Ocean & Coastal Management 124 (2016) 33–41

Contents lists available at ScienceDirect

Ocean & Coastal Management

journal homepage: www.elsevier.com/locate/ocecoaman

Commentary

Can the ecosystem services concept help in enhancing the resilience of land-sea social-ecological systems?

Jacek Zaucha [a, b, *], Alexis Conides [c], Dimitris Klaoudatos [c], Katja Norén [d]

[a] Maritime Institute in Gdańsk, Gdańsk PL 80-830, Dlugi Targ 41-42, Poland
[b] University of Gdańsk, Faculty of Economics, Poland
[c] Hellenic Centre for Marine Research, Institute for Marine Biological Resources and Inland Waters, 46.7 Km Athens-Sounion, 19013 Anavyssos Attikis, Greece
[d] IVL Swedish Environmental Research Institute, Kristineberg 566, 451 78 Fiskebäckskil, Sweden

ARTICLE INFO

Article history:
Received 26 September 2015
Received in revised form
26 January 2016
Accepted 27 January 2016
Available online 23 February 2016

Keywords:
Marine ecosystem services
Evolutionary resilience
Lagoons
Estuaries
Coastal management
Complex systems

ABSTRACT

The paper analyses the possibility of using the concept of marine ecosystem services to fuel public debate on the evolutionary resilience of land-sea interface regions. It is based on the experience of the interdisciplinary ARCH project-Architecture and roadmap to manage multiple pressures on lagoons (financed by the Seventh Framework Programme of the EU) that researched the development of selected European regions located around estuaries, fjords, and lagoons. The ARCH project aimed at elaborating interdisciplinary management plans for ten land-sea interface regions in the EU. Marine ecosystem services were used in this process and proved their usefulness as a spanning object bringing together different types of interests, expertise, and knowledge in a holistic way. The paper presents different ways of handling marine ecosystem services as a trigger for public debate on resilience in land-sea interface regions. It analyses the strong and weak points of the concept of ecosystem services to this end and suggests some key preconditions for the more conscious, effective use of the concept in daily decision-making processes in land-sea complex social-ecological systems.

1. Introduction

The objective of this paper is to examine the advantages and disadvantages of applying the concept of marine ecosystem services as a boundary spanning object for lagoon, fjord, and estuary regions in the EU for improving public debate on how to increase the socio-ecological (evolutionary) resilience of land-sea complex social-ecological systems. A boundary object in this paper means an object able to link different mental and management perspective. For details please see (Star and Griesemer, 1989; Slob and Duijn, 2013; Becker, 2011).

Marine ecosystem services have been examined in various contexts so far (Berkes, 2011; Nayak, 2014; Gilbert, 2008; Turner et al., 2014), but without sufficient emphasis on the prevailing development paradigm[1] and governance mechanisms. This paper fills in this gap. The starting point is acknowledgment of the specificity of the land–sea interface as an complex socio-ecological system i.e. the systems in which societal (or human) component (subsystem) is in constant interaction with the ecological (or biophysical) one (cf. Halliday and Glaser, 2011: 2; Glaser et al., 2008; Gallopin, 2003: 15). The land-sea interface regions provide the human system with important and sometimes unique benefits such as food for human and animal consumption, sport-, eco-, agro-tourism, raw materials for fertilizers and medicines, nutrient mineralization, water purification and CO_2 sequestration (Turner et al., 2014: 18). Moreover, natural marine systems also produce important non-use values such as biodiversity that enhances overall human well-being and quality of life (Ressurreição et al., 2012).

In comparison to the terrestrial social-ecological systems, the land-sea ones have the following characteristics:

- extremely complex governance patterns (in many cases, the land-sea border also separates different types of authorities with different agendas and management objectives,

* Corresponding author. Maritime Institute in Gdańsk, Maritime Institute in Gdańsk, Gdańsk PL 80-830, Dlugi Targ 41-42, Poland.
E-mail addresses: jacek.zaucha@im.gda.pl (J. Zaucha), akoni@tee.gr (A. Conides), katja.noren.work@gmail.com (K. Norén).

[1] According to Merriam-Webster dictionary paradigm means a model or pattern for something that may be copied.

http://dx.doi.org/10.1016/j.ocecoaman.2016.01.015
0964-5691/

jurisdictions, responsibilities, and hierarchical levels) stemming from the fact that land-sea interface regions are influenced by a variety of socio-economic, political, and biophysical interactions and flows;

- ☐ the importance of knowledge integrity and the need for a multi-disciplinary approach in order to understand the complexity of socio-economic and environmental processes in land-sea interface regions (e.g., in addition to the "normal set of disciplines" the management of marine social-ecological systems requires additional knowledge specific to the sea);
- ☐ the high level of uncertainty regarding the dynamics of the marine ecosystem (as pointed out by Turner et al. (2014: 21) – our knowledge of many of the key aquatic processes is insufficient and, the data are hampered by "fragmented standards, formats and nomenclature, a lack of information on precision and accuracy, the pricing policy of some providers, and insufficient temporal or spatial resolution" (EC, 2010: 4);
- ☐ problems with perception and low level of awareness (e.g., asymmetry in popular knowledge on the importance of the role of different biotopes and taxa, especially those that are non-charismatic – e.g. Zarzycki, 2011; Ressurreição et al., 2012);
- ☐ usual high levels of self-identification and historical path dependence, thus, changing development paradigms in such regions might be difficult and time-consuming.

The long-term development of areas adjacent to lagoons, estuaries, and fjords depends on the proper combination, as well as maintenance, and accumulation of natural, human, social, moral, and physical capital (Stokols et al., 2013: Table 1). The importance of non-use values and phenomena is one reason why the development of such regions is (i) subject to market failure i.e., a sub-optimal level of well-being (Bator, 1958), and (ii) calls for public choice mechanisms and solutions, i.e., purposeful collective decision-making that balance growth pressure with dynamic coastal and marine processes (Dyckman et al., 2014).

For these reasons the traditional economic approach based on maximizing utility through the production of goods and services does not work. Moreover while developing land-sea interface one should take into consideration not only existing developmental processes, but also bias among stakeholders and natural uncertainty, i.e., the possibility of new interactions within the system and the occurrence of new pressures as well as opportunities and challenges both internal and external. For instance, according to Huber-Sannwald et al. (2012: 3160), one should allow inter-temporal (past, present, and future), cross-scale (focus on interactions) and cross-disciplinary analysis (simultaneous analysis of the biophysical, socio-economic/socio-cultural and cross-cutting domains) considering policy, governance, and management. Moreover, the author emphasizes the importance in this context of a "system memory" (e.g. in the sense of traditional local knowledge and social learning) and legacy (e.g. historic development of land-use change; path dependence).

Another difficulty is the result of an attempt to combine different temporal and spatial scales (Morgado et al., 2014). For instance, decisions made in Brussels on Natura 2000 or on maximum fish yield could influence the land-sea interface as strongly as changes in the consciousness of local people or the increase of local conflicts. This creates the problem of setting a commonly accepted definition of the spatial boundaries of lagoon systems. However, for functional regions in which water is the core unifying factor, this is a typical situation (Sneddon and Fox, 2012). There are multiple boundaries of such a region, and they

Table 1
Summary of content and issues in the case study sites.

Case study site	Engineered lagoons	Urban development, quality of life	Lack of social capital	Lack of management	Nature protection and development	Institutional borders	Fisheries, aquaculture	Harbour development	Climate change and sea level rise	Sediments and eutrophication	Pressures from tourism	Freshwater flow
Vistula lagoon, Baltic Sea												
Göta älv, Kattegat Gulf		X			X	X			X	X	X	X
Byfjorden, Norwegian Sea		X						X	X	X	X	
Elbe estuary, North Sea	X	X			X	X		X	X	X		X
Rhine estuary, North Sea	X	X			X	X		X	X	X		X
The Broads, North Sea	X				X	X			X	X	X	
Òbidos lagoon, Atlantic Ocean	X		X	X			X		X	X	X	
Lesina lagoon, Mediterranean Sea			X	X	X	X	X		X	X		
Amvrakikos lagoon, Mediterranean Sea			X	X	X	X	X		X	X		X
Razelm-Sinoe lagoon, Black Sea	X		X		X	X	X		X	X	X	X

Source: Zaucha and Breedveld (2013:39).