



Do ecosystem service maps and models meet stakeholders' needs? A preliminary survey across sub-Saharan Africa



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ARTICLE INFO

Article history:

Received 3 August 2015

Received in revised form

11 February 2016

Accepted 28 February 2016

Keywords:

Africa

Decision-maker

Ecosystem service

Policy-maker

Science-policy interface

ABSTRACT

To achieve sustainability goals, it is important to incorporate ecosystem service (ES) information into decision-making processes. However, little is known about the correspondence between the needs of ES information users and the data provided by the researcher community. We surveyed stakeholders within sub-Saharan Africa, determining their ES data requirements using a targeted sampling strategy. Of those respondents utilising ES information (> 90%; n=60), 27% report having sufficient data; with the remainder requiring additional data – particularly at higher spatial resolutions and at multiple points in time. The majority of respondents focus on provisioning and regulating services, particularly food and fresh water supply (both 58%) and climate regulation (49%). Their focus is generally at national scales or below and in accordance with data availability. Among the stakeholders surveyed, we performed a follow-up assessment for a sub-sample of 17 technical experts. The technical experts are unanimous that ES models must be able to incorporate scenarios, and most agree that ES models should be at least 90% accurate. However, relatively coarse-resolution (1–10 km²) models are sufficient for many services. To maximise the impact of future research, dynamic, multi-scale datasets on ES must be delivered alongside capacity-building efforts.

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1. Introduction

An understanding of ecosystem services (the benefits humans get from nature; ES) is critical for decision-making if multi-functional landscapes are to be successfully managed to maximise long-term benefits for society (Carpenter et al., 2009; Millennium Ecosystem Assessment, 2005). Decisions and policy regarding land and water management can be improved through the provision of quantitative ES information (defined here as data that assists with decision-making, including reports, maps, models, lists, websites,

biophysical surveys and social surveys) derived through robust and repeatable methods, based on spatially-explicit data (Bastian et al., 2012; Fisher et al., 2009; McKenzie et al., 2011). This could be especially so in developing countries, where the rural poor are often highly dependent on ES for their livelihoods, especially as a safety net during crises (Enfors and Gordon, 2008; Shackleton et al., 2008).

Globally, ES science has had relatively broad uptake into policies and management plans by a range of stakeholders. For example, some governments (e.g. China), development agencies (e.g. the World Bank), non-governmental organisations (NGOs; e.g. Conservation International) and businesses (e.g. Unilever) have made substantial efforts to incorporate ES into their missions and practices (Ruckelshaus et al., 2013; Wong et al., 2014). This relatively rapid uptake into policies and management may indicate that ES science has a high potential to alter decision-making practices, leading to more ecologically sound decisions. However, the realisation of the concept appears to be limited, with few documented examples demonstrating how ES concepts have

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changed decision-making outcomes (Laurans et al., 2013; Ruckelshaus et al., 2013). For example, a number of recent papers have critically analysed the scientific literature to evaluate the production and utilisation of ES information, focussing on methodological frameworks and data availability (Crossman et al., 2013; Egoh et al., 2012; Laurans et al., 2013; Martínez-Harms and Balvanera, 2012; McKenzie et al., 2014; Ruckelshaus et al., 2013; Wong et al., 2014). However, other than isolated local-scale studies (e.g. Sitas et al., 2013, 2014), the implementation gap between the potential impact of ES research and its utilisation in practice remains and has yet to be investigated through engagement with stakeholders (Laurans et al., 2013). Such engagement is vital if ES science is to move towards demand-driven research (Honey-Rosés and Pendleton, 2013).

Our goal in this study was to provide a first-order evaluation of potential reasons for the implementation gap by systematically surveying stakeholders about both their current use of ES information and of their future requirements and needs, in a region where quantitative data are scarce. Stakeholders are defined here as individuals capable of directly or indirectly influencing the long-term development of policy (e.g. impacting the visibility of particular issues, or being involved in discussions and what technical knowledge is emphasised), following Ruckelshaus et al. (2013). Specifically, we investigate: 1) *if stakeholders lack sufficient knowledge and training to utilise ES information* (Laurans et al., 2013); and 2) *whether existing ES information is fundamentally inadequate*. For the latter, we ask whether those surveyed can get access to information for their desired ES at the appropriate temporal or spatial scales, or whether they perceive the available ES information as too uncertain or too inaccurate to support changes in policy or practices (Bingham et al., 1995; Toman, 1998; Turner, 2007). We focus on sub-Saharan Africa as this is one of the world's poorest regions, so any changes in practice or policy could have substantial impact on human well-being (Enfors and Gordon, 2008; Shackleton et al., 2008). This region is, however, perhaps the most data-poor in the world, with little proof of evidence-based ES decision-making (Crossman et al., 2013; Egoh et al., 2012; Martínez-Harms and Balvanera, 2012; Ruckelshaus et al., 2013; Wong et al., 2014).

2. Method

2.1. Survey methodology

The survey was designed to elicit perceptions of the adequacy of existing ES information and capacity, alongside qualitative statements whereby respondents could give in-depth responses detailing specific issues related to their work (Table 1; Appendix A). The survey was conducted in two phases. Firstly, we surveyed stakeholders at the Capacity Building for Undertaking Ecosystem Assessment workshop in Pretoria, South Africa (3rd–6th February 2014). Secondly, we developed an online version of the same survey in both English and French using Google Forms. The online survey was circulated by email to other stakeholders from sub-Saharan Africa who are engaged in projects in the Ecosystem Services for Poverty Alleviation research programme (<http://www.espa.ac.uk/>). The online-survey was open from 1st April to 30th June 2014.

We employed a targeted sampling strategy, focussing on stakeholders already engaged with general ES concepts, but not actively selecting people working with specific ES types (i.e. provisioning, regulating, supporting, and cultural) nor topics (e.g. food production, forest management etc). For example, the workshop in Pretoria was held to assist engagement with the Intergovernmental Platform on Biodiversity and Ecosystem Services and so

Table 1

A summary of the survey structure and questions.

Start of survey			
Organisation			
At what scale do you carry out most of your work?			
In which fields do you carry out most of your work?			
Do you work with ecosystem services as part of your job?			
If yes,		If no,	
Which ecosystem services do you work with?		Why not?	
In what way(s) do you use information on ecosystem services?			
What information of tools on ecosystem services do you find useful in your job?			
Do you make use of ES maps in your work?			
If yes,		If no,	
Please give a specific example of how you have used them in your work		Why not?	
Do you make use of ES models in your work?			
If yes,		If no,	
Please give a specific example of how you have used them in your work		Why not?	
Do you currently have adequate information or tools on ecosystem services to carry out your work?			
If yes,		If no,	
Do you required additional information/tools on ES at a difference spatial scale?		Does the inadequacy of information/tools on ES relate to spatial scale?	
If yes,		If no,	
At what spatial scale?		At what spatial scale?	
Do you require additional ES information/tools on ES at different time points?		Does the inadequacy of information/tools on ES relate to different time points?	
If yes,		If no,	
At what time point?		At what time point?	
At what temporal scale?		At what temporal scale?	
Do you require additional information/tools on different ecosystem services?		Does the inadequacy of information/tools on ES relate to the type of ecosystem services?	
If yes,		If no,	
Which ES?		Which ES?	
Do you require additional information/tools on ES that are linked to specific policy/policies?		Does the inadequacy of information/tools on ES relate to policy applicability?	
If yes,		If no,	
Which policy/policies?		Which policy/policies should the information relate to/inform?	
Is there any other information related to ES, not mentioned above, that you would find useful to carry out your job?			
Do you consent to being contacted for more information?			
End of survey			

attracted stakeholders with a general ES interest. It is also conceivable that, of those invited to partake in this study, stakeholders already using ES in their work were more inclined to invest time in completing the survey. This would result in an over-estimate of the proportion of stakeholders utilising ES information, therefore underestimating the implementation gap. Our aim, however, was not to *quantify* the implementation gap, but to understand *why* it remains. By favouring those stakeholders engaged in using ES

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