



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



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ARTICLE INFO

Article history:

Received 10 April 2013

Received in revised form 30 July 2013

Accepted 27 September 2013

Keywords:

Human dimensions

Ecosystem services

Social values

Enabling legislation

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.

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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

ecosystems, on the distribution of rights to access, and responsibilities for stewardship (Lertzman, 2009). A management process, therefore, is the sum of these actions, the goals and objectives, the procedure through which they are legitimized by social norms, values, and the institutions and actors involved in carrying out said actions. In theory, natural resource *management* is assumed to be value neutral. This is because a management process is tasked with achieving goals and objectives provided to it by its societal context. Values have already been applied by this time. The job of management is to operationalize the normative values of society that are reflected in policies, plans, and accepted behaviors (Lockwood et al., 2010) as directed in various pieces of legislation.

Lawmakers typically attempt to create a framework for management outcomes by highlighting general themes, such as ecological, social, and economic values and considerations (Brown et al., 1995). Though rarely dictating specific courses of action, legislation does often stipulate concepts and management tools (e.g., spatial and temporal zoning) administrators and planners shall have at their disposal. In recognition of these conflicting uses and their associated values, resource legislation tends to be more general, inclusive, and balanced with respect to use, conservation, and preservation.

Resource management plans, on the other hand, are the ultimate agency response to resource legislation, theoretically designed to achieve a socially desired ecosystem state. This state can usually be related back to the resource legislation and the desired benefits that can be derived from that ecosystem, i.e. the ecosystem services. With the identification of a desired end state, or the quality of the ecosystem service provided by some state of the environment, comes a responsibility to manage toward that state and a need to measure success (Palumbi et al., 2008).

4. Legislation and ecosystem services

Resource management plans are not the product of some divine ecological or social guidance. They are in fact a response, often a mandated one, to resource legislation, which is itself a stated policy derived from social values about why an area is important and in need of management.

As mentioned previously, our current paradigm more often reflects preservation/protection values from an environmental/natural science perspective. Without doubt, these values are resident in various pieces of resource related legislation. However, these are not the only values to be found in the same legislation. To illustrate this we will briefly review two pertinent pieces of federal legislation: the Coastal Zone Management Act of 1972, and the National Marine Sanctuaries Act of 1972. A brief examination of parts of these acts will highlight that the framers intended to provide for and balance diverse societal objectives. By extension, this will also provide insight into the ecosystem services which should be identified and managed for, on behalf of society.

4.1. *The Coastal Management Act of 1972 (16 U.S.C. 1451)*

Many people live along U.S. coasts for the esthetic beauty and economic opportunity they provide. The Nation's coastal areas serve an important role in the commerce, industry, food supply, and recreation of the people of the United States and as such are a visible indicator of the state of our country's environment. In fact, it was the fouling of our beaches in the 1970s and 1980s that led many to realize the seriousness of our environmental problems. In 1972, in response to public concern over coastal pollution, development, and use, Congress enacted the Coastal Zone Management Act (CZMA). Section 302 of the CZMA found that:

(a) There is a national interest in the effective management, beneficial use, protection, and development of the coastal zone. (b) The coastal zone is rich in a variety of natural, commercial, recreational, ecological, industrial, and esthetic resources of immediate and potential value to the present and future well-being of the Nation. (c) The increasing and competing demands upon the lands and waters of our coastal zone occasioned by population growth and economic development, including requirements for industry, commerce, residential development, recreation, extraction of mineral resources and fossil fuels, transportation and navigation, waste disposal, and harvesting of fish, shellfish, and other living marine resources, have resulted in the loss of living marine resources, wildlife, nutrient-rich areas, permanent and adverse changes to ecological systems, decreasing open space for public use, and shoreline erosion. (d) The habitat areas of the coastal zone, and the fish, shellfish, other living marine resources, and wildlife therein, are ecologically fragile and consequently extremely vulnerable to destruction by man's alterations. (e) Important ecological, cultural, historic, and esthetic values in the coastal zone which are essential to the well-being of all citizens are being irretrievably damaged or lost. (f) New and expanding demands for food, energy, minerals, defense needs, recreation, waste disposal, transportation, and industrial activities in the Great Lakes, territorial sea, exclusive economic zone, and Outer Continental Shelf are placing stress on these areas and are creating the need for resolution of serious conflicts among important and competing uses and values in coastal and ocean water.

As noted above, if managed properly, the coastlines of the United States provide enormous potential in terms of food, recreation, commerce, and abound in plants and animals. Again we note that a balanced set of socially defined and desired terms (ecosystem services) (e.g., commercial, ecologically fragile, recreational, industrial, living marine resources, esthetic, population growth, economic development, wildlife, residential development, extraction, transportation, navigation, waste disposal, and harvesting) are featured prominently. These are things of value to society, and are desired ecosystem services to be managed for.

4.2. *The National Marine Sanctuary Act of 1972 (16 U.S.C. 1431)*

The National Marine Sanctuary Act (16 U.S.C. 1431) (NMSA) was promulgated by Congress in 1972 to protect nationally significant marine areas for their ecological and historical value (Tarnas, 1988). The Act directed that a National Marine Sanctuary Program be established within NOAA, and that this program utilize comprehensive resource management strategies to manage for ecological and social benefits, increase public understanding of these unique marine areas, and to facilitate use. Like the National Park Service, the NMSA espouses a dual mandate of both protection and use. In section 301 of 16 U.S.C. 1431 Congress found that:

Certain areas of the marine environment possess conservation, recreational, ecological, historical, scientific, educational, cultural, archeological, or esthetic qualities which give them special national, and in some cases international, significance.

While the need to control the effects of particular activities has led to enactment of resource-specific legislation, these laws cannot in all cases provide a coordinated and comprehensive approach to the conservation and management of special areas of the marine environment.

A Federal program which establishes areas of the marine environment which have special conservation, recreational, ecological, historical, cultural, archeological, scientific, educational, or

esthetic qualities as national marine sanctuaries managed as the National Marine Sanctuary System will—(a) improve the conservation, understanding, management, and wise and sustainable use of marine resources, (b) enhance public awareness, understanding, and appreciation of the marine environment, and (c) maintain for future generations the habitat, and ecological services, of the natural assemblage of living resources that inhabit these areas (NOAA, 2005, p. 247).

This dual mandate of use and protection is evident in the mix of social and ecological terms found in the Act, and provides managers and planners with guidance for creating a balanced management plan. Again, this legislation identifies for managers the ecosystem services desired by society, around which management plans should be developed and implemented.

5. Conclusion

Resource managers work in complex and unpredictable social, economic, cultural and political systems. Preferable ecosystem states, whether defined at a local level by resource managers or at a higher, societal level, are constrained by a series of external factors. These factors, such as social and economic trends, capacity of government, political will, enabling legislation, migration, and competing ecosystem services or goals all represent potential barriers and stumbling blocks to success (Ranganathan et al., 2008; Rechkemmer and von Falkenhayn, 2009). In the face of this reality, and perhaps at a crucial time in the human–nature interaction complex, natural resource management has become stuck in an era of turbulence (Brechtin et al., 2002; Brunner et al., 2005; Glover et al., 2004). Goals are frequently contested, temporal and spatial scales of analysis are constantly debated and significant uncertainty exists about the effects and effectiveness of management actions. This state is exemplified by growing public dissatisfaction, expressed in many forms, including a lack of public participation, animosity and distrust toward government, appeals and litigation (Lockwood et al., 2010; Murphy, 2009). The implications of this state are far reaching and possibly highly detrimental to society and the resources it depends so closely on.

Resource management is not solely about the preservation or conservation of natural ecosystems but more about defining the dynamic between people and the resources they depend upon. The process of defining that dynamic is iterative and must account not only for changing natural resource conditions but also for changing social conditions. At a time when social attitudes and values are changing rapidly, there is a need for a shift in the way in which coastal resources are managed. The traditional approach, which disproportionately emphasizes understanding and managing for biophysical parameters and focuses on preservation/protection, is no longer appropriate or capable when it comes to incorporating a broad spectrum of social values. That era has passed. The phrase, “we don’t manage fish, we manage people,” is often uttered. While this may not be entirely true, it does make a significant point. We still have a limited understanding of people, from their intentions and behavior to their attitudes and management preferences. This severely impairs our ability to define and understand what ecosystem services we as a society seek, and what trade-offs and costs we are willing to accept.

Society’s affinity toward using and enjoying coastal environments dictates that coastal ecosystems must be managed in a complex arrangement for both protection and use. Therefore the primary management goal now becomes how to maintain specific ecosystem services for future generations while allowing the current generation to use and benefit from them. This paper has argued that social values and priorities, expressed by social, political and

economic systems by way of the democratic and legislative process, drive coastal resource management. As a result, the ecosystem services approach to resource management provides an avenue to account for the activities, impacts, and needs of people in recognition of their increasing dominance in coastal ecosystems. A more holistic approach to management of coastal environments, with human dimensions and ecosystem services as the center piece, offers a higher chance of success than is currently enjoyed, creating a powerful argument for a shift in priorities across all resource management institutions.

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