTRACT

Scenarios of future outcomes often provide context for policy decisions and can be a form of science communication, translating complex and uncertain relationships into stories for a broader audience. We conducted a survey experiment (n = 270) to test the effects of reading land use change scenarios on willingness to participate in land use planning activities. In the experiment, we tested three combinations of scenarios across two time periods, comparing survey responses of individuals reading a set of scenarios with individuals who did not read scenarios. Reading scenario narratives increased willingness to participate in land use planning activities and perceived self-efficacy. Measures of interest and sense of community also increased willingness to participate. Tests of an indirect mediation model found self-efficacy partially mediated the effect of reading scenarios on willingness to participate. This latter relationship may be a mechanistic explanation for the effect of reading scenarios. Envisioning the future with brief, bulleted scenarios of land use change in a print format appears to increase self-efficacy in planning for the future. Our results suggest scenarios can serve as a vehicle for changing public participation in land use planning.

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1. Introduction

Since the 1960s, land use planners have incorporated scenarios, or plausible conditions, at some time in the future, into long-term comprehensive visioning and planning. By portraying alternative future conditions, scenarios can expand thinking and broaden people's perspectives in the context of planning efforts (Xiang and Clarke, 2003). Scenarios are increasingly used to explore possible future changes in socioeconomic and biophysical conditions (Swart et al., 2004; GSC, 2014). With expanding media outlets, scenarios can now reach much wider audiences. These concurrent increases in application and audience scope intensify the need to understand scenarios' effects on perceptions and behaviors. With scenario audiences expanding beyond small groups of participating stakeholders, understanding the preferences of the general population becomes an important step in scenario planning (Kaltenborn et al., 2012). Such efforts can enable greater representation of citizens in planning. Here, we conducted a survey experiment of the general population in Maine, USA, to examine their scenario preferences and to test the effects of reading land use planning-focused scenarios on participation in planning activities.

In this paper, we broadly define scenarios as plausible conditions at some time in the future. Qualitative scenario narratives are descriptive stories that create images of future worlds and conditions, which enable public participation with scenarios (Chakraborty, 2011; Hopkins and Zapata, 2007). This paper focuses on written, qualitative scenarios of land use change presented in a bulleted format to allow readers to easily compare conditions across scenarios. By exploring "what if" questions through scenarios, participants can become more engaged in imagining the future and overcome cognitive biases that anchor them to the status quo (Schoemaker, 1993; Tversky and Kahneman, 1974). Scenarios also provide context for policy decisions and qualitative scenarios are becoming a form of science communication, translating complex, uncertain relationships into stories for a broader audience (Sheppard et al., 2011; Ramos, 2010). Because of the increasing use of qualitative scenarios as communication, understanding how people interpret and react to scenarios is important.

Scenarios are an opportunity to involve the public in planning for the future. At present, participatory planning (planning with the public) infrequently includes the wider population; instead, processes often involve a non-representative group of stakeholders (Höppner et al., 2008; Scott, 2011). Planning scholars view citi-

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zen engagement as a critical mechanism for trust, credibility, and commitment (Burby, 2003; Innes and Booher, 1999; Campbell and Marshall, 2000). However, planners are less likely to engage citizens than recommended by researchers; Brody (2003) noted a lack of use of innovative public participation methods and persistent reliance on traditional methods, such as public hearings. Shipley and Utz (2012) also note that planners lack a vetted tool for evaluating participation methods for procedural and distributional fairness.

Reading scenarios of future changes may affect willingness to participate in planning. However, research quantitatively measuring citizen engagement with voluntary land-use planning activities is infrequent (Höppner et al., 2008). Intent to participate in planning activities is higher for people with higher levels of intrinsic interest (Syme and Nancarrow, 1992; Höppner et al., 2008), self-efficacy,[1] outcome expectancy,[2] and place attachment (Höppner et al., 2008). Because sense of community[3] and place attachment are overlapping concepts (Pretty et al., 2003), a higher sense of community may also increase intent to participate. In addition to affecting willingness to participate, it may also be true that reading scenarios of the future can affect the above factors. We do know scenarios can increase individuals' estimates of occurrence for low probability events (Griffin et al., 1990; Kuhn and Sniezek, 1996; Koehler, 1991). Also, scenarios can vary the frame for an issue, by highlighting certain effects of an issue while concealing others (Tversky and Kahneman, 1974; Chong and Druckman, 2007). Therefore, we conducted a survey experiment to test effects of reading scenario narratives on willingness to participate in land use planning activities, and on the other factors (e.g., interest in the issue) that may increase willingness to participate. Our results suggest some scenarios can increase both willingness to participate and the factors affecting willingness to participate.[4]

2. Hypotheses and theoretical framework

Our primary objective is to understand how reading scenarios affects citizens' engagement with land use planning. Guided by the literature, we tested five hypotheses:

H1. Reading scenarios will increase willingness to participate in land use planning activities.

H2. Reading different scenarios will have varying impacts on willingness to participate in land use planning activities.

H3. Reading less-distant future scenarios (year 2033) will have a greater increase in willingness to participate in land use planning activities than more-distant future scenarios (year 2053).

H4. Self-efficacy, outcome expectancy, interest, sense of community, and reading scenarios will positively affect willingness to participate in land use planning activities.

H5. Self-efficacy will mediate the effect of reading scenarios on willingness to participate in land use planning.

We assessed willingness to participate in land use planning as the behavioral intent for participation (Hypothesis 1). Participation behaviors can be difficult to identify within a survey format, as these behaviors are not a regular, daily occurrence. Therefore, we used the construct of behavioral intent, as it is a predictive antecedent to behavior (Ajzen, 1991). While behavioral intent is known to have predictive power, it does not fully explain behavior. Intentions account for only 20–30% of variance in behavior (Gollwitzer, 1999); strong intentions are reliably observed to be realized more often than weak intentions (Ajzen, 1991).

We also examined the effects of different scenario frames on willingness to participate (Hypothesis 2). Scenario presentation can affect assessed plausibility and probability of the occurrence of future events. Negative scenarios are difficult to envision and accept (Schoemaker, 1993); they are often given less weight than positive scenarios. Reading positive and negative scenarios affects estimates of behavioral responses, as there is a preference to believe the future will unfold as desired and that obstacles can be overcome (Newby-Clark et al., 2000). Positive framing of scenarios also has a greater impact on predictions than scenario plausibility. Kuhn and Sniezek (1996) found that reading any scenario increased confidence in the scenario's occurrence, while multiple scenarios and single, complex scenarios resulted in increased uncertainty as compared to single, simple scenarios.

To assess the effects of scenario time frame on individuals' responses, we explored the sensitivity of effects across two future time frames (Hypothesis 3). The farther away the future is, the greater the abstractions made about it (Nussbaum et al., 2006; Liberman and Trope, 2008). Individuals, on average, considered the future to be 15 years ahead, and their ability to imagine the future ends after 15–20 years (Tonn et al., 2006). Scenarios can make the distant future more concrete by impacting beliefs and affect (i.e., emotion) and altering individuals' confidence and perception about what may happen in the future (Schoemaker, 1993). We investigated whether the timeframe in which a scenario is viewed affects the intent to participate in land use planning activities.

To assess additional factors affecting willingness to participate (Hypothesis 4), we addressed a number of constructs identified in the citizen engagement literature: self-efficacy, outcome expectancy, interest, and sense of community. Self-efficacy is strongly related to intent and action. When citizens have a low level of self-efficacy, government has a limited ability to engage them in community problem-solving, as individuals are unlikely to participate in activities where they perceive themselves ineffective (Hibbard and Lurie, 2000). Outcome expectancy is the belief there is an appropriate strategy to bring about the desired outcome (Bandura, 1986). Current operational definitions of self-efficacy are likely to be influenced by expected outcomes, indicating researchers should acknowledge the causal influence of outcome expectancies on self-efficacy (Williams, 2010). Intrinsic interest is an important motivator of behavior (Bandura and Schunk, 1981) and also has been demonstrated to be a predictor of community participation in planning (Syme et al., 1991).

Sense of community[3] has been linked to citizen engagement. Foster-Fishman et al. (2009) found sense of community as a norm that strongly predicted citizen participation, and Perkins et al. (1990) found individuals holding a high sense of community are more likely to pursue citizen action. To date, no one has examined the relationship between sense of community and willingness to participate in land use planning-specific activities.

To fully assess the effect of scenarios on willingness to participate, we also considered whether self-efficacy could mediate the effect of scenarios on willingness to participate (Hypothesis 5). Self-efficacy is a known factor affecting behavioral intent; as such, it is included in the Theory of Planned Behavior as perceived control (Ajzen, 1991). Perceived control has been demonstrated as a mediator variable in other behaviors (Baron and Kenny, 1986); for this reason, we specifically examined whether self-efficacy could act as a mediator variable between reading scenarios and willingness to participate.

[1] Self-efficacy is the belief in one's capacity to execute a behavior (Bandura, 1982).
[2] Outcome expectancy is the belief there is an appropriate strategy to bring about the desired outcome (Bandura, 1986).
[3] Sense of community refers to the social community, either located in a physical place or a group of people sharing common traits and identity regardless of location (Gusfield, 1975).
[4] We use the term "land use planning activities" to refer to activities such as attending public meetings, volunteering on planning committees, or other forms of public participation related to land use planning.

Below are two stories of what the future could look like in Maine in **[2033/2053]**. Please read through both stories. Then identify which is more likely and which you prefer.	
CURRENT TRENDS (Current) ECONOMY – Employment trends continue unchanged. HOUSING/COMMERCIAL AREAS – New housing and business development occur mostly in suburban and nearby rural areas. POPULATION – Small increase, but then a slow decrease in state population; aging trend continues. AGRICULTURE AND FORESTRY – No change in these sectors from today.	**LOCAL FOCUS (Local)** ECONOMY – Employment trends change in response to increased demand for local products; Maine's economy supports more local businesses than under Current Trends. HOUSING/COMMERCIAL AREAS –Downtowns and adjacent neighborhoods are revitalized; New housing and business development occur in urban, suburban, and rural areas. POPULATION – Small increase in state population. AGRICULTURE AND FORESTRY – Increased demand for local agricultural and forest products helps both sectors grow relative to Current Trends.
MAINE MARKETPLACE (Market) ECONOMY – Employment trends change; Maine's economy shifts to match the national economy and supports more service jobs than under Current Trends; the East-West highway is built; Maine's renewable energy sector grows. HOUSING/COMMERCIAL AREAS – New housing and business development occur mostly in suburban and nearby rural areas as people move closer to towns from rural areas. POPULATION – Decrease in state population, with southern urbanized regions increasing and remote rural regions depopulating. AGRICULTURE AND FORESTRY – Small scale farms and forestry operations decline, while larger, industrial operations remain.	**AMENITY-BASED GROWTH (Amenity)** ECONOMY – Employment trends change; Tourism and related service industry employment increases in inland areas along I-95 and near coastal areas, lakes, and recreation lands. HOUSING/COMMERCIAL AREAS – Towns along I-95 become amenity-based destinations for retirees and young families; a national park near Baxter State Park revitalizes towns in the area; areas near the coast, lakes, and recreation lands see increased development. POPULATION – Increase in state population due to in-migration and retention of youth; people move closer to towns, lakeshores, the coast, and recreation lands. AGRICULTURE AND FORESTRY – Both sectors decline relative to Current Trends as increased development reduces the stock of working lands.

Fig. 1. Four scenarios presented to survey respondents in six conditions (Current/Market/2033, Current/Market/2053, Current/Local/2033, Current/Local/2053, Current/Amenity/2033, Current/Amenity/2053).

3. Methods

3.1. Survey design and administration

Our data are from a mail survey[5] sent between May and September of 2013, to a representative sample of 1200 Maine adults drawn from an InfoUSA® national sample. After an initial introduction letter, each round presented the participant with the 12-page survey, a reminder letter, and a one-dollar cash incentive. We randomly assigned respondents to receive a survey, either with (1) two scenarios in a text format or (2) with no scenarios. All individuals reading scenarios (hereafter, readers) and not reading scenarios (hereafter, non-readers) responded to questions about intent to participate in planning activities; interest in the town's future, sense of community at the town level, and agency around land use planning (outcome efficacy and self-efficacy, Table 1). We collected demographic information, such as age, gender, income, children in household, household size, years in Maine, and education level, to assess the representativeness of the sample.

The four scenarios we presented describe potential changes in Maine (Fig. 1). Aside from the baseline scenario, Current Trends, we constructed each scenario to diverge systematically from the status quo in multiple areas (the economy, housing/commercial areas, population, and agriculture and forestry), thereby approximating socioeconomic scenarios affecting land use change (e.g., Alcamo et al., 2008; Bennett et al., 2003). We elected to present qualitative scenarios of land use change (Fig. 1), rather than specific landscape maps of the different scenarios because presenting place-specific spatial data to our statewide participants would be challenging in a mail survey. These scenarios were designed to address issues land use planners are likely to consider when engaging the public in comprehensive planning. Readers were randomly assigned one of three combinations of scenarios across one of two time periods: 2033 or 2053, for a total of six conditions (Fig. 1). To isolate the potential effects a particular scenario could have on other variables while minimizing respondent fatigue, we presented each reader with a pair of scenarios. All readers saw the Current Trends scenario plus one other scenario. We also elected to present the scenarios in bulleted form, rather than the more common narrative format, so that readers could more readily compare attributes of the scenarios. We then asked readers to identify both their preferred scenario and the most likely scenario, to encourage close consideration of the scenarios and to identify whether preferred and most likely scenarios varied among scenario set viewed.

3.2. Sample derivation and characteristics

The completed surveys were double entered into an ACCESS database and then compared and cleaned of errors to create the final dataset. We addressed missing data, examining the sample for non-random patterns by comparing demographic variables of respondents with and without missing data.

Our response rate is 28.3% {334 received/(1190 surveys sent out minus 10 undeliverable)}. We screened data for accuracy and missing values, finding 313 of 334 cases had completed part or all

[5] We used a two-round modified Dillman method (Dillman, 2007).

Table 1
Variables[a] addressed by this study.

Factor	Measurement
Willingness to participate	I am willing to participate in land use planning activities in my town
Self-efficacy	I feel able to contribute to planning for the future of my town
Outcome expectancy	I am confident that my town can effectively plan for the future
Interest in the issue	I care about my town's future
Sense of community[b]	I feel like I belong in the town I live in
	I have a good bond with others in the town I live in
	For doing the things that I enjoy most, no other place can compare to my town
	My town reflects the type of person I am

[a] All variables are based on responses to 7-point Likert scale questions of agreement: (7 = strongly agree, 1 = strongly disagree).
[b] This is an index created from four questions from the Brief Sense of Community index (Peterson et al., 2008); each item represents one of the four facets of sense of community: reinforcement of needs, membership, influence, and shared emotional connection.

questions. Of the 313 cases, 8.6% contained missing data (ranging from one to two out of nine items missing). We employed list-wise deletion to address missing data, leaving 270 cases with complete information for hypothesis testing and regression analyses.

We assessed missing data for non-random patterns by conducting independent *t*-tests on missing data with respect to demographic variables. We found significant differences between full and incomplete respondents in terms of age ($p < 0.001$), number of children in household ($p < 0.001$), and income ($p < 0.001$). Respondents fully completing surveys are more likely to be older, have less children and smaller households, and have lower incomes. However, for variables used in this study, incomplete responses had only one to two missing items out of the variables of interest.

To assess non-response bias, we compared our final sample of 270 respondents with the population of Maine on three commonly used sociodemographic variables: gender, age, and education (Table 2), per Brenner et al. (2013). As often the case with mail surveys, respondents to our survey are more likely to be older, male, and more educated than the general population of Maine, from which our sample was randomly drawn.

Of the 270 respondents included in this study, 122 were scenario readers (Current/Market scenarios, n = 43; Current/Local scenarios, n = 46; Current/Amenity scenarios, n = 33), and 148 were nonreaders. We tested for demographic differences among groups and found no significant difference between readers and nonreaders, except for years lived in Maine. Individuals reading the Current/Amenity scenarios had lived in Maine significantly less than in the other groups ($F = 2.71$, p-value = 0.07). Therefore, we included years lived in Maine as a control variable in our regression analyses.

3.3. Data analysis

Using survey responses, we tested our hypotheses with ANOVA, linear regression, and indirect mediation modeling, using R 2.15.3 (R Core Team, 2012). We used an alpha of 0.1 in these statistical analyses. We applied ANOVAs to look for differences in five variables between nonreaders and all groups of readers (pooled), (2) nonreaders and each of the three reader groups, and (3) differences between year of the scenarios read (2033/2053). For Hypothesis 4, we employed ordinary least squares linear regression including the following explanatory variables: self-efficacy, outcome expectancy, interest, sense of community, years lived in Maine (as a control variable), viewed Market scenario (yes/no dummy variable), viewed Local scenario (yes/no dummy variable), viewed Amenity scenario (yes/no dummy variable), and viewed scenario year as 2033 (yes/no dummy variable). Zeros in all three scenario dummy variables (Market, Local, and Amenity) represent the group that viewed no scenarios.

We conducted indirect mediation modeling for Hypothesis 5 with the MBESS package (Kelley, 2010), which uses procedures suggested by Preacher and Hayes (2004, 2008). The mediation model tested reading scenarios (yes/no) as the independent variable, self-efficacy as the mediator variable, and willingness to participate as the dependent variable (Fig. 2). This approach requires a large sample size for each group; therefore, we pooled the three reader groups into a single reader group.

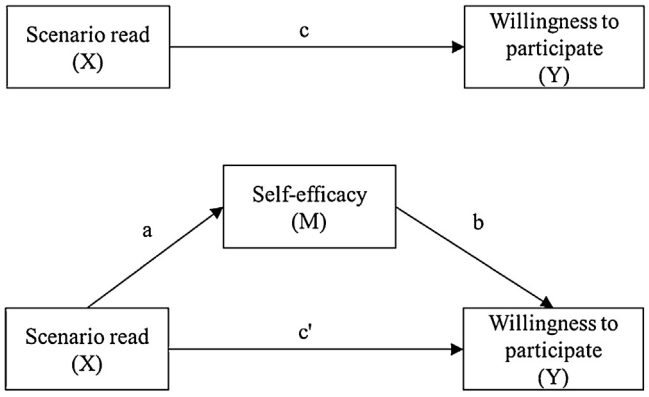

Fig. 2. Mediation model of reading scenarios (X), self-efficacy (M), and willingness to participate (Y).

4. Results

4.1. Descriptive and correlation statistics

Readers preferred the Local Focus and Amenity-Based Growth scenarios over the Current Trends scenario (Table 3). Readers identified the Maine Marketplace scenario as less preferred than the Current Trends scenario. This difference in preferences was significant across reader groups, identifying preferred and not preferred scenarios. Under all scenario combinations, the majority of readers identified the Current Trends scenario as the most likely.

We examined Pearson's correlations among demographic and construct variables (Table 4). To minimize loss of power from missing data, we applied pairwise comparison and pooled across scenario treatments, recognizing pairwise comparisons' limits in comparing across variables. We found moderate correlations among all construct variables (willingness to participate, self-efficacy, outcome expectancy, interest, and sense of community). Only sense of community and interest in the community's future were correlated with demographic variables. Increased age was correlated with increased sense of community and interest in the community's future, while being male was positively correlated with sense of community. However, years lived in Maine, income, and education were not correlated with any of the construct variables of interest.

Table 2
Descriptive statistics of the completed survey sample as compared to population statistics for age, gender, and education level.

	Sample (%)	Population (%)
Age		
18 to 24 years	2%	11%
25 to 39	12%	21%
40 to 54 years	21%	29%
55 to 64	31%	18%
65+	33%	17%
Gender		
Male	62%	49%
Female	38%	51%
Education		
Less than high school	3%	9%
High school	23%	35%
Some post-secondary	32%	29%
Bachelor's degree	23%	18%
Graduate/professional degree	18%	10%

Data Source: US Bureau of the Census, American FactFinder, 2013. DP-1 General Population and Housing Characteristics (2010 Census), DP03 Selected Economic Characteristics, S1501 Educational Attainment (2012 American Community Survey 1-Year Estimates) for the state of Maine.

Table 3
Scenario group respondents' preferred and most likely scenarios, between the Current Trends and other scenario read and between scenario years (2033/2053).[a]

	Other Scenario				Year of Scenarios		
	Maine Marketplace	Local Focus	Amenity-based Growth	χ^2 (d.f. = 2)	2033	2053	χ^2 (d.f. = 2)
Which of these two futures do you prefer?				10.32***,a			0.40
Current Trends	59%	16%	33%		40%	31%	
Other Scenario	41%	84%	67%		60%	69%	
n	41	43	30		57	58	
Which of these two futures do you think is most likely?				2.64			0.00
Current Trends	69%	60%	75%		70%	68%	
Other Scenario	31%	40%	25%		30%	32%	
n	42	44	32		56	62	

†p < 0.1, *p < 0.05, **p < 0.01.
*** p < 0.001.
[a] Tests whether there is a difference across groups in individuals' identification of the Current Trends scenario versus other scenario viewed in terms of preference and perceived likelihood.

Table 4
Pairwise Pearson's correlations for construct and demographic variables, pooled across all partial or complete survey responses (n = 270).

	Willingness to Participate	Self-Efficacy	Outcome Expectancy	Interest	Sense of Community scale	Years lived in Maine	Gender (Being male)	Age	Education	Income
Willingness to Participate	1	0.5***	0.3***	0.44***	0.41***	0.05	0.16	0.08	0.16	−0.01
Self-Efficacy		1	0.47***	0.31***	0.38***	0.09	0.12	0.11	0.08	0.03
Outcome Expectancy			1	0.32***	0.43***	0.04	0.07	0.07	0	0.02
Interest				1	0.54***	0.14	0.05	0.22**	0.01	−0.01
Sense of Community scale [a]					1	0.17**	0.12**	0.25***	0.02	−0.01
Years lived in Maine						1	0.11	0.59***	−0.36***	0.22*
Gender (Being male)							1	0.11	−0.05	0.17
Age								1	−0.17	−0.18
Education									1	0.46***
Income										1

†p < 0.1.
* p < 0.05.
** p < 0.01.
*** p < 0.001.
[a] Average of 4 items, α = 0.84.

4.2. Hypothesis testing

We found (Table 5) significant positive effects of reading a scenario on willingness to participate (Hypothesis 1), significant differences for willingness to participate depending on the assigned scenario (Hypothesis 2), but no difference in effects across the different future years (Hypothesis 3). Sense of community differed among those reading scenarios in 2033 and in 2053; respondents reading about a more distant future also have a higher sense of community.

Self-efficacy, interest in the issue, and sense of community were significant, positive predictors of willingness to participate, while outcome expectancy was not (Table 6, Specification 1). The effect of reading scenarios on individuals' willingness to participate depended upon the scenario combination viewed, with the Current/Local scenario combination having the greatest positive effect of the three scenario combinations (Table 6, Specifications 2 and 3). The effects of the Current/Market and Current/Amenity scenarios were not significant. The year in which the scenario was set (2033

Table 5
Means, [a] (standard deviations), and F statistics (one-way ANOVA) for construct variables, by No Scenario/Scenario (n = 270), scenario set (Market, Local, Amenity, n = 122), and scenario year (2033/2053, n = 122).

	No Scenario/Scenario			Scenario Set (Current + Second Scenario)				Scenario Year		
	No Scenario	Scenario	$F_{(1,269)}$	Market	Local	Amenity	$F_{(2120)}$	2033	2053	$F_{(1,121)}$
	x̄ (s.d.)	x̄ (s.d.)	x̄ (s.d.)	x̄ (s.d.)	x̄ (s.d.)	x̄ (s.d.)	x̄(s.d.)	x̄ (s.d.)	x̄ (s.d.)	x̄(s.d.)
Willingness to Participate	4.30 (1.58)	4.93 (1.53)	11.55^{***,b}	4.89 (1.56)	5.37 (1.31)	4.52 (1.68)	3.30*	4.88 (1.42)	5.03 (1.65)	0.33
Self-Efficacy	3.89 (1.64)	4.45 (1.70)	7.50***	4.21 (1.83)	4.57 (1.66)	4.61 (1.60)	0.67	4.45 (1.65)	4.45 (1.77)	0.00
Outcome Expectancy	3.91 (1.49)	4.21 (1.46)	2.62	4.35 (1.23)	4.15 (1.57)	4.09 (1.54)	0.34	4.23 (1.43)	4.17 (1.50)	0.24
Interest	6.01 (1.36)	6.01 (1.10)	0.00	6.09 (1.20)	6.02 (1.36)	5.88 (1.58)	0.23	5.92 (1.41)	6.10 (1.31)	0.54
Sense of Community scale[c]	4.65 (1.40)	4.87 (1.49)	1.61	5.06 (1.26)	4.73 (1.53)	4.80 (1.73)	0.57	4.63 (1.54)	5.13 (1.40)	3.50†

** p < 0.01.
† p < 0.1.
* p < 0.05.
*** p < 0.001.
[a] Scale: 1: strongly disagree, 2: disagree, 3: somewhat disagree, 4: neither agree nor disagree, 5: somewhat agree, 6: agree, 7: strongly agree.
[b] Tukey HSD pairwise comparisons: Market/Local, 0.53, p = 0.22; Market/Amenity, −0.32, p = 0.63, Local/Amenity, −0.85, p = 0.04.
[c] Average of 4 items, α = 0.84.

Table 6
Linear regression estimates of willingness to participate in land use planning activities (n = 270). The reference group for Specifications 2 and 3 is nonreaders.

	Specification 1			Specification 2			Specification 3		
	ß	$SE_{ß}$	t	ß	$SE_{ß}$	t	ß	$SE_{ß}$	t
Intercept	0.62	0.42	1.46	0.53	0.42	1.26	0.54	0.42	1.27
Self-efficacy	0.34***	0.06	6.25	0.32***	0.05	5.93	0.34***	0.06	6.07
Outcome expectancy	−0.03	0.06	−0.53	−0.04	0.06	−0.66	−0.04	0.06	−0.62
Interest	0.36***	0.08	4.63	0.37***	0.08	4.85	0.37***	0.08	4.71
Sense of community	0.14**	0.07	2.08	0.15†	0.07	2.20	0.15*	0.07	2.20
Years lived in Maine	−0.00	0.00	1.09	−0.01	0.00	−1.54			
Read Market scenario (dummy)	–	–	–	0.37†	0.22	1.68	–	–	–
Read Local scenario (dummy)	–	–	–	0.86***	0.21	3.99	–	–	–
Read Amenity scenario (dummy)	–	–	–	−0.03	0.25	−0.11	–	–	–
Read 2033 (dummy)	–	–	–	–	–	–	0.30	0.188	1.61

Specification 1: R^2 = 0.34, adjusted R^2 = 0.33, p-value < 0.001, Specification 2: R^2 = 0.38, adjusted R^2 = 0.36, p-value < 0.001, Specification 3: R^2 = 0.35, adjusted R^2 = 0.33, p-value < 0.001; Joint significance of fit test for scenario dummy variables: F = 4.42, p = 0.002.
† p < 0.1.
* p < 0.05.
** p < 0.01.
*** p < 0.001.

or 2053) also was not significant (Table 6, Specification 3). Variable estimators were robust under multiple specifications.

We also tested the extent to which self-efficacy mediated the effect of reading scenarios on willingness to participate in land use planning (Hypothesis 5, Table 7). Specifically, the difference between the mediated and unmediated effects of reading scenarios on willingness to participate in land use planning was estimated to be 0.08 (a × b) and to lie between 0.02 and 0.14 (95% confidence interval), based on procedures recommended by Preacher and Hayes (2004, 2008). Because zero is not in the 95% confidence interval, we can conclude the indirect (or mediated) effect is significantly different from zero at p < 0.01. The results weakly supported Hypothesis 5, which predicted self-efficacy mediates the effects of reading the scenarios on willingness to participate. We found a partial mediation occurring, with scenarios having both direct and indirect effects on willingness to participate.

5. Discussion

Reading the Local or Market scenarios increased willingness to participate and simply reading a scenario increased self-efficacy, suggesting that exposure to certain future scenarios, for even a short amount of time, may directly and indirectly (by increasing self-efficacy) increase willingness to participate in land use planning. The effect of reading a scenario on willingness to participate depends on the scenario combination provided. For example, in the ANOVA, willingness to participate is higher for readers of the Local scenario as compared to readers of the Amenity scenario (Table 5). Similarly, in the regression, willingness to participate is higher among readers of the Local or Market scenarios compared to readers of the Amenity and no scenario groups (Table 6). Both the Local and Amenity scenarios were identified as preferred to the Current Trends scenario, suggesting which scenarios are included in a scenario set may affect willingness to participate in land use planning activities. Understanding the diversity of what residents view as desirable may be critical to encouraging greater participation in planning activities. Inclusion of scenarios showing a preferred future in mass media outlets (e.g., websites, newspapers) may encourage public participation and increase the diversity of representation in planning. Time into the future appears less important; we did not find a difference in response variables between short- and long-term scenario settings.

Unexpectedly, we found weak support that reading longer-term scenarios (2053 versus 2033) resulted in a higher sense of community. This result raises questions about the relationship between sense of community and the psychological distance of events. In construal theory about psychological distance, difficult decisions are easier to make when they occur farther in the future (Lieberman and Trope, 2008). It may be that taking the longer view also fosters a sense of community or that those with a higher sense of community were more inclined to take the longer view. Additional factors contributing to higher levels of sense of community among respondents include age (older), time lived in Maine (more time), and gender (male).

Table 7
Bootstrapped mediation analysis results (B = 1000) using MBESS (Kelley 2010).

	path/effect	ß	SE	95% CI
c	scenario willingness to participate	0.65**	0.19	0.27–1.02
a	scenario self-efficacy	0.56***	0.20	0.16–0.96
b	self-efficacy willingness to participate	0.43***	0.05	0.33–0.53
c'	scenario & self-efficacy willingness to participate	0.40**	0.17	0.07–0.74
a × b	(scenario self-efficacy)* (self-efficacy willingness to participate)	0.08**		0.02–0.14

For paths, c: total effect of IV on DV; a: independent variable (IV) to mediator. b: direct effect of mediator on dependent variable (DV). c': direct effect of IV on DV. a × b: indirect effect of IV on DV through mediator, $R^2 = 0.248$.
†p < 0.1.
* p < 0.05.
** p < 0.01.
*** p < 0.001.

Our study provides support for sense of community as a predictor of willingness to participate in land use planning activities. This result is likely because sense of community and place attachment overlap (Pretty et al., 2003), and place attachment plays a known role in land use planning (Höppner et al., 2008). Unlike Höppner et al. (2008), we did not find outcome expectancy to predict willingness to participate; however, consistent with prior studies (Williams, 2010), we did find that outcome expectancy is positively correlated with self-efficacy, and we find self-efficacy increases willingness to participate. The partial mediation of scenarios on willingness to participate by self-efficacy and the relationship between outcome expectancy and self-efficacy suggest the potential for endogeneity. A structural equation model could more fully explore these relationships; such an approach would require a larger sample size and is beyond the scope of this study.

Our ANOVA and bootstrapped mediation analyses results suggest reading scenarios of the future can increase willingness to participate by increasing self-efficacy. Individuals reading scenarios had a higher level of self-efficacy around planning for their community's future than those who did not. Schoemaker (1993) has pointed to scenarios altering confidence and perception about what may happen in the future. This may extend to confidence about one's own ability to make change. Research on message framing has also shown that emphasizing self-efficacy can be more effective than negative framing (O'Neill and Nicholson-Cole, 2009). However, where our regression analyses were able to parse out the effects of specific scenario sets, only the Current/Local scenario set was significantly correlated with willingness to participate, suggesting a cautious interpretation in extending these relationships to all scenarios.

Visualization techniques are often used in public health and other fields to affect an individual's behavior because these visualizations increase self-efficacy (Kim and Sundar, 2012; Taylor et al., 1998). This same phenomenon may occur when individuals imagine scenarios of community-level land use futures by reading scenario narratives; increasing self-efficacy increases willingness to participate. Our results run counter to some climate change research, where imagining extreme negative scenarios of climate change reduced self-efficacy (Dockerty et al., 2006). While we found no significant difference in self-efficacy among different scenario sets viewed, more extreme or negative scenarios could have led to different results. For example, extreme negative scenarios may lead people to feel powerless while extreme positive scenarios may empower the individual. Showing extreme scenarios could also affect scenario believability, reducing imaginative stretching of future possibilities (Schoemaker, 1993). From these results, we suggest future research should focus on this relationship between plausibility and self-efficacy.

We evaluated the effects of scenarios on individuals to understand the potential effects of scenarios presented to the general population, yet scenario processes typically occur within a group setting, and recent evaluation efforts examine them within this context (Chakraborty, 2011; Nyerges and Aguirre, 2011). Group dynamics are known to affect individuals' assessment of probability (Boje and Murnighan, 2014). Also, repeated involvement may increase one's investment in the outcome of the process (Staw, 1976) or decrease it, in cases of stakeholder fatigue (Janhansoozi, 2006). As such, our scenario experiment with brief contact cannot be extended to longer-term, group-based work, but it does suggest research directions for evaluating these scenario processes.

Additional future research is needed to understand how scenarios can serve as a communication tool, or conversation boundary object, beyond small groups of stakeholders. Researchers could examine other perceptions, values, and behaviors potentially affected by the increased use of scenarios in mass media, such as decision-making and support for policies. Specifically building upon this study of land use change scenarios, other mechanisms for why scenarios affect willingness to participate could be explored. Direct comparisons of scenario format (e.g., visual versus text versus combined media) within a single study could be made, building upon individual studies examining the effects of one format type. Our research examined the impact of a brief exposure to scenarios of the future in a written, bulleted format. Previous research on presentation format often has focused on different visual presentation formats (Al-Kodmany, 1999; Schroth et al., 2015). We would expect the potential for effects of scenarios to differ with format (e.g., graphs versus maps versus bullets). While difficult to separate format from process, future research on format's effect on the broader public is needed. Additionally, scale (e.g., global/local) and interest, or saliency, of topic to the audience may interact with scenario format to affect decision-making. Longitudinal studies on the impact of scenarios would also provide more information about behaviors, not just behavioral intent.

While this study identified a difference in responses depending upon scenario set viewed, more research is needed to isolate the factors contributing to these differences. Our scenarios used broad categories (e.g., economy, housing, population, and agriculture/forestry) and possible changes tailored to Maine, a rural state in the United States with a natural resource-based economy. Land use issues in other regions will vary, requiring other categories and themes in order to be salient to audiences. The geographic scale at which scenarios are developed can also determine scenarios' level of detail. Assessing the sensitivity of audience reactions to scenario components (e.g., categories, scale) could help guide the design of scenario processes. Finally, much work has gone into identifying guidelines for developing a set of scenarios (Alcamo et al., 2008; Chakraborty and McMillan, 2015). Future work could focus on testing these guidelines relative to public participation and mass communication, improving our understanding of how various participation and outreach efforts during scenario development relate to outcomes of the scenario process.

6. Conclusions

Planning with the public rather than for the public requires expanding public participation to include the broadest number of members of the public possible (Klosterman, 2013). Our research demonstrates the potential for text-based scenarios of community-level land use changes to serve as a communication tool that can directly or indirectly increase willingness to participate in community planning for the future, providing voice and agency to those who normally do not, or cannot, attend local meetings. Reaching individuals not already likely to participate has implications for planners seeking to increase the representativeness of public participation in planning. Scenarios could be included in emerging virtual public participation efforts (Gordon et al., 2011) or used as outreach materials at the beginning of public participation processes. Current use of virtual participation appears more focused on exposing more individuals to materials and decisions, but also has the potential to extend to interactive dialogue and co-production of materials (Kleinhans et al., 2015). Planning practitioners may also want to combine the presentation of such scenarios with other methods that evoke individuals' sense of community and self-efficacy, like consensus building processes (Manzo and Perkins, 2006) and shared community work (Sanoff, 2000). Connection to the broader community and being in control about outcomes are known factors that increase people's intent to participate in planning activities.

Our results also have implications for existing scenario processes. Like self-visualizations increase self-efficacy around changing one's individual habits, scenarios' ability to increase self-efficacy may also offset stakeholder fatigue for those already participating. These findings about self-efficacy support previous work which concluded that engaging with scenarios can transition a scenario process from scenario development to actually using the scenarios to make policy (O'Brien and Meadows, 2013). Given the multitude of scenario projects with public involvement underway across broad issues, such as land use, climate change, and ecological conservation (Peterson et al., 2003; Baker et al., 2004; Sheppard et al., 2011; GSC, 2014), reducing stakeholder fatigue is an important concern. Overall, our results suggest scenarios can be a vehicle for increasing and extending public engagement around land use and planning issues.

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