### **ARTICLE IN PRESS**

Ecosystem Services xxx (2017) xxx-xxx



Contents lists available at ScienceDirect

## **Ecosystem Services**

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



# Integrating methods for ecosystem service assessment: Experiences from real world situations

Rob Dunford a,b,\*, Paula Harrison c, Alison Smith a, Jan Dick d, David N. Barton e, Berta Martin-Lopez f, Ezsther Kelemen g,h, Sander Jacobs i, Heli Saarikoski j, Francis Turkelboom i, Wim Verheyden i, Jennifer Hauck k,l, Paula Antunes m, Réka Aszalós n, Ovidu Badea o, Francesc Baró p,ag, Pam Berry a, Laurence Carvalho d, Giulio Conte af, Bálint Czúcz n,q, Gemma Garcia Blanco r, Dave Howard c, Relu Giuca s, Erik Gomez-Baggethun e,p,t, Bruna Grizetti u, Zita Izakovicova v, Leena Kopperoinen j, Johannes Langemeyer p,ag, Sandra Luque w, David M. Lapola x, Guillermo Martinez-Pastur y, Raktima Mukhopadhyay z, S.B. Roy z, Jari Niemelä aa, Lisa Norton c, John Ochieng ab, David Odee ab, Ignacio Palomo ac, Patricia Pinho ad, Joerg Priess k, Graciella Rusch e, Sanna-Riikka Saarela j, Rui Santos m, Jan Tjalling van der Wal ae, Angheluta Vadineanu s, Ágnes Vári n, Helen Woods d, Vesa Yli-Pelkonen aa

- <sup>a</sup> Environmental Change Institute, Dyson Perrins Building, South Parks Road, Oxford OX1 3QY, UK
- <sup>b</sup> Centre for Ecology & Hydrology Maclean Building, Benson Lane, Crowmarsh Gifford, Wallingford, Oxfordshire OX10 8BB, UK
- <sup>c</sup>Centre for Ecology and Hydrology, Lancaster Environment Centre, Library Avenue, Bailrigg, Lancaster LA1 4AP, UK
- <sup>d</sup> Centre for Ecology and Hydrology, Bush Estate, Penicuik, Midlothian EH26 OQB, UK
- <sup>e</sup> Norwegian Institute for Nature Research (NINA), Gaustadalléen 21, 0349 Oslo, Norway
- Leuphana University of Lüneburg, Faculty of Sustainability, Institute of Ethics and Transdisciplinary Sustainability Research, Scharnhorststraβe 1, 21355 Lüneburg, Germany
- <sup>g</sup> Environmental Social Science Research Group (ESSRG Ltd.), Rómer Flóris u. 38., 1024 Budapest, Hungary
- h Department of Decision Sciences, Corvinus University of Budapest, Fővám tér 8., 1093 Budapest, Hungary
- <sup>1</sup>Research Institute for Nature and Forest (INBO), Kliniekstraat 25, 1070 Brussels, Belgium
- <sup>j</sup> Finnish Environment Institute, P.O. Box 140, FI-00251 Helsinki, Finland
- <sup>k</sup> Helmholtz-Centre for Environmental Research UFZ, Permoserstraße 15, 04318 Leipzig, Germany
- $^{1} Co Know\ Consulting\ -\ Coproducing\ Knowledge\ for\ Sustainability,\ Jesewitz,\ Germany$
- <sup>m</sup> CENSE Centre for Environmental and Sustainability Research, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, 2829-516 Caparica, Portugal
- <sup>n</sup> Institute of Ecology and Botany, Centre for Ecological Research, Hungarian Academy of Sciences, Alkotmány u. 2-4, H-2163 Vácrátót, Hungary
- ONational Institute for Research and Development in Forestry "Marin Dracea", Eroilor Blvd 128, Voluntari, Romania
- P Institute of Environmental Science and Technology (ICTA), Universitat Autònoma de Barcelona (UAB), Edifici Z (ICTA-ICP), Carrer de les Columnes s/n, Campus de la UAB, 08193 Cerdanyola del Vallès (Barcelona), Spain
- <sup>q</sup> European Topic Centre on Biological Diversity, Muséum national d'Histoire naturelle, 57 rue Cuvier, FR-75231 Paris, Paris Cedex 05, France
- <sup>T</sup>Urban Environment and Territorial Sustainability Area, Energy and Environment Dividision, Parque Tecnológico de Bizkaia, C/Geldo, Edificio 700, E-48160 Derio Bizkaia, Spain
- SUniversity of Bucharest Research Center in Systems Ecology and Sustainability, Splaiul Independentei 91-95, 050095 Bucharest, Romania
- Department of International Environment and Development Studies (Noragric), Norwegian University of Life Sciences (NMBU), P.O. Box 5003, N-1432 Ås, Norway
- <sup>u</sup> European Commission Joint Research Centre (JRC), Via E. Fermi 2749, 21027 Ispra (VA), Italy
- <sup>v</sup> Institute of Landscape Ecology, Slovak Academy of Sciences, Štefánikova 3, 81499 Bratislava, Slovakia
- WIRSTEA, National Research Institute of Science and Technology for Environment and Agriculture, UMR TETIS, 500 rue JF Breton, Montpellier 34000, France
- × UNESP Universidade Estadual Paulista, Ecology Department LabTerra, Av.24-A, 1515 CEP, 13506-900 Rio Claro, São Paulo, Brazil
- y Centro Austral de Investigaciones Científicas (CADIC CONICET), Houssay 200, Ushuaia (9140) Tierra del Fuego, Argentina
- <sup>z</sup> IBRAD (Indian Institute of Bio Social Research and Development), VIP Road, Kestopur, Prafulla Kanan, Kolkata 700101, West Bengal, India
- aa Department of Environmental Sciences, P.O. Box 65, FI-00014 University of Helsinki, Finland
- <sup>ab</sup> Kenya Forestry Research Institute (KEFRI), P.O.Box 20412-0200, Nairobi, Kenya
- <sup>ac</sup> Basque Centre for Climate Change, Alameda de Urquijo 4, 48008 Bilbao, Spain
- ad INCLINE Interdisciplinary Climate Change Research Group, Instituto de Astronomia e Geofísica, USP Universidade de São Paulo, R. do Matão, 1226 Butantã, São Paulo, SP 05508-090, Brazil
- ae Wageningen University & Research Marine (WUR), P.O.Box 57, 1780 AB Den Helder, The Netherlands
- af IRIDRA. Via La Marmora, 51 50121 Florence, Italy
- <sup>ag</sup> Hospital del Mar Medical Research Institute (IMIM), PRBB, Carrer Doctor Aiguader 88, 08003 Barcelona, Spain

E-mail address: Robert.Dunford@ouce.ox.ac.uk (R. Dunford).

https://doi.org/10.1016/j.ecoser.2017.10.014

2212-0416/© 2017 Published by Elsevier B.V.

<sup>\*</sup> Corresponding author at: Environmental Change Institute, Dyson Perrins Building, South Parks Road, Oxford OX1 3OY, UK.

#### ARTICLE INFO

Article history:
Received 13 January 2017
Received in revised form 14 October 2017
Accepted 20 October 2017
Available online xxxx

#### ABSTRACT

The Ecosystem Services (ES) concept highlights the varied contributions the environment provides to humans and there are a wide range of methods/tools available to assess ES. However, in real-world decision contexts a single tool is rarely sufficient and methods must be combined to meet practitioner needs. Here, results from the OpenNESS project are presented to illustrate the methods selected to meet the needs of 24 real-world case studies and better understand why and how methods are combined to meet practical needs. Results showed that within the cases methods were combined to: i) address a range of ES; ii) assess both supply and demand of ES; iii) assess a range of value types; iv) reach different stakeholder groups v) cover weaknesses in other methods used and vi) to meet specific decision context needs. Methods were linked in a variety of ways: i) as input-output chains of methods; ii) through learning; iii) through method development and iv) through comparison/triangulation of results. The paper synthesises these case study-based experiences to provide insight to others working in practical contexts as to where, and in what contexts, different methods can be combined and how this can add value to case study analyses.

© 2017 Published by Elsevier B.V.

#### 1. Introduction

The popularisation of the Ecosystem Services (ES) concept has led to a significant uptake of ecosystem service based approaches in national and international policy frameworks (TEEB, 2010; Bateman et al., 2014; UN et al., 2014; IPBES, 2015; Maes et al., 2016). This, along with increased awareness of the interconnectedness of the natural environment and the widespread contributions of the natural world to human wellbeing, has put increasing pressure on practitioners in the land-use and environment sectors to assess and manage natural capital in a way that better reflects these holistic benefits.

This poses significant challenges. As the Ecosystem Service concept has become more widely recognised, so the number of tools/ methods (treated here as synonyms) available to assess ES has increased (Harrison et al., 2017; Bagstad et al., 2013). Individual ecosystem service tools, however, are often insufficient to meet the varied needs of land management challenges, and practitioners will therefore need to find the right combinations of tools to meet their needs – and to enable them to assess the broad range of values provided by nature (Jacobs et al., 2017). Whilst there are a number of studies that attempt to provide guidance on which tools to use under which circumstances (e.g. Vatn, 2009; Bagstad et al., 2013; Martinez-Harms et al., 2015; Ruckelshaus et al., 2015; Hirons et al., 2016; Grêt-Regamey et al., 2017), there has to date been no study that takes a bottom-up, example-based look at the range of tools required to address real-world case studies and the practical factors that drive the selection and combination of different methods.

The OpenNESS project (EU FP7; 2012–2017, www.openness-project.eu) investigates the factors that influence the extent to which the Ecosystem Service concept can be put into practice in 24 real-world case studies, predominantly in Europe, but also in India, Kenya, Argentina and Brazil (see Table SM1 and Wijna et al., 2016 for further information). These case studies provide a test bed for assessing the utility of ecosystem service tools in practice, and the way in which different tools can be combined to address real-life problems. Within this paper we address three research questions:

- 1) What methods were combined within the case studies?
- 2) What factors drove the use of combinations of methods?
- 3) How were different methods combined within the case studies, and did this add value?

We aim to provide grounded insights and examples to assist others embarking on ecosystem service assessments where priorities are driven by practical end-user needs.

#### 2. Methodological approach

The OpenNESS case-studies address a range of ecosystem management/planning challenges that were selected by practitioners (Table SM1). In each case study a research team, funded by the project, worked alongside a team of local stakeholders who are involved with the management of and/or have some interest and/or dependency on the case study's central issue. Case study teams were able to choose one or more tools to meet their needs, with training being provided. This paper is based on the research teams' explanations of the factors that influenced their selection and combination of tools to meet the stakeholders' needs.

The methods available for selection by the case study teams are listed in full in Table SM2. There are many ways to group methods but within this paper we group them into seven classes according to the type of ES values assessed: biophysical, socio-cultural or monetary (Gómez-Baggethun et al., 2016), as shown in Fig. 1. The classification also reflects the level of stakeholder participation, the level of biophysical realism reflected within the model (following Lavorel et al., 2017) and which parts of the ES cascade the method focusses on (biophysical structures and functions, ecosystem services or benefit and values to humans; Haines Young and Potschin, 2010). The main classes of model are summarised below.

Biophysical models: These process-based models assess biophysical value using a higher level of biophysical realism than approaches based on land-use proxies. They are based on detailed quantitative understanding of biophysical relationships within the environment and tend to focus on the structure/function part of the ES cascade. It is rare, but possible, to include stakeholder participation within the modelling.

Integrated mapping-modelling approaches: These combine spatial approaches with an element of bio-physical modelling to extrapolate from spatial datasets to ecosystem services. They are often designed specifically to address ecosystem services and include established methods such as InVEST and ESTIMAP (Zulian et al., 2014).

Land-use scoring approaches: This includes approaches based primarily on mapped data that produce ES outputs by applying some kind of expert-scoring. Referred to here as the "matrix

## Download English Version:

## https://daneshyari.com/en/article/6556409

Download Persian Version:

https://daneshyari.com/article/6556409

<u>Daneshyari.com</u>