Ecological Indicators 52 (2015) 320–331

Contents lists available at ScienceDirect

Ecological Indicators

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

# Improving the identification of mismatches in ecosystem services assessments

Ilse R. Geijzendorffer[a,b,*], Berta Martín-López[c], Philip K. Roche[b]

[a] Institut Méditerranéen de Biodiversité et d'Ecologie marine et continentale (IMBE) Aix Marseille Université, CNRS, IRD, Avignon Université, Technopôle Arbois-Méditerranée Bât. Villemin–BP 80, F-13545 Aix-en-Provence, France
[b] Irstea, Mediterranean Ecosystems and Risk Research Unit, UR EMAX, 3275 Route de Cézanne, CS 40061, 1382 Aix-en-Provence Cedex 05, France
[c] Social-Ecological Systems Laboratory, Department Ecology, Universidad Autónoma de Madrid, C/Darwin, 2–C-201 (Biology Fac.), Campus Cantoblanco, Madrid, Spain

ARTICLE INFO

*Article history:*
Received 13 February 2014
Received in revised form 1 December 2014
Accepted 14 December 2014

*Keywords:*
Demand
Governance
Management
Mapping
Supply
Sustainable

ABSTRACT

Assessments and sustainable management of ecosystem services (ES) require an understanding of both ES supply and demand qualities, quantities, spatial scales and dynamics. Mismatches, i.e., differences in quality or quantity between the supply and demand of ES, can occur in many different forms. Being able to identify these mismatches and their nature is of prime importance for informing governance and management decisions. This manuscript explores which mismatches can be detected by current ES supply and demand assessments and which mismatches currently remain unidentified.

An analytic framework was developed comprised of five interlinked components of ES supply and demand linking nature and society (i.e., potential supply, managed supply, match, demand, and interests). This framework was used to examine 11 recent papers, which applied ES assessments to both ES supply and demand, to determine which mismatches were or could be identified and which mismatches remained unidentified.

The selected papers typically used multiple methods in their assessments to capture supply and demand components. The found diversity in methods and the inclusion of temporal and spatial dimensions, and the existence of multiple stakeholder groups allowed for the assessments to identify several mismatches, but also lead to differences in the discriminative capacity of the assessments between the selected papers. The mismatch that was most often included in the assessments was *Unsatisfied demand*, whereas the least included mismatch was *Unsustainable uptake*. The mismatches caused by differing spatial patterns were most often identified, whereas the existence of mismatches among different stakeholder groups was least often detected in the assessment methods.

Three options emerged that could further strengthen the discriminative capacity of ES supply and demand assessments to inform sustainable ES governance and management decisions: (i) include multiple stakeholders groups and the diversification of their roles and demands; (ii) acknowledge that ES supply is not only determined by the bio-geophysical conditions, but also determined by the ES demand by society, in terms of their quantity, quality and location, as well as by the applied management; (iii) include temporal and spatial scale sensitivity into the discriminative capacity of assessment methods to allow for a better identification which institutional structures could most effectively act upon them.

© 2014 Elsevier Ltd. All rights reserved.

## 1. Introduction

Sustainable management of ecosystem services (ES) is a shared ambition in environmental policies at global (i.e., Aichi targets[1]) and European (i.e., European Biodiversity 2020 targets (European Commission, 2011), Water Framework Directive (European Commission et al., 2000)) national and at regional scales (e.g., payments for ecosystem services, protected areas management and landscape planning). Sustainable management of ES should ensure the capacity of a social–ecological system to sustain the supply of ES on the long term and with sufficient access for all stakeholders in the face of disturbance and ongoing transitions (adapted from Biggs et al., 2012). Scientifically, the ES concept and its implementation have been identified as challenging topics which have taken prominent places on the scientific agenda's

* Corresponding author. Tel.: +33 442908470.
*E-mail address:* ilse.geijzendorffer@imbe.fr (I.R. Geijzendorffer).
[1] www.cbd.int/sp/targets/.

http://dx.doi.org/10.1016/j.ecolind.2014.12.016
1470-160X/© 2014 Elsevier Ltd. All rights reserved.

(ecoSERVICES (Future Earth), Group on Earth Observations Biodiversity Observation Network (GEO-BON), the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES)). One scientific objective is to advance the understanding of the flow of ES from ecosystems to society to facilitate the development of sustainable ES management options from an integrated ecological and societal perspective. To contribute to this objective, the complexity included in ES assessment methods has increased considerably while transparent visualisations have been included for easy message communication purposes.

Ecosystem services represent a diverse and complex concept (Nahlik et al., 2012) which forms a bridge between ecological and social systems, because the ES depend on the interactions and feedbacks from multiple social and ecological factors (Scholes et al., 2013). As such ES have been defined as products of interconnected and nested social–ecological systems and they should be measured in the complex context of those socio-ecological systems (Fisher et al., 2009; MEA (Millennium Ecosystem Assessment), 2005; Reyers et al., 2013). Commonly used social–ecological system frameworks, such as presented in Von Heland and Folke (2014) and Reyers *et al.* (2013), highlight the fact that per definition ES only exist when there is a demand or use by stakeholders (Paetzold et al., 2010). Additionally, sustainable ES management should take place without degrading ecosystems (Villamagna et al., 2013) and when differences between the demand and supply of ES should be minimised.

Due to focus and framework of applied ES assessments, the discriminative capacity for differences between the supply and demand of ES is likely to be impaired. As already commonly recognised in food supplied by agricultural systems (Kroll et al., 2012; Pérez-Soba et al., 2012), the large majority of ES are generated under the influence of human interventions, whether it is to alter the supply itself (e.g., urban planning for cleaner air or "land management" in Van Oudenhoven et al., 2012), to gain access to the services (e.g., creation of infrastructure or land ownership) or to achieve the benefits themselves (e.g., governance concerning distribution of services over stakeholder groups) (Schröter et al., 2014). Contrary to the interpretation in many frameworks and its acknowledged importance in scientific agenda's, the role of stakeholders and social components in the ES supply and management does not appear in most of the applied studies (Nieto-Romero et al., 2014; Seppelt et al., 2011).

In the last decade, several ES frameworks and methodological approaches have been developed to capture the complexity of the socio-ecological systems and the flow of ES through them, such as the Millennium Ecosystem Assessment (MEA (Millennium Ecosystem Assessment), 2005), the cascade model (Haines-Young and Potschin, 2009), The Economics of Ecosystems and Biodiversity (TEEB; de Groot et al., 2010), the Ecosystem Properties, Potentials, and Services (EPPS) (Bastian et al., 2013), or ES capacity and flow models (Bastian et al., 2013; Schröter et al., 2014; Villamagna et al., 2013). Generally, these frameworks include the flow of ES from ecosystems to society, but the societal dimension, actors and their roles are weakly captured (Nieto-Romero et al., 2014; Liquete et al., 2013). As previously stated by several authors (e.g., Burkhard et al., 2013; Syrbe and Walz, 2012), the role society plays in ES demand and supply has to be made more explicit in both conceptual frameworks as well as the applied assessments.

To facilitate the development of sustainable management of ES, the differences between the supply and the demand of ES and their potential causes need to be identified in applied assessments (Crossman et al., 2013; Van Jaarsveld et al., 2005; Schröter et al., 2012). Therefore, mismatches are in this manuscript defined as the differences in quality or quantity occurring between the supply and demand of ES. This study aimed to explore which of these mismatches can be detected by current ES assessments and which mismatches remain unidentified. The underlying hypothesis is that the discriminative capacity of current supply and demand analyses may be insufficient to detect some differences due to the frameworks used. Eleven recent ES supply and demand assessment papers were analysed to determine which mismatches were already being identified and which ones currently remain unidentified.

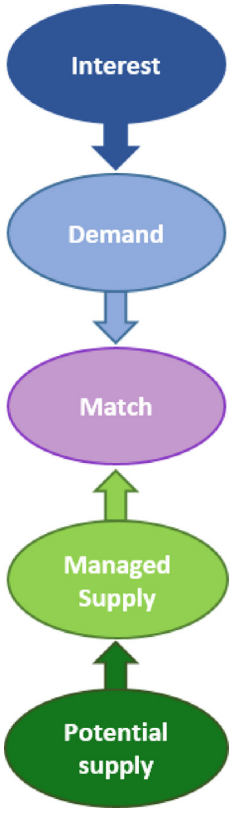


**Fig. 1.** The components of the analytic framework used for the paper analysis.

## 2. Material and methods

### 2.1. The components of the supply and demand framework

As a first step, a supply-and-demand framework (hereafter called SD framework) was developed based on existing literature to guide the analysis of the selected papers. This paper did not aim to propose a new ES framework, but following Wallace (2007), rather strived for a simple framework that would allow for the evaluation of which types of mismatches between supply and demand were included in the selected papers. The developed analytical framework composed of five interlinked components of ES supply and demand (Fig. 1).

The backbone of the SD framework is based on current ES frameworks, including the most influential frameworks: the MEA framework (2005), the cascade model (Haines-Young and Potschin, 2009), the TEEB framework (de Groot et al., 2010) and the Mapping and Assessment of Ecosystem Services (MAES) framework (Maes et al., 2013). Although the role of society has been included in these four frameworks in different degrees, none of them explicitly distinguished the different interlinked components of supply to demand that lead to actual ES. Some recent conceptual advances were made in Villamagna *et al.* (2013) and Schröter *et al.* (2014) who differentiated the actual use and the potential supply of services. Similarly, Schröter *et al.* (2012) already presented some ideas on spatial mismatches. These thoughts were also included in the

Download English Version:

https://daneshyari.com/en/article/6294558

Download Persian Version:

https://daneshyari.com/article/6294558

Daneshyari.com