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Analysis

A flexible ecosystem services proto-typology based on public opinion

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ABSTRACT

Interest in the conception and application of ecosystem services has increased significantly in recent years. However, there remains some doubt about the universality and utility of the terminology used to describe these services. Public preferences for ecosystem service terminology were elicited using an online survey ($n = 145$) of adults in the UK and other countries. A list of different ecosystem phenomena was provided and respondents identified each as a benefit, function, good and/or service. Results were generally robust to subjective differences in familiarity with the subject matter. In the overall sample, benefit was the most preferred descriptor followed by function, service and good. However, by using a combination of non-parametric statistical tests, 10 descriptor sets emerged from the data to describe 22 different ecosystem phenomena. Three of these descriptor sets were individual words (benefit, function and good), covering 9 of the 22 ecosystem phenomena. The other 7 descriptor sets were multiple words (e.g. benefit-good and benefit-function-service) covering the remaining 13 ecosystem phenomena. Scoring the 22 ecosystem phenomena in terms of 4 characteristics (intake, solid, survive and visible) yielded mixed results in terms of being able to distinguish between descriptor sets based on the presence or absence of these characteristics.

1. Introduction

'Ecosystem services' is an umbrella term that has been developed to refer to a particular conceptualisation of ecosystem phenomena. This conceptualisation is largely functional, with ecosystems categorised according to their utility to humans. This resonates, to many, with the market-driven terminology used by economists, with some authors distinguishing between different types of service, including cultural, provisioning, regulating and supporting ecosystem services (e.g. Fisher et al., 2009; Hein et al., 2006; MA, 2003, 2005; Mace et al., 2011). Research into ecosystem services has risen exponentially since the 1980s (Fisher et al., 2009) and boasts landmark, highly cited, texts. To emphasise the significance of marketisation, a seminal text has sought to provide a value for the global stock of ecosystem services (Costanza et al., 1997). More recently, the Millennium Ecosystem Assessment (MA) has sought to understand the current state and future outlook of ecosystem services for different countries around the world (MA, 2005).

Despite the increasing use and application of ecosystem services terminology within academic arenas (see, for example, Costanza et al., 1997; de Groot et al., 2002; MA, 2003, 2005; Hein et al., 2006; Wallace, 2007; Maynard et al., 2010; Mace et al., 2011; Nahlik et al., 2012) understandings of 'ecosystem services' remain problematic within lay discourse according to a study conducted for the UK Government's Department for Environment, Food and Rural Affairs (Define Research & Insight, 2007, p. 40). They concluded that the term *Ecosystem services* was too "baffling for most due to the lack of awareness of the term ecosystems". The related term *Nature's services* resonated better with people. The need to consider alternative ways of describing the services provided by ecosystems is corroborated by studies which have elicited views from the American public (Metz and Weigel, 2010) and conducted textual analyses of UK web sites (Wild and McCarthy, 2010; Wild et al., 2013).

While it is tempting to agree that the term 'ecosystem services' is inappropriate as a general conception, Fish (2011, p. 676) offers the following warning: "[an ecosystem services assessment] loses much of its analytical power if it does not work with its own, very particular, vocabulary". At the same time increasing emphasis is being placed on public knowledge(s), public participation and public understanding of science with Luck et al. (2012) explaining that a key rationale for ecosystem assessments is communication and education. Therefore it is important to investigate and apply ecosystem services terminology based on conceptual frameworks which take into account a wider set of preferences beyond those of networked groups of experts. As Fish (2011, p. 675) notes, beyond researchers, decision makers and other people actively involved in ecosystem services research "there is a need to encompass a much greater diversity of ideas, expertise and creative inspiration" (Fish, 2011, p. 675). This paper seeks to address this challenge by eliciting – for the first time – public opinion about the appropriate ecosystem service terminology to use with respect to *specific ecosystem*

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phenomena. Previous studies (Define Research & Insight, 2007; Metz and Weigel, 2010) have only elicited public preferences for ecosystem services terminology in general terms. In so doing the paper seeks to engage with debates about the relationship between group and individual decision-making, as a contribution to wider discussions about the nature and construction of expert and lay knowledge.

2. Problematic Foundations

According to Gómez-Baggethun et al. (2010, p. 1213) "in the late 1960s and 1970s a series of contributions started referring to the way particular "functions of nature" served human societies[1]"; they go on to list examples of these contributions by American, British and Dutch academics. Beyond functions, Vihervaara et al. (2010) state that the *idea* of ecosystem goods and services was first suggested by Eugene Odum (1959) an American ecologist, at The University of Georgia. But, according to Costanza and Kubiszewski (2012) and Gómez-Baggethun et al. (2010), it is Walter Westman (1977) – another American ecologist, this time at The University of California, Los Angeles – who appears to be the first person to use the term ecosystem services. Whether this remains true outside of the academic literature published in the English language is an open question. At the same time Westman's article also appears to be the first to use and apply all four of the descriptors which are the focus of this paper — benefit, function and good as well as service. Reading Westman's original article it is interesting to note that he conceptualises (a) benefits as phenomena which emanate from goods; (b) functions and services as synonyms; (c) benefits as phenomena which also emanate from these functions/services: "The structure of an ecosystem includes the species contained therein […] [t]his is the ecosystem's standing stock-nature's free "goods". From the structural aspects of ecosystems, society reaps two kinds of "benefits": (i) the direct harvest of marketable products […] and the procurement of the genetic resources of valuable species […] and (ii) the use and appreciation of ecosystems for recreation, aesthetic [sic] enjoyment, and study. The "functions" of an ecosystem, on the other hand, are characterised by the ways in which the components of the system interact. They are the dynamics of ecosystems — nature's free "services". These "functions" impart to society a variety of "benefits". They include the absorption and breakdown of pollutants, the cycling of nutrients […]" (Westman, 1977, p. 961[2]). Another early example which applies the concept of ecosystem services is provided by two more American ecologists – Ehrlich and Mooney (1983) – who also refer to ecosystem benefits and functions although no mention of ecosystem goods is made. Instead, what Westman considered as goods, Ehrlich and Mooney consider to be *controllers* which they define as "the organisms that determine the structure of the ecosystem" (Ehrlich and Mooney, 1983, p. 248). Although definitions of benefits, functions and services are not provided by Ehrlich and Mooney, examples of services are given which suggest that they are being defined in the same way as Westman defines services and functions.

The development of the ecosystem services literature since these early examples continues to be dominated by Western authors (Costanza and Kubiszewski, 2012), a dominance not circumvented by this paper whose authors are all (white, male) British researchers. The literature is also characterised by sustained differences of opinion as to whether and how the benefits, functions, goods and services associated with ecosystems differ from each other (de Groot et al., 2010). For example, Nahlik et al. (2012) discuss how some authors equate benefits with services whilst others regard benefits to be phenomena which emanate from services. The two most well known examples they discuss – Costanza et al. (1997) and MA (2005) – both take the former approach, by equating services and benefits.

A review of the current approach to conceptualising ecosystem services suggests that what is commonly presented as consensus is, at best, only localised consensus within and not between different groups of 'experts'. To illustrate the prevailing diversity of opinions between different groups of experts, Table 1 describes some alternative descriptors put forward for what the United Kingdom's National Ecosystem Assessment (UK NEA, Mace et al., 2011) regarded as final ecosystem goods and services. The conceptual framework developed by the UK NEA lists 11 different authors from a variety of institutions. Some alternative frameworks in Table 1 boast higher numbers of contributors (e.g. MA, 2003, 2005; Maynard et al., 2010) at least ostensibly, depending on the actual structures and processes of involvement. However what unites all of these studies is the presentation of a consensus view based on the decisions of a group, or in the case of Wallace (2007), the views of just one individual 'expert'. The tendency for these studies to appear in academic journals as opposed to outlets more accessible to a general audience can be expected to change over time because more projects will begin to be reported online which use the increasingly popular ecosystem services terminology (Frykman, 2012).

The existence of these differences of opinion has stimulated a certain amount of research into exactly these differences — in terms of their identification and causes. Going beyond this, although it is conceivable that these differences of opinion could have implications for policy and planning (Lamarque et al., 2011), any such implications are difficult to discern not least because there is very little evidence available which illustrates the effect of ecosystem services research on decision making (McKenzie et al., 2014). Such services are often only recognised as important once it is too late, after their degradation (Daily et al., 2009). In terms of the causes of these differences of opinion, at least some people in the research community may regard ecosystem services as a boundary object[3] (Schröter et al., in press; Star, 2010; Star and Griesemer, 1989) within which manoeuvring between related terminology is to be expected. Schröter et al. (in press, p. 5) also suggest that maybe we should expect the prevailing differences of opinion about terminology and definitions because ecosystem services research is still in its "development phase". Mollinga (2010) expands on this, noting how this developmental phase has been going on since at least the 1990s. However, multiple protagonists could be spending time and energy competing to champion their approaches (Harrington et al., 2010) for parochial reasons, rather than aiming for a field-wide consensus position. One implication of this might be that the array of alternative terminology and definitions which exists is reflective of dysfunctional group based decision making leading to sub-optimal outcomes i.e. a number of conflicting definitions and typologies which few people are really happy with.

Developing and applying ecosystem services terminology based on the collective agreement of a range of experts appears to be a rational approach to an important issue. When considering understandings of group dynamics this solution appears even more plausible. Research into group dynamics and the behaviours of individuals within group settings has a long history in suggesting 'process gain' as an outcome in which group performance is more, or better than, would be expected on the basis of the member characteristics (e.g. Shaw, 1932). For example, a classic study in the USA looking at the effectiveness of students working in groups, compared to students working on their own, found that across a range of exercises groups achieved more than individuals did and students in the group conditions used higher level reasoning strategies in completing the tasks (Gabbert et al., 1986). In addition, it appears that it is not only the cumulative effect of individual knowledge that results in people performing better in groups but also that simply being in the presence of others also enhances productivity. For example, analysing data collected from 2000 bicycle race times,

[1] The appropriation of the word function by economists and its subsequent recasting in utilitarian terms is lamented by Peterson et al. (2010).

[2] Emboldening added by the authors.

[3] Beyond boundary objects Mollinga (2010) distinguishes two other types of boundary phenomena: concepts and settings. Ecosystem services would be classed as a boundary concept, rather than an object, according to this approach.