

# Multiple values for the management and sustainable use of coastal and marine ecosystem services



Shamik Chakraborty<sup>a,\*</sup>, Alexandros Gasparatos<sup>b</sup>, Robert Blasiak<sup>c</sup>

<sup>a</sup> Faculty of Sustainability Studies, Hosei University, 17-1, Fujimi 2-Chome, Chiyoda-ku, Tokyo 102-8160, Japan

<sup>b</sup> Institute for Future Initiatives (IFI), University of Tokyo, Tokyo, Japan

<sup>c</sup> Stockholm Resilience Center, Stockholm, Sweden

## 1. Different values in coastal and marine social-ecological systems

Coastal and marine areas are increasingly recognized as coupled social-ecological systems (SES) or seascapes consisting of highly inter-linked human and ecological elements (Berkes et al., 2003). These seascapes provide numerous ecosystem services ranging from provisioning services related to marine products of economic and subsistence value (Anneboina and Kumar, 2017; Potts et al., 2014) to regulating and cultural ecosystem services that have manifold contributions to human wellbeing (MA, 2005; Blasiak et al., 2017; Garcia Rodrigues et al., 2017). These ecosystem services are essential for approximately 28% of the global population that lives in coastal areas. However, coastal and marine SES experience rapid change, for example, facing the greatest exposure to climatic change that leaves their poor and marginalized residents among the world's most vulnerable (IPCC, 2019; Blasiak et al., 2017).

Considering the important contribution of coastal and marine SES to the wellbeing of many local communities, and humanity as a whole, there have been calls for the adoption of ecosystem-based approaches for their management (Foley et al., 2010; Maes et al., 2012). However, development interventions and management practices can have important trade-offs in such contexts (Mach et al., 2015; Berg et al., 2016). For example, while aquaculture has the potential to relieve pressure on overexploited wild fish stocks and improve the food security of local communities (Troell et al., 2014), it can also cause water pollution, habitat degradation, loss of genetic diversity, and nutritional deficits (Bush et al., 2013; Cashion et al., 2017; Glover et al., 2017; Hicks et al., 2019; Li, 2017). Similarly, tourism and recreational activities can enhance the cultural benefits obtained from seascapes, but at the same time they can have negative impacts through habitat change/loss, pollution and loss of local traditions (Gladstone et al., 2013; Lopes et al., 2015). Similarly, the development of renewable energy infrastructure in coastal and marine SES has been associated with both positive and negative effects on aquatic biodiversity and associated ecosystem services (Gasparatos et al., 2017; Casalegno et al., 2014).

Often, the decision to opt for certain management interventions is

influenced by the distinct values and vested interests of different stakeholders (Lyver et al., 2017; Smythe and Thompson, 2014). Often these stakeholders have radically different value systems and ascribe different values to the biodiversity and ecosystem services provided by coastal and marine SES (Simpson et al., 2016; Blasiak et al., 2015; Lopes and Videira, 2017). Furthermore, although many of these ecosystem services can be directly tied to markets and are thus amenable to economic valuation (e.g. TEEB, 2010; Barbier et al., 2011), other services are more connected with cultural identity, spiritual interactions, and sense of place, all of which are difficult to assess or quantify (Chan et al., 2012a, 2012b; Pascual et al., 2017). For instance, cultural connections to the sea and other elements of coastal and marine SES can significantly influence how people value biodiversity and ecosystem services (Wakita et al., 2014; Blasiak et al., 2015).

## 2. Current approaches for studying values in coastal and marine SES

A large strand of literature has been exploring the values associated with coastal and marine SES, and the ecosystem services they provide. The overwhelming amount of literature, including within *Ecosystem Services*, deploys standard economic tools to articulate, elicit or derive the values associated with these services and/or management practices (TEEB, 2010). Common approaches include: (a) contingent valuation method (CVM) (Blignaut et al., 2016; Stefanski and Villasante, 2015; Barrera et al., 2014); (b) choice experiments (Norton and Hynes, 2014; Christie et al., 2015); (c) travel cost method (Zhang et al., 2015; Chae et al., 2012); (d) avoided damages (Pascal et al., 2016); (e) market values and opportunity costs (Thompson et al., 2014; Adekola et al., 2015); and (f) value transfer (Ghermandi et al., 2016; Crespini and Simonetti, 2016). A relatively large amount of studies utilises standardized tools such as InVest (Berg et al., 2016; Guerry et al., 2012) or combinations and hybrids of the above economic valuation techniques (e.g. Toledo et al., 2018; Vo et al., 2015; Jobstvogt et al., 2014).

Fewer studies use non-monetary techniques including: (a) socio-cultural valuation (de Souza Queiroz et al., 2017; Havas et al., 2016);

\* Corresponding author at: Shamik Chakraborty, Faculty of Sustainability Studies, Hosei University, 17-1, Fujimi 2-Chome, Chiyoda-ku, Tokyo 102-8160, Japan.  
E-mail addresses: [shamik.chakraborty.76@hosei.ac.jp](mailto:shamik.chakraborty.76@hosei.ac.jp) (S. Chakraborty), [gasparatos@ir3s.u-tokyo.ac.jp](mailto:gasparatos@ir3s.u-tokyo.ac.jp) (A. Gasparatos).

**Table 1**  
Summary of the studies contained in the Special Issue.

Article	Area	Main theme	Ecosystem services	Elicitation and analysis methods	Study groups
Dam Lam et al. (2019)	Global	Literature patterns related to the integration of multiple values in coastal and marine social-ecological systems in indigenous settings.	Multiple	Systematic literature review	NA
Pascoe et al. (2019)	Australia	Economic values of coastal ecosystem assets.	Multiple	Latent class analysis - Analytical Hierarchy Process - Choice experiment	Coastal residents
Owton et al. (2019)	Kenya	Values assigned by local communities on mangrove biodiversity and non-market ecosystem services.	Multiple	Deliberative choice experiment	Local community members
Lau et al. (2019)	Papua New Guinea	Value of different marine and terrestrial ecosystem services to different local community members.	Multiple	- Ranking/rating exercises - Socioeconomic survey	Local community members with different livelihoods
Chaigneau et al. (2019)	Kenya, Mozambique	Mechanisms mediating how ecosystem services contribute to different human wellbeing domains.	Multiple	- Focus Group Discussions	Local community members with different livelihoods
Chan et al. (2019)	Jamaica	Linkages between ecosystem services and social wellbeing for different groups affected by an MPA.	Multiple	Individual interviews, Focus Group Discussions	Fishers and local community members
Ainsworth et al. (2019)	UK	Values associated with cultural ecosystem services and how they contribute to individual and collective human wellbeing.	Cultural	- Community Voice Method	Stakeholders with different engagement with the marine environment
Johnson et al. (2019)	USA, Australia	Relationship between social values and landscape characteristics in protected areas.	Multiple	Participatory mapping	Visitors and tourists
Outeiro et al. (2019)	Brazil	Ecosystem services trade-offs due to different management options around an MPA and its effects to different user groups.	Mainly provisioning and cultural	Maximum Entropy Modelling Spatial-economic analysis, Socioeconomic survey	Local fishers, tourist association, MPA managers
Chakraborty and Gasparatos (2019)	Japan	Drivers of ecosystem change and their effect on coastal and marine ecosystem services.	Mainly provisioning and cultural	- Expert interviews - Household survey	Local community members with different livelihoods
Lopes and Videira (2019)	Portugal	Description and piloting of a participatory framework for scoping, conceptualizing and articulating ecosystem services values.	Multiple	- Community mapping Participatory analysis Mediated modelling	Stakeholders with different engagement with the national park

(b) social network analysis (Roldán et al., 2015); (c) participatory systems mapping (Lopes and Videira, 2017; Guimarães et al., 2013; Pert et al., 2015); (d) narrative-based methods (Outeiro et al., 2015); (e) expert opinion (Eastwood et al., 2016); (f) photo-questionnaire (Peña et al., 2015); and (g) deliberative workshops (Pascua et al., 2017), among others. An expanding body of literature also uses combinations of the above techniques (Fish et al., 2016b; Kenter, 2016; Kenter et al., 2016a).

Most of the studies that use monetary and non-monetary approaches to articulate, elicit or derive values tend to focus on multiple ecosystem services. However, studies using non-monetary techniques tend to capture a wider variety of cultural services (e.g. de Souza Queiroz et al., 2017; Roldán et al., 2015; Eastwood et al., 2016; Havas et al., 2016). Very few studies have attempted to combine different monetary and non-monetary techniques (e.g. Soy-Massoni et al., 2016; Barnes-Mauthe et al., 2015; Ranger et al., 2016), or elicit/synthesize monetary values through non-standard economic approaches such as life satisfaction (Jarvis et al., 2017) and local wellbeing valuation (Sangha et al., 2017).

### 3. Why is it important to focus on multiple values?

As mentioned above, coastal and marine SES provide many different types of ecosystem services that are important to various stakeholders, which often have radically different values and vested interests when prioritizing ecosystem services and management actions. Furthermore, the large constellation of monetary and non-monetary techniques can articulate, elicit or derive these diverse values, but often through very different perspectives (TEEB, 2010; Gasparatos and Scolobig, 2012). Indeed, many studies have identified marine and coastal SES as systems where multiple values intersect strongly (e.g. Klain and Chan, 2012; Jobstvogt et al., 2014; Kenter et al., 2016b, Drakou et al., 2017).

Considering this multiplicity of values and ways to elicit them, it is safe to argue that focusing on single value dimensions is unlikely to allow us to fully understand the benefits derived from the different coastal and marine ecosystem services, as well as design effective management approaches. Several conceptual and theoretical papers have actually made a case for considering and capturing multiple values in coastal and marine contexts (e.g. Irvine et al., 2016; Kenter et al., 2016a; Fish et al., 2016a; Cooper et al., 2016; Everard et al., 2016).

These calls can be tracked to the strong, emerging tradition within the ecosystem services and ecological economics literature on the need to integrate multiple values for ecosystem services valuation and management. This has been articulated both in the main large-scale assessments (MA, 2005; TEEB, 2010; NEA, 2011; IPBES, 2019), as well as the wider ecosystem services literature (Potschin-Young et al., 2017; Tengö et al., 2014; Bennett et al., 2015). It has also been consolidated within the work of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), which has embraced an inclusive approach for the valuation of ecosystem services, that seeks to delineate the multiple and diverse values that arise from different worldviews (Pascual et al., 2017).

We strongly believe that effectively articulating and considering multiple values can provide a solid foundation for ensuring the conservation and sustainable use of marine and coastal ecosystem services in the context of rapid socioeconomic and environmental change. The notion that emerging economic paradigms such as the Blue Economy can indeed ensure sustainable development is premised on the operationalization of inclusive approaches that encompass this diversity of values (Bennett et al., 2019). This special issue seeks to further this rich tradition and recent developments related to the framing and operationalization of the discourse about multiple values in coastal and marine SES.

### 4. Content of the special issue

The eleven papers comprising this Special Issue capture, synthesize

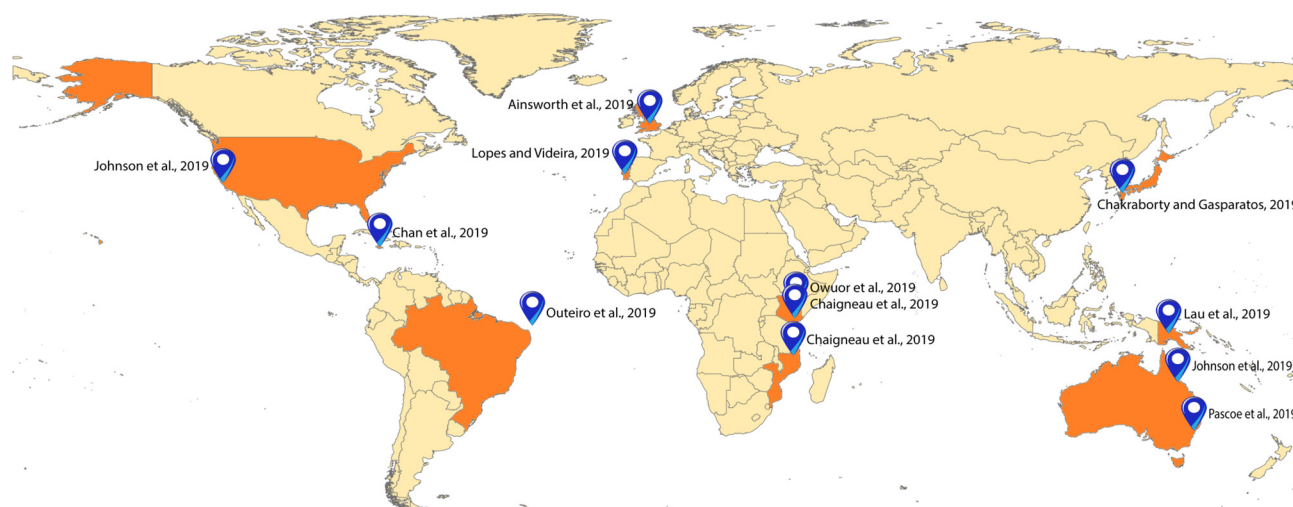


Fig. 1. Geographical focus of the case studies contained in the Special Issue.

and communicate the multiple values associated with the use and management of coastal and marine SES, and the ecosystem services they provide. Collectively the papers focus on different areas of the world and use various quantitative and qualitative techniques to articulate, elicit or derive the values assigned by diverse stakeholders (Table 1, Fig. 1). Below we offer a short description of each study.

Dam Lam et al. (2019) undertake a systematic review to explore patterns in the peer-reviewed literature about the multiple values associated with coastal and marine SES in indigenous settings. Through different statistical and visualization tools they identify two distinct research branches, contextual and causal research. Contextual studies mainly use qualitative techniques to study the drivers and pressures of change in indigenous coastal and marine SES, providing a rather comprehensive understanding of related topics. Causal studies tend to engage better relevant stakeholders to explain relationships and impacts within such SES. The authors argue for cross-fertilization between these distinct research approaches, as a means of integrating more effectively the different knowledge systems and values in indigenous coastal and marine SES

Pascoe et al. (2019) combine Analytic Hierarchy Process (AHP) with choice experiments to elicit values for coastal and marine habitats. In particular they deploy these techniques to elicit the preferences for protecting habitats in the coastal areas of New South Wales, Australia. The results suggest that nearly 90% of the respondents are willing to pay (WTP) for supporting coastal habitat protection. The authors subsequently use the relative values derived from the AHP to extrapolate the choice experiment results and estimate non-market values for a wide range of coastal and marine habitats.

Owuor et al. (2019) elicit the values of local communities for mangrove biodiversity and non-market ecosystem services in Mida Creek, Kenya. Through a deliberative choice experiment approach they inform participants from the local communities about the multi-faceted role of ecosystem processes and services for their wellbeing, and following deliberation in focus group settings, they elicit the values and preferences of individual respondents through a choice experiment. Unpaid labour (i.e. volunteer time) for mangroves conservation is used as the payment mechanism to estimate WTP for biodiversity and ecosystem services. The highest WTP were for biodiversity, followed for shoreline erosion protection, nursery and habitat for fish, and education and research.

Lau et al. (2019) use a combination of non-monetary ranking and rating exercises, and socioeconomic surveys to elicit the value that local communities in Papua New Guinea ascribe to different terrestrial and coastal ecosystem services, and the factors affecting these values. The results suggest that respondents uniformly assign the highest value to

those marine and terrestrial provisioning services that directly support their livelihoods and material wellbeing. However, respondents also tend to assign value to ecosystem services supporting material, subjective, and relational aspects of their wellbeing.

Chaigneau et al. (2019) use a research approach anchored on the “Theory of Human Need” and the “Capability Approach” to identify both the multiple links between different ecosystem services and wellbeing domains, as well as the mechanisms through which ecosystem services contribute to wellbeing. Through Focus Group Discussions (FGDs) with coastal communities in Kenya and Mozambique they identify three types of mechanisms through which ecosystem services contribute to wellbeing: namely monetary, use and experience. They argue that it is important to consider all these mechanisms when developing interventions aiming to protect or improve the flows of benefits to people.

Chan et al. (2019) examine perceptions about the linkages between ecosystem services and social wellbeing in small-scale fishing communities of Bluefields, Jamaica. They use a combination of individual interviews and FGDs to analyze the perceived changes to these linkages following the design and implementation of a marine protected area (MPA). The results suggest that the MPA has affected substantially how different groups access ecosystem services. Overall, certain groups such as inshore fishers have experienced large negative effects from the MPA, while at the same time being the most marginalized.

Ainsworth et al. (2019) use the Community Voice Method to shed light on the cultural ecosystem services provided by two marine SES in the UK. Through filming and qualitative interviews with many relevant stakeholders they identify the, often, intangible cultural ecosystem services provided by seascapes, and how they contribute to individual and collective human wellbeing. Some cultural benefits such as sense of place, aesthetic pleasure and cultural identity are bi-directional, and contribute directly to a ‘fulfilled human life’. Other cultural benefits related to self-transcendence values are also present, and underscore a desire for sustainable marine management.

Johnson et al. (2019) elicit and compare the social values that were mapped through interviews with outdoor recreationists in two MPAs in Australia and the USA. They use a mapping tool interfaced with Maximum Entropy Modeling to spatially represent the social values associated with the major ecosystem services provided by different elements of the seascape. They evaluate the relationship between highly rated social values and specific biophysical metrics to explain spatial dynamics, and identify high and low priority locations for the visitors of the two protected areas.

Outeiro et al. (2019) combine spatial-economic analysis with social surveys to understand ecosystem services trade-offs in the Fernando de

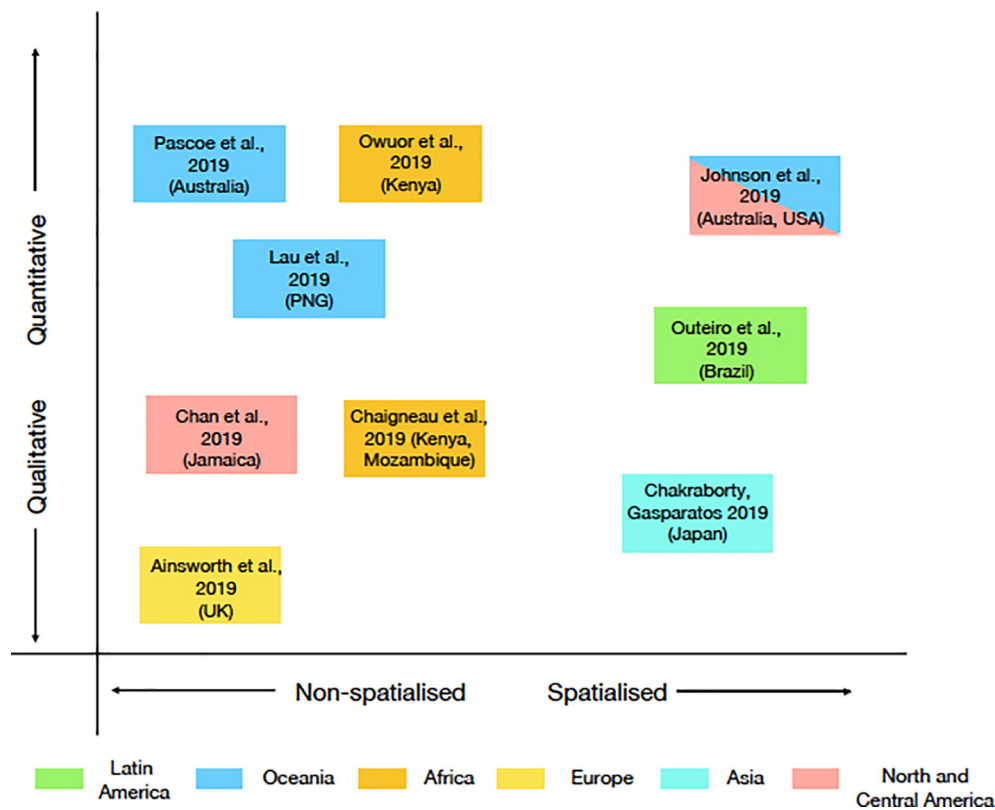


Fig. 2. Characteristics of the studies contained in the Special Issue.

Noronha MPA in Brazil. The spatial-economic analysis suggests that tourism revenues are ten times higher than those provided by fisheries, and would not be substantially affected if fisheries were to be expanded within some parts of the MPA. However, there are important cultural impacts associated with the inability of some social groups to easily access portions of the MPA. This has resulted in the loss of place attachment, cultural heritage and identity for many local community members, especially fishers that cannot easily switch to alternative economic activities.

Chakraborty and Gasparatos (2019) explore the drivers of ecosystem change in the seascape of Himeshima Island (Japan), and how it has affected the provision of ecosystem services. Through a combination of expert interviews, household surveys, and community mapping exercises they identify areas that provide important ecosystem services bundles across the island, and their value to the local community. The results suggest that various direct and indirect drivers of ecosystem change have converged to affect the provision of ecosystem services from some of the most critical parts of the seascape. The profound demographic and socioeconomic changes associated with an ageing society and rural depopulation have been key elements of this process, not the least through the erosion of traditional and local knowledge (TLK).

Lopes and Videira (2019) introduce a three-stage participatory framework (PARTICULATES) for scoping, conceptualizing and articulating ecosystem services values. The framework offers structured guidelines for teasing out multiple value dimensions, and could be applied to different types of decision-making processes in coastal and marine settings. The framework is piloted in the Arrábida Natural Park, a protected area in Portugal, which has been experiencing different development challenges. Pilot tests with the main stakeholders in the area are used to highlight the operation of the framework, evaluate its performance, and identify valuable lessons for its successful implementation.

In summary, most of the studies contained in this Special Issue are

empirical investigations of how different groups assign value to coastal and marine ecosystem services, and how they benefit from these services. Between them, these empirical case studies use a wealth of qualitative and quantitative methods that are able to spatialise the elicited values in various degrees (Fig. 2). Some of these studies come from different parts of the world, including some regions and seascapes that are relatively under-represented in the current literature (e.g. Africa, Latin America, East Asia). Collectively, the different studies highlight the very diverse values associated with marine and coastal ecosystem services, emerging from the radically different ways that different groups and respondents interact with these seascapes. This prompts for the adoption of inclusive approaches to coastal and marine management that should be very conscious of the radically different stakeholders, values and interests in these settings, and should seek to include them meaningfully in decision-making processes.

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