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The human dimensions of coastal ecosystem services: Managing for social values

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ABSTRACT

Coastal management is driven by the values and priorities of society as expressed through social, political, and economic systems. Diverse resource management goals reflect what society wants from its surrounding environments as presented in enabling legislation and other resource laws. Today, coastal management encompasses decisions of what to regulate, what enterprises and initiatives to promote, and which ecosystem services are most important to citizens and businesses. Data based on the natural or physical sciences are important, but are just one input into this socially driven, value-based process. This paper offers an insight into why an ecosystem service approach using human dimensions as the major driver is becoming an increasing focus of coastal resource management.

1. Introduction

Despite rapid improvements in technological, economic and material well-being, human progress still relies heavily on naturally provided ecosystem services (Boyce and Shelley, 2003; Sen, 1999). Coastal ecosystems, defined as including both human and biophysical components, provide a variety of important regional and national benefits, including tourism, recreation, fisheries, trade, and esthetic and cultural value. Our daily lives depend on a range of services the natural environment provides including energy security, environmental conservation, food production, fresh water provisions, health, recreation, tourism, natural hazard protection, infrastructure and housing (Ranganathan et al., 2008). Coastal management therefore encompasses a large range of complex, overlapping, and often contradictory interests. Decisions regarding regulatory priorities such as development initiatives and long term plans, resource conservation, and resource allocation must be made in the face of shifting societal values and ever-changing political, social, and biophysical climates (Campbell et al., 2009; Cundill and Fabricius, 2010; Sanginga et al., 2010). Balancing the demands between public goods, private enterprise, preservation, and development has become the main natural resource management challenge (Brechin et al., 2002; Brunner et al., 2005; Dietz et al., 2003). What we manage *for* is a question of increasing relevance and importance to agencies. The concept of ecosystem services helps answer this question, in part by recognizing that coastal management is driven largely by social values. The purpose of this paper is to provide an overview perspective on the role of social values (the driving force in coastal resource management), ecosystem services and human dimensions, and how they interrelate in the management of coastal resources.

Ecosystem services have been defined as the conditions and processes through which natural ecosystems, and their associated species, sustain and fulfill human life (Moberg and Folke, 1999). Examples include provision of clean water and clean air, maintenance of liveable climates (carbon sequestration), pollination of crops and native vegetation, as well as fulfillment of people's cultural, spiritual, and intellectual needs. Therefore, ecosystem services are the benefits, both tangible and intangible, created by particular sets of ecological characteristics that are explicitly tied to social value (Dore and Webb, 2003; Olsson et al., 2004; Ranganathan et al., 2008; Turner et al., 2003). In other words, ecosystem services are the outcomes of ecosystem functions that yield value to people. Ecosystem services are often confused with biodiversity. Biodiversity—the variability of life on earth, within species, between species, and between ecosystems—is not an ecosystem service in and of itself. Rather, biodiversity serves as a basic platform for all direct ecosystem services that we benefit from as a society.

An ecosystem services approach to resource management moves beyond how people affect ecosystems to include how people depend on, benefit from and are affected by, ecosystems. This reflects an important change in our thinking in terms of management goals. We have moved from a preservation perspective in which humans (and society at large) are perceived to interact with

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the natural environment in a one-way direction (i.e., we negatively impact it) to a two-way interactive direction in which society derives various benefits from the environment, but with trade-offs and at some environmental cost. Today it is more an issue of what ecosystem services does society want with what tradeoffs and at what costs. The concept of ecosystem services has become central to the discussion about the dependence of humans on nature and what that means both socially and economically (Costanza and Farley, 2007).

The value of coastal ecosystem services, and the natural assets that provide them, has often been overlooked when making decisions about resource use, not because of a lack of importance, but because these goods are freely available rather than bought and sold through markets (Vaze et al., 2006). The benefits derived from ecosystem services, and the related costs of degradation or impacts, are often not part of the traditional economy or traded in markets. Many ecosystem services are frequently not recognized or considered, and are even neglected when decisions are made. They are off the ledgers of the public and policymakers, taken for granted, and yet nonetheless prized once made scarce (Brander et al., 2007; Yang et al., 2008). This contributes to the gradual erosion of some of the essential, communal life support services such as climate regulation, carbon storage, cultural heritage, esthetics, erosion protection and waste disposal (Hardin, 1968). Although some work to explicitly account for these benefits using a range of economic and non-market metrics has been done further research, would reveal hidden costs and benefits to many current practices and yield decisions that most readily reflect the true value of the natural environment to society (Bhat, 2003; Champ et al., 2003; Pendleton and Kildow, 2006).

Still, the relationship between human well-being and ecosystem services is not linear. When an ecosystem service is abundant relative to the demand, a marginal increase in ecosystem services generally contributes only slightly to human well being. However, when the service is relatively scarce, a small decrease can substantially reduce human well-being (Farber, 1987). The degradation of ecosystem services therefore ultimately represents the loss of a capital asset.

Given that different sets of ecological characteristics will generate alternative sets of ecosystem services, it is necessary to understand how society, and those responsible for managing coastal resources on behalf of society, decides which ecosystem services are preferred, and what environmental consequences are to be tolerated. A fundamental element in deciding which ecosystem services are desired and with what environmental consequences are social values.

2. Social values

Social values are certain qualities and beliefs that are shared by a specific culture or group of people. These traits can include but are not limited to religious, economic, political, and cultural factors (Eagly and Chaiken, 1993). Based upon this limited number of core values, individuals maintain a certain attitude or disposition to respond positively or negatively toward some aspect of the perceived world (Ajzen, 1989; Ajzen and Fishbein, 1972). The term attitude then references not only the act of perception but also the evaluative meaning ascribed to an object in the process. The entire set of attitudes held by a person is therefore a subset of their beliefs, values, and ethical orientations at any given time (Rokeach, 1986). It is safe to assume that, in general, everyone's attitudes are different. Societal response to coastal management and ecosystem service use is therefore highly variable and complex across multiple scales (Moser, 2005). This is due in part to the inherent variety of character displayed by human beings across different socio-economic and demographic ranges, as well as the institutional mechanisms that have been socially established to represent various social values.

As an example, differences in people's attitudes toward climate change and sea level rise, as well as potential policy options, point to a variety of issues, including varying degrees of problem awareness, perceptions of risk and urgency, differences in value-based lenses, cognitive frames and integrative complexity, varying motivations, abilities, and constraints to taking actions (Moser and Dilling, 2004). These differences are compounded by the fact that coastal resources provide a wide range of ecological goods and services that are of high social and economic value (Moberg and Folke, 1999). In many cases, the same resource, such as coastal wetland areas, can have high intrinsic value from a biodiversity standpoint while simultaneously having a high extrinsic value by protecting local infrastructure, or supporting important industries such as commercial or recreational fishing, or as a location for a marina or a bridge. All of these ecosystem services are valid, and represent legitimate expressions of social values.

These expressions of social value are presented in the form of enabling legislation, such as the National Marine Sanctuaries Act, or in the form of environmental legislation, such as the National Environmental Policy Act, the Endangered Species Act, or the Clean Water Act. Our collective values are presented to agencies through democracy and the legislative process. In recent decades, legislation has called for preservation and protection, and at the same time for public access, recreation and tourism, economic development, historic and cultural uses, and more (Austin et al., 2004). Typically these competing ecosystem services are included in the same legislation. Due to the increased pressures on coastal resources, management strategies involving a complex set of regulations and use restrictions are often employed to balance the needs of the environment with that of society (The World Bank, 2006). Managers face a difficult dilemma.

Their dilemma is rooted in the scenario that environmental and social goals are often developed independently without due consideration for the tradeoffs inherently linked to competing, conflicting objectives (Weinstein et al., 2007). This is reflected in the "management dilemma", in which there are no solutions to one problem that do not at the same time violate some other management goal or constraint (Lachapelle et al., 2003). We ask agencies to preserve and protect our valuable coastal resources, and at the same time and in the same location make them accessible for all manner of use. You cannot increase access and use, and at the same time enhance preservation and protection. Similarly, we cannot increase the level of protection afforded a resource without decreasing access and use. By not specifically addressing this management dilemma, which often results in various forms of conflict between stakeholders, managers are left trying to engage in combat conservation. An understanding of these tradeoffs and how stakeholder groups will be affected, and the direction and magnitude of possible conflicts, would provide insight into how best to adapt to shoreline changes (Humphreys, 2005; Ostrom, 2010; Suzuki and Iwasa, 2009; Warner, 2000). The management choices can no longer be environment versus development, but must strive to achieve more subtle combinations to reach eco-societal goals or norms (Weinstein and Reed, 2005).

3. Resource management

Management from a general perspective can be defined as a set of actions taken to guide a system toward achieving desired goals and objectives, usually subject to a set of externally imposed constraints (Davidson et al., 2009). There is a diverse array of formal and informal social constraints that exist throughout society on how people should, and do, interact with resources and