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Research article

Identifying social factors that undermine support for nature-based coastal management

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ABSTRACT

Human use and degradation of coastal ecosystems is at an all-time high. Thus, a current challenge for environmental management and research is moving beyond ecological definitions of success and integrating socioeconomic factors. Projects and studies with this aim, however, have focused primarily on monetary valuations of ecosystem functions, overlooking the behaviors and psycho-social motivations of environmental management. Using a nature-based salt marsh restoration project on Martha's Vineyard, Massachusetts, we assess the role of human attitudes and preferences in evaluating social success for ecosystem management. We use structural equation modeling to compare the strengths of social variables in predicting restoration project support, and find public understanding to be a more important predictor than personal values. Our results show that even among stakeholders with strong pro-environmental values, a weak understanding of the management initiative can undermine support. We also find that project support does not necessarily translate to the prioritization of similar management strategies. Instead, when individuals consider overall management priorities, differences arise between particular resource user-groups. This suggests that strong public support for individual initiatives can misconstrue complexities in stakeholder preferences that emerge in more comprehensive management considerations. Future investigations of the psycho-social components of management solutions should address the potentially tiered nature of human preferences, as well as whether public perceptions of management effectiveness act as an additional context-dependency of social viability.

1. Introduction

Coastal habitats provide a wide variety of ecosystem services and support diverse ecological communities, but have been severely degraded (MEA, 2005). Salt marshes are one of the most impacted of all coastal habitats due in large part to development practices (Bohn and Kershner, 2002; Lotze et al., 2006). As a result, coastal salt marshes have become the focus of many restoration and management efforts. For restoration to be successful, nature-based strategies are needed that support ecologically and socially desirable outcomes, and not shoreline armoring that drives further habitat loss and disrupts land-water exchange (Bozek and Burdick, 2005). However, nature-based coastal protection interventions are still in their infancy, particularly in high-energy salt marshes (Scyphers et al., 2015). The coastal management value of these approaches will depend on both ecological and social responses to their implementation.

To utilize a coupled social-ecological systems framework in coastal management, it is necessary to understand how variables from both systems interact and contribute to project success. Currently, empirical understanding of relevant ecological factors exceeds that for social factors (de Juan et al., 2017). Furthermore, the framework for understanding what it means for management to be socially viable is not well established, and rarely operationalized (but see Knight et al., 2010; Klain and Chan, 2012). While socioeconomic assessments of coastal management efforts are becoming more common, monetary valuations dominate (Le Gentil and Mongruel, 2015). Social-psychological research on environmental attitudes and behavior, however, has demonstrated that people are motivated by far more than economic considerations (Stern, 2000). In fact, many have argued that management conflicts (e.g. illicit trade of natural resources, adherence to Marine Protected Area restrictions) are often a struggle of social values rather than

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technical expertise or ecological processes (Mascia et al., 2003; Gelcich et al., 2005).

Human values are described as preferences for certain modes of conduct (means), or outcomes (ends), that act as a motivational framework to guide behavior (Schwartz, 1994). This framework has been adapted to explain the role of personal values in motivating environmentally significant behavior for conservation and management (Stern et al., 1993). This adaptation suggests that concern for environmental issues is based on matters of altruism (a social-altruistic values orientation), self-interest (egoistic orientation), or in the interest of 'all living things' (biospheric orientation). In natural resources management, the extent of concern acts as the precursor to attitudes that shape policy or project support. Therefore, an understanding of human values associated with management support and viability can help managers anticipate behavior (e.g., compliance) or identify potential management alternatives.

This study aimed to inform our understanding of effective social-ecological management by using human values, perceptions, and preferences in assessing what facilitates social viability in coastal management. To operationalize this, we conducted semi-structured interviews with individuals representing multiple stakeholder groups in coastal communities across Martha's Vineyard (MA, USA). A nature-based salt marsh stabilization project was created with a 'living shoreline' design using biodegradable materials. The novelty of this technique coupled with the high visibility associated with the project provided a social landscape well suited for exploring human responses and preferences. Specifically, we sought to determine how social variables influenced project support and mediated choices for potential alternative management strategies.

2. Methods

2.1. Study setting

This study focuses on a community dealing with poor water quality and coastal erosion in Martha's Vineyard. As part of a response to these issues, a restoration effort was undertaken along an eroded salt marsh in Summer 2016. The restoration project involved installation of coconut fiber logs (0.4 m diameter x 3 m length) and bags filled with oyster shells (0.3 m width x 0.6 m length) in Sengekontacket Pond (Fig. 1). This 'living shoreline' design was implemented with the goal of reducing erosion and improving water quality through recruitment of salt marsh vegetation.

2.2. Survey design and data collection

Our 27-question survey instrument was created with multidisciplinary input from social scientists, ecologists, and managers and it included two parts with both quantitative and qualitative measures. First, we collected information using semi-structured, one-on-one interviews on an individual's relationship to Sengekontacket Pond, and the modes and frequencies with which they used it. Second, we allowed participants to self-report basic socioeconomic information (e.g. income level), behavioral norms related to environmental issues, beliefs about the state of the environment, underlying personal values, level of confidence in their understanding of the goals and design of the living shoreline restoration project, support for the restoration project, and preferences for pond restoration management scenarios. An individual's understanding of the restoration project is described as 'confidence' because participants were not required to prove that they understood the project's goals and design. Environmental beliefs were gauged using the New Ecological Paradigm (NEP) scale (Dunlap and Van Liere, 1978) and underlying personal values were measured using Schwartz's value items organized into environmentally-relevant value orientations (Stern et al., 1993).

The coastal salt ponds on Martha's Vineyard, including Sengekontacket Pond where the living shoreline project is located, experience heavy use by both the residents living on the island, as well as the tourists who vacation there during the summer months (June–September). In particular, Sengekontacket Pond sees a wide range of recreational use along its shoreline, which includes private residences, conservation land, and public beaches. In an effort to capture this complexity in our data collection, we targeted individuals that fell within a 'community of interest' who either: (a) visited a public beach along the pond's eastern side (Joseph Sylvia State Beach); (b) visited a nature reserve along the western side (The Mass Audubon Felix Neck Wildlife Sanctuary); (c) lived or vacationed in a development along the southwestern side (Ocean Heights); or (d) held an active recreational shellfishing permit for the pond (Fig. 1). Study participants were recruited and interviewed in-person during peak tourist season in Summer 2016 at the three locations listed above, with the exception of shellfishers who were identified through a publically available list of active permit-holders and then recruited and interviewed over the phone because of scheduling difficulty. The only difference between interviews conducted in person ($n = 103$) and those conducted over the phone ($n = 7$) were the self-report measures; phone recruits completed these through Qualtrics online survey software. All study participants were dictated the same text describing the basic goals and design of the restoration project immediately prior to being interviewed.

2.3. Analyses

We used structural equation modeling (SEM) to investigate the links between social variables and project support within the dataset. We designed SEM structure in accordance with the relationships outlined by Values-Beliefs-Norms (VBN) theory (Stern et al., 1999), and used multi-model analysis to compare the strength of the VBN pathway in predicting project support against that of project understanding (Fig. 2). Given that the majority of latent variables stem from scales rigorously tested in previous literature, we used simple tests of reliability (Cronbach's alpha; Gliem and Gliem, 2003) to check their validity (Table 1). The latent variable measuring 'egoistic' values reported low reliability and was therefore removed from the model. We used partial-least-squares (PLS) regression as the method of estimation in our SEM due to a relatively small sample size compared with model complexity. This method of estimation does not report a global measure of goodness of model fit. PLS-SEM focuses instead on the explained variance of endogenous variables within a model, making it an adequate method for comparing the predictive strength of different social variable causal chains (Hair et al., 2011). All individual relationships between our social variables and project support were investigated further with one-way ANOVAs, post-hoc pairwise comparisons, and pairwise comparisons using t-tests. Of these, we focus our discussion of results on statistically significant relationships (i.e. ANOVA statistics are not reported because no significant relationships were found between variables compared using ANOVA tests). We also tested for differences across stakeholder groups in the priorities assigned to coastal management alternatives using t-test pairwise comparisons.