

# Northumbria Research Link

Citation: Chaigneau, Tomas, Brown, Katrina, Coulthard, Sarah, Daw, Tim M. and Szaboova, Lucy (2019) Money, use and experience: Identifying the mechanisms through which ecosystem services contribute to wellbeing in coastal Kenya and Mozambique. *Ecosystem Services*, 38. p. 100957. ISSN 2212-0416

Published by: Elsevier

URL: <https://doi.org/10.1016/j.ecoser.2019.100957>  
<<https://doi.org/10.1016/j.ecoser.2019.100957>>

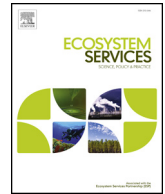
This version was downloaded from Northumbria Research Link:  
<http://nrl.northumbria.ac.uk/39865/>

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: <http://nrl.northumbria.ac.uk/policies.html>

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)

[www.northumbria.ac.uk/nrl](http://www.northumbria.ac.uk/nrl)





# Money, use and experience: Identifying the mechanisms through which ecosystem services contribute to wellbeing in coastal Kenya and Mozambique

Tomas Chaigneau<sup>a,\*</sup>, Katrina Brown<sup>b</sup>, Sarah Coulthard<sup>c</sup>, Tim M. Daw<sup>d</sup>, Lucy Szaboova<sup>a</sup>

<sup>a</sup> Environment and Sustainability Institute, University of Exeter, Penryn, UK

<sup>b</sup> College of Life and Environmental Sciences, University of Exeter, Exeter, UK

<sup>c</sup> Northumbria University, Newcastle, UK

<sup>d</sup> Stockholm Resilience Centre, Stockholm University, Stockholm, SE-106 91 Stockholm, Sweden

## ABSTRACT

Despite extensive recent research elucidating the complex relationship between ecosystem services and human wellbeing, little work has sought to understand *how* ecosystem services contribute to wellbeing and poverty alleviation. This paper adopts concepts from the “Theory of Human Need” and the “Capability Approach” to both identify the multitude of links occurring between ecosystem services and wellbeing domains, and to understand the mechanisms through which ecosystem services contribute to wellbeing. Focus Group Discussions (N = 40) were carried out at 8 sites in Mozambique and Kenya to elicit how, why, and to what extent benefits derived from ecosystem services contribute to different wellbeing domains. Our results highlight three types of mechanisms through which ecosystem services contribute to wellbeing, monetary, use and experience. The consideration of these mechanisms can inform the development of interventions that aim to protect or improve flows of benefits to people. Firstly, interventions that support multiple types of mechanisms will likely support multiple domains of wellbeing. Secondly, overemphasising certain types of mechanism over others could lead to negative social feedbacks, threatening the future flows of ecosystem services. Finally, the three mechanism types are interlinked and can act synergistically to enhance the capacities of individuals to convert ecosystem services to wellbeing.

## 1. Introduction

Since the Millennium Ecosystem Assessment (Millennium Ecosystem Assessment, 2005), research on the relationships between wellbeing and the benefits obtained from the environment, known as “ecosystem services”, has expanded dramatically (Vihervaara et al., 2010). Whilst there is an increasing appreciation for the multiple ways in which nature is (and can be) valued (Costanza et al., 2017; Spangenberg and Settele, 2016; Carpenter et al., 2009), we still lack a good understanding of *how* ecosystem services contribute to wellbeing and potentially to poverty alleviation (Cruz-Garcia et al., 2017; Fedele et al., 2017; Suich et al., 2015). We argue that this is due to: (i) a lack of consideration of the complexity of the linkages between ecosystem services and wellbeing (Liquete et al., 2013), and (ii) a lack of empirical understanding of the nature of these interactions and the different mechanisms through which ecosystem services contribute to wellbeing (Suich et al., 2015).

The focus of ecosystem services research in relation to wellbeing and poverty alleviation has predominantly been towards provisioning services (Suich et al., 2015). This is inherently biased towards marketable goods that can provide cash income, and their subsequent

contribution towards economic dimensions of wellbeing (Liu and Opdam, 2014). While monetary factors undoubtedly enhance wellbeing (Diener and Seligman, 2004; Gough et al., 2006), ecosystem services provide a broader range of benefits, which are both tangible and intangible (Chan et al., 2011). These benefits can be valuable to people for various reasons and can, therefore, contribute to different dimensions of wellbeing, depending on needs and use of ecosystem services (Liu and Opdam, 2014).

For example, those living from the sea value fishing for more than simply the economic gains generated by the activity. Fishers enjoy the work above (and beyond) the monetary benefits they obtain, as it gives them a sense of identity, as has been well documented in research on job satisfaction in fisheries (Bavinck et al., 2012; Cinner, 2014). The shade provided from mangrove trees is another more obscure ecosystem service in some settings, associated for example, with the provision of respite and shelter from the sun, contributing thus to the subjective wellbeing and health of gleaners, rather than providing direct monetary benefits (Daw et al., 2016).

The above suggest that single ecosystem services can contribute to multiple wellbeing domains through different mechanisms. This has important implications for conservation and development, as it implies

\* Corresponding author.

E-mail address: [t.w.b.chaigneau@exeter.ac.uk](mailto:t.w.b.chaigneau@exeter.ac.uk) (T. Chaigneau).

that monetary approaches, such as financial incentives, will not necessarily induce positive behaviour change when wellbeing is also linked to non-tradable, non-material benefits from ecosystem services (Chan et al., 2012a). Although the monetary valuation of ecosystem services can provide insight into the importance of ecosystem services for wellbeing, the case has been made against its use as a sole decision-making criterion when developing conservation or development interventions (Cordier et al., 2014).

Calls have been emerging departing from merely economic valuation approaches, to better integrating considerations of social justice, economic efficiency and ecological sustainability in policy and decision-making processes (Costanza et al., 2017; Farley, 2012). These calls are driven by the recognition of plural values and multiple beneficiaries (Daw et al., 2011; Jacobs et al., 2016), and highlight the non-linear, complex and dynamic nature of human-environment relations (Costanza et al., 2017). In response to these calls, new valuation approaches have emerged that begin to explicitly recognize the intangible values of some ecosystem services (e.g. integrated or participatory valuation) (Jacobs et al., 2016; Díaz et al., 2018).

Whilst connections are increasingly being made between multiple ecosystem services and multiple dimensions of wellbeing, to fully understand the relationship between ecosystems and wellbeing cannot solely entail a listing and ranking of the plethora of links between the two. The management of ecosystem services requires an understanding of the mechanisms through which wellbeing is derived from ecosystem services (Fedele et al., 2017). Yet, there is a lack of empirical studies that explicitly unpack these mechanisms around *how* ecosystem services contribute to wellbeing (Suich et al., 2015).

The aim of this paper is to understand the different mechanisms through which ecosystem services provision contributes to human wellbeing, using examples from two coastal social-ecological systems in Kenya and Mozambique. In particular we draw on two seminal theories to unpack the relationship between ecosystem services and wellbeing, namely the theory of human need and the capability approach. The theory of human needs (Doyal and Gough, 1991) provides universally applicable wellbeing domains, as a basis for identifying the multiple dimensions of wellbeing that ecosystem services contribute to. The capability approach (Sen, 1999) can help us focus on the mechanisms through which ecosystem services contribute to different wellbeing domains. As such, this paper carries out an empirical study on how ecosystem services contribute to wellbeing rather than solely describing or quantifying individual or specific ecosystem service and wellbeing links. In this respect our study addresses some of the main concerns and critiques of ecosystem services scholars.

Section 2 outlines a well-theorised holistic framework to establish mechanisms between ecosystem services and human wellbeing, the study sites (eight coastal communities in Kenya and Mozambique), and the data collection and analysis methods. Section 3 populates this framework with specific contextual connections between coastal ecosystems and different aspects of their wellbeing in the study communities, thus avoiding categories of ecosystem services and wellbeing domains that are non-sensical in the cultural context of this study. Section 4 outlines the implications of this study, including implication for ecosystem service or conservation management and sustainable development interventions.

## 2. Methods

### 2.1. Methodological approach

The theory of human need (Doyal and Gough, 1991) provides our theorised list of universal basic needs that are relevant to all humans on the planet (Chaigneau et al., 2018). This includes material aspects of wellbeing that are objectively verifiable (e.g. drinking water, income, shelter), alongside subjective elements (e.g. sense of respect and autonomy) that although important, are less tangible, and largely depend

on an individual's own assessment to capture adequately. These domains are also all deemed to be equally important (Doyal and Gough, 1991), despite the fact that many of these domains are not commonly investigated in ecosystem service assessments.

Applying such a multi-dimensional concept of wellbeing enables us to consider diverse aspects of life, and explore the breadth of ways in which ecosystem services contribute to a range of wellbeing outcomes, including (and beyond) a solely monetary focus (Agarwala et al., 2014; Milner-Gulland et al., 2014). It also sheds light on the multiple, often non-material or intangible links between the environment and human wellbeing, and enables an exploration of the perceived relative importance of these ecosystem services for different wellbeing domains (Russell et al., 2013).

The capability approach (Sen, 1999) provides an analytical lens to investigate the mechanisms through which ecosystem services contribute to wellbeing. As Sangha et al (2018) point out, people's connections with nature are not only limited to the benefits or services derived from ecosystems, but also entails their capabilities to derive those benefits. Polishchuk and Rauschmayer (2012) highlight how the capability approach exposes the multiple ways in which ecosystem services underpin human capabilities. For example, ecosystem services can act both as sources of wellbeing (i.e. as goods, services) and environmental conversion factors (e.g. regulating services such as climate, floods or erosion), which impact how people turn ecosystem services into capabilities. Therefore, the capability approach shifts our interpretation of empirical data from wellbeing outcomes towards the suite of opportunities that arise from each ecosystem service, as well as the mechanisms that enable these.

Up to now, a very narrow body of literature has explored how the capability approach can explain how ecosystem services enhance human wellbeing (Caveen et al., 2014; Dawson and Martin, 2015; Polishchuk and Rauschmayer, 2012; Sangha et al., 2018). This literature explains how an ecosystem service is likely to contribute to a range of different capabilities (opportunities) through a set of conversion factors. These include the social and environmental context, as well as people's personal circumstances (Robeyns, 2005), highlighting the multiple ways in which ecosystem services enhance human wellbeing, including less obvious or unexpected links.

More can be learned from this relationship by turning to the development literature where research on the processes and mechanisms supporting wellbeing has taken a more central stage. In particular, Amartya Sen's entitlements work (Sen, 1981, 1977), which allows for a socially differentiated analysis of access to natural resources, can enable us to unpack the relationships between ecosystem services and human wellbeing. Such an approach considers a broader range of mechanisms, beyond market exchange, that mediate people's access to (and control over) resources, including mechanisms related to customary law or kin networks and relationships. The concept of *environmental entitlements* as "alternative sets of utilities derived from environmental goods and services over which social actors have legitimate effective command and which are instrumental in achieving wellbeing" are of particular interest when identifying the mechanisms that mediate the conversion of ecosystem services to wellbeing (Leach et al., 1999; Hicks and Cinner 2014). These environmental entitlements include mechanisms where the *direct use* of an ecosystem good contributes to wellbeing (e.g. commodities such as food, water, fuel or medicine) (Leach et al., 1999). Other mechanisms include the *trade*, or monetary exchange, of such resources. Money obtained through such exchange may also facilitate the purchase of other goods, such as food or even luxury items that attract the respect of others in the community (Sen, 1977).

Other than through the trade and use of ecosystem services, people also gain wellbeing from experiencing the less tangible aspects of ecosystem services. For example, the act of fishing itself can be valued for different reasons. It may be that it engenders or supports important relationships with crew members, or that it contributes to freedom, autonomy, identity, a sense of place and a sense of being respected by

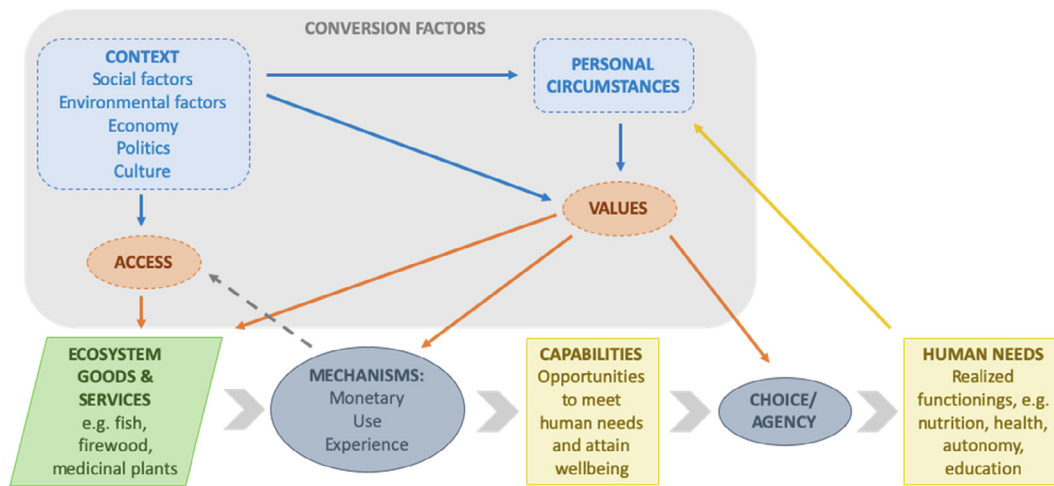


Fig. 1. A Capability Approach analytic lens for linking ecosystem services and human wellbeing. Sources: Polishchuk and Rauschmayer, 2012; Robeyns, 2005; Sen, 1999, 1981.

others (e.g. Reed et al., 2013; Urquhart and Acott, 2014). However, mechanisms related to experience may not always yield positive outcomes for wellbeing. Fishing, for example, can be a dangerous activity at times, affecting physical security and health negatively (Woodhead et al., 2018).

Based on the above, to unpack how people gain wellbeing from natural resources in this paper, we draw on the theoretically informed concepts of direct and trade entitlements (Sen, 1981), complementing them with a third mechanism type, *experience*, derived from our own empirical data through an inductive process.

Fig. 1 summarises our analytical approach and the concepts that we draw on in eliciting the multiple links between coastal ecosystem services and wellbeing. A number of personal, social and environmental ‘conversion factors’ (Robeyns, 2005) are instrumental for converting ecosystem services and goods into wellbeing (Polishchuk and Rauschmayer, 2012). These include a suite of contextual factors, which shape people’s personal circumstances and their ability to gain access to ecosystems. People’s personal circumstances are also determined by their realized functionalities, which are the human needs met through interaction with the environment (as well as other sources). Contextual factors and personal circumstances both shape people’s values (e.g. tastes, preferences, attitudes, which in turn are reflected in the: (a) perceptions about what constitutes an ecosystem service, (b) the mechanisms (whether monetary, direct use or experience) that people mobilize in order to convert ecosystem services into capabilities, and (c) the choices they make about which capabilities to pursue in order to satisfy their human needs. Building on Polishchuk and Rauschmayer (2012), we recognize that ecosystem services can contribute to attained functionalities both directly (as sources of wellbeing) and indirectly (as conversion factors) (Fig. 2).

2.2. Study sites

This study was carried out across eight coastal sites in northern Mozambique and Kenya, ranging from remote to peri-urban settings, with proximity to mangrove and/or coral reef ecosystems and with a range of levels of poverty. Local communities in these sites are known to depend on various ecosystem services (Fig. 3 and Table 1), especially on coastal ecosystem services such as fish and octopus. However, they differ in how they rate the importance of mangrove ecosystem services, and the services associated with tourism and the gleaning of shells.

The focus of this paper is to highlight common patterns in the way ecosystem services contribute to wellbeing across these diverse sites. The selected sites provide a range of different contexts, and represent a

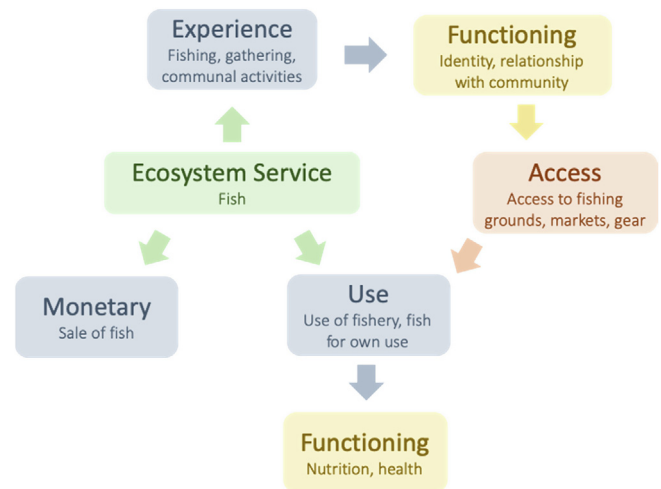


Fig. 2. Mechanisms through which ecosystem services contribute directly and indirectly to human wellbeing. Source: Polishchuk and Rauschmayer, 2012.

diverse array of coastal ecosystem service and wellbeing interactions, which underpin many coastal social-ecological systems across East Africa.

2.3. Data collection

The data was collected as part of the larger project SPACES<sup>1</sup> aiming to establish how marine ecosystem services contribute to human wellbeing and poverty alleviation in coastal communities. We used Focus Groups Discussions (FGDs) as the predominant qualitative research method to elucidate the relationships between ecosystem services and wellbeing through the eyes and hearts of the respondents.

Three different types of FGDs were carried out at each site between November 2013 and March 2014. Their size ranged between 3 and 10 participants, as our target of 6–9 participants for each FGD was not always possible (Table S1, Supplementary Electronic Material). These FGDs were not representative of the whole population in the study communities, as our sampling strategy aimed to capture diverse views, experiences and relations to ecosystems.

The first type of FGD (ES FGD, Table S1, Supplementary Electronic Material) was aimed at understanding relevant ecosystem services in

<sup>1</sup> For more information for project SPACES refer to: [www.espa-spaces.org](http://www.espa-spaces.org).

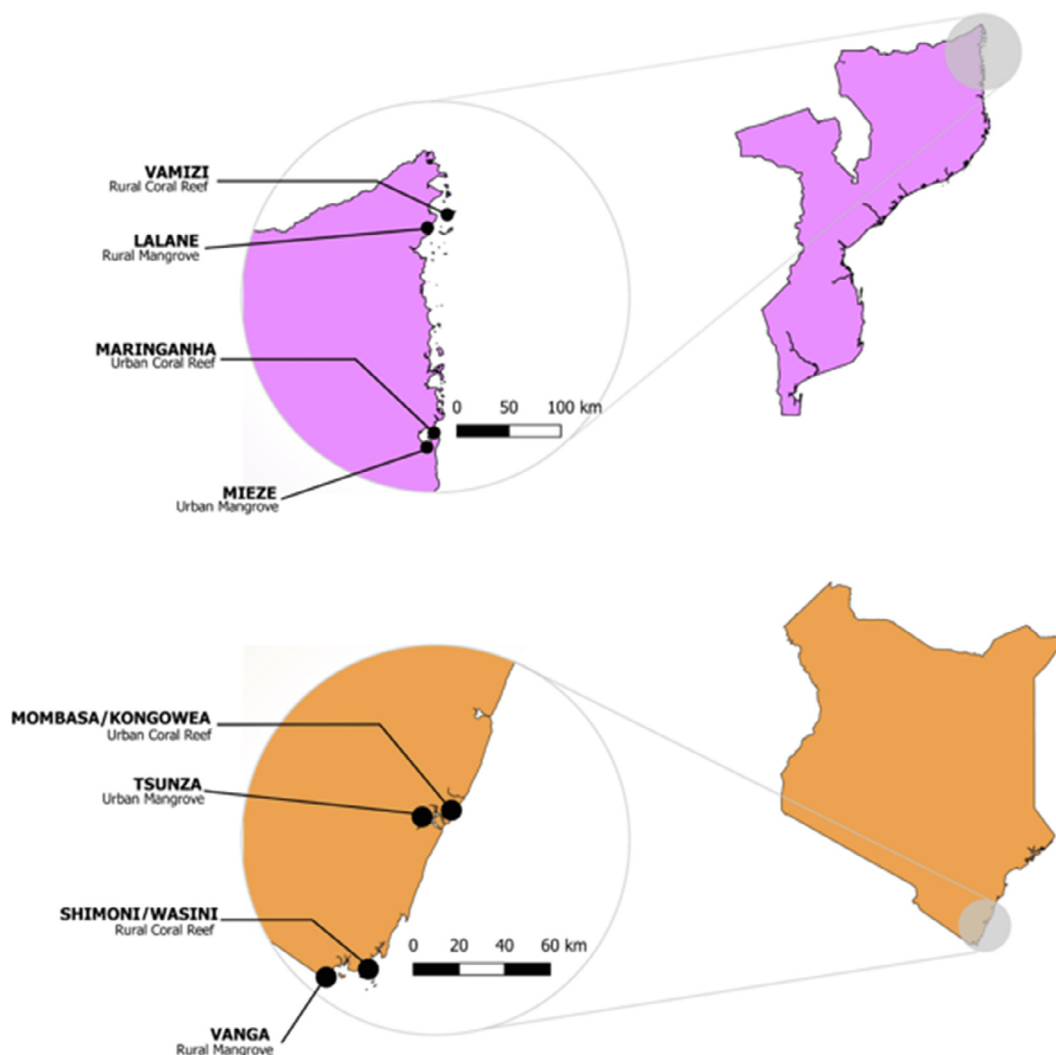


Fig. 3. Study sites in and northeast Mozambique (upper) and southeast Kenya (lower). Figure by F Januchowski-Hartley.

each context. Key informants were selected to represent different aspects of the environment, and were recruited through snowball sampling after discussions with the village leader that identified knowledgeable individuals on relevant coastal ESs. Some of the participants included village elders, members of fishery associations and those involved in mangrove restoration projects. Whenever informants were not available, they were asked to suggest other participants. In this type

of FGD, participants were asked to discuss and list the various different potential benefits that the community obtains from the coastal environment. These benefits were compiled inclusively across all sites and an artist illustrated each benefit (Fig. S2, Supplementary Electronic Material) to be used as probes for the follow up FGDs that sought to identify the links and mechanisms between ecosystem services and wellbeing (see below).

**Table 1**  
Characteristics of the study communities.

Country	Community	Setting	Ecosystems		Coastal ecosystem-based livelihoods			Demographics			
			Coral reefs	Mangroves	Fisheries	Tourism & hospitality	Mangrove & non-timber forest products	Agriculture	Population	Predominant Religion	
									Muslim	Christian	
Mozambique	Vamizi	Rural	✓	✓	✓	✓	✓	✓	533	✓	
	Lalane	Rural	✓		✓		✓	✓	1150	✓	
	Maringanha	Urban	✓		✓	✓	✓	✓	4000	✓	
	Mieze	Rural		✓	✓		✓	✓	32,000	✓	✓
Kenya	Kongowea	Urban	✓		✓	✓	✓	✓	100,000	✓	✓
	Tsunza	Rural		✓	✓	✓	✓	✓	10,000	✓	✓
	Shimoni and	Rural	✓	✓	✓	✓	✓	✓	5000	✓	✓
	Wasini Island	Rural	✓	✓	✓	✓	✓	✓	1900	✓	
	Vanga	Rural	✓	✓	✓	✓	✓	✓	6500	✓	

Source: SPACES (2016).

The second type of FGDs (WB 1–2 FGD, Table S1, Supplementary Electronic Material), aimed at validating the list of basic needs. This was based on a comprehensive list of universal wellbeing domains that was drawn from the theory of human need (Gough, 2014) (Section 2.1). Two FGDs were carried out at each site, with participants purposively sampled based on information gathered via community profiling (which involved participant observation, a review of the local literature and secondary data analysis) and key-informant interviews. The key informant interviews were conducted with knowledgeable community members with a good understanding of the community (e.g. traditional authorities, village elders). The invited respondent aimed to reflect a range of income strata, ethnic groups, primary occupations, genders, and geographical areas in each of the communities. Participants were asked “how would you describe a household that is doing well or doing badly?”. This served to validate a full list of wellbeing domains (i.e. physical security, education, health, water, economic security, sanitation, respect, relationships, autonomy, participation, shelter and food) that was the same across all sites to ensure consistency (Chaigneau et al., 2018).

The ES and WB FGDs served to inform and guide the third type of FGDs (ES-WB FGD 1–2, Table S1, Supplementary Electronic Material), which identified the types of links and mechanism between ecosystem services and wellbeing domains. These ES-WB FGDs form the basis of our empirical analysis in Section 3. To reduce participant fatigue in the study communities, rather than formally inviting participants, we selected individuals that were able to participate and had the desire and time to do so. Even though the selected sample was not representative of the respective communities, our selection process enabled more fruitful discussion and more active participation with participants that were willing to engage with the project. However, FGDs were separated by gender, in order to understand better the mechanism between ecosystem services and wellbeing domains. During this FGD we presented participants the illustrations of each ecosystem benefit derived through the first FGD. The importance of each of these benefits was broadly discussed within the group, and participants were then asked to state the perceived importance for each wellbeing domain using the following scale: 1 = A little important; 2 = Quite important; 3 = Very important. Participants were then asked to explain, for each of these links, how each ecosystem service contributed to the domain of wellbeing, and why they were classified as important or not. Consensus was sought within each FGD, with the ensuing discussion translated and transcribed in the field.

FGDs were moderated in Portuguese (in Mozambique) and Swahili (in Kenya). Facilitators were trained to consider power dynamics and to ensure that each participant’s voice was heard. Given the different dialects in rural northern Mozambique, additional interpreters were required to translate from Portuguese to the local dialect. We followed ethical procedures set out by the University of Exeter. This ensured that each participant was aware of the purpose of the research, validated that the research was aimed towards beneficial effects that outweighed the risks, that harm was avoided through agreed precautions and that data was made anonymous. All participants gave verbal consent prior to participating in the FGDs.

#### 2.4. Data analysis

Descriptive statistical analysis was carried out to summarise the perceived links and importance of each ecosystem service for each wellbeing domain. To elicit the importance of ecosystem services for wellbeing, the results were aggregated from the ES FGDs. The perceived importance was represented as a proportion of the summed importance of ES for a WB domain across all ES-WB FGDs over the maximum possible importance (of 3) that could be attributed by all ES-WB FGDs ( $n = 16$ ).

The information obtained from ES-WB FGDs pertaining to the nature of these links was coded using a semi-inductive process. The

code selection was partly guided by Sen (1981, 1977) and partly by keeping an open mind to new insights emerging from the empirical data using the qualitative analysis software NVIVO (2010). Rather than a solely deductive process, whereby answers are placed into pre-determined categories, we allowed for the creation of new categories which fit our data more closely. This was particularly the case when coding for experience. Responses were consequently coded as either a use, a monetary or an experiential mechanism type. At times, there were numerous types of links between an ecosystem service and a wellbeing domain, with the link therefore coded multiple times. Octopus for example would contribute to health as it could be caught and sold for money to buy medicine (monetary mechanism), but could also be boiled and used as a soup to treat certain ailments (use mechanism).

Many links were clearly classifiable as one of the three types of mechanisms, while others required more interpretation by the research team. In particular, the sharing of goods was considered to be important for social relationships. This could arguably be classified as a use mechanism, but we opted to code it as an experiential mechanism. The act of catching fish or octopus, or of collecting firewood, for example, allowed one to share these goods, which allowed friendships to be forged or maintained. Gifts could also be considered as a type of exchange mechanism, but our categorisation aimed to isolate monetary exchange (which dominate many forms of ecosystem service assessment) from other forms of benefits. Thus, as no specific commodity was required in return for gifts they were categorised as an ‘experience’ type of mechanisms.

To identify the mechanisms associated with different ESs we sum the total number of links between a given ES and all WB domains across all ES-WB FGDs. The proportions of each type of mechanism operating between an ES and all WB domains was calculated as the sum of the links operating through that mechanism, over the total number of links between that ES and all WB domains (including all 3 mechanism types). This process was repeated for each ES. A similar approach was carried out to identify how different mechanisms are associated with WB domains. Here, the total number of links between a given WB domain and all ESs was summed across all ES-WB FGDs. The proportions of each type of mechanism operating between a WB domain and all ESs was calculated as the aggregate of the links operating through a mechanism over the total number of links between that WB domain and all ESs (including all 3 mechanism types). This process was repeated for each WB domain.

### 3. Results

#### 3.1. Contribution of ecosystem services to wellbeing

A variety of different services were identified from the environment and contributed to aspects of wellbeing to varying degrees (Table 2).<sup>2</sup> While some of these included commonly studied ecosystem services (e.g. fisheries, tourism, mangrove poles), others are rarely investigated. For example, the shade produced by mangroves was cited in Kenya as providing a discrete space for illicitly brewing alcohol, away from the police, but also valuable as relief from the sun when waiting for fishers to come back from the sea, or for a break whilst gleaning in the heat of the day. Mangroves were also used for medicine, to create dyes, as a site for beehives for honey, and were used as reference points by fishers and merchants by sea.

More links between ecosystem services and wellbeing domains were identified by Kenyan FGDs and they emphasised these less-studied services to a greater extent than those in Mozambique. Nevertheless, with the exception of illegal brewing and dye, which were not discussed

<sup>2</sup> More detailed information about the contribution of ecosystem services to wellbeing domains at each site for men and women is available at <http://www.espa-spaces.org/resources/spaces-data-explorer/>.

**Table 2**  
Aggregate importance scores for ecosystem services in Kenya and Mozambique (as a percentage of maximum importance that could be attributed).

Ecosystem Services		Health	Education Physical Security	Water	Respect	Autonomy	Shelter	Food Economic Security	Participation	Sanitation	Relationships	Total		
Kenya	Mangrove Illegal Brewing	13	4	8	4	8	0	0	0	8	0	21	6	
	Mangrove Shade	46	21	8	0	8	4	13	0	0	33	13	13	
	Mangrove Reference Point	13	13	42	0	13	13	0	4	0	17	0	21	11
	Mangrove Medicine	54	0	0	0	0	0	4	8	17	0	0	8	
	Mangrove Sanitation	17	0	25	13	38	0	13	0	0	25	54	21	17
	Mangrove Firewood	33	58	33	17	13	75	29	83	71	38	13	58	43
	Mangrove Poles	46	79	63	25	29	33	83	63	67	25	54	50	51
	Mangrove Dye	0	8	0	0	4	13	17	8	38	13	13	17	11
	Mangrove Honey	54	29	21	8	13	25	17	42	42	13	0	21	24
	Tourism	13	29	8	17	17	4	17	13	21	8	21	29	16
	Octopus	50	58	33	38	38	29	46	54	33	21	33	42	40
	Fish	79	96	58	67	63	92	88	83	88	54	50	88	75
	Shells	8	25	0	21	13	17	21	8	29	13	21	46	18
	Total	33	32	23	16	20	23	27	28	31	21	21	33	
Mozambique	Mangrove Illegal Brewing	0	0	0	0	0	0	0	0	0	0	0	0	
	Mangrove Shade	4	0	13	0	0	0	0	0	0	0	0	1	
	Mangrove Reference Point	0	0	13	0	4	0	8	0	13	0	0	4	3
	Mangrove Medicine	67	8	29	0	38	4	0	13	4	8	0	17	16
	Mangrove Sanitation	4	0	0	0	0	0	0	0	0	0	0	0	
	Mangrove Firewood	4	8	25	0	0	8	0	17	17	4	17	4	9
	Mangrove Poles	0	29	54	0	21	33	79	4	42	25	58	33	32
	Mangrove Dye	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mangrove Honey	38	0	4	0	17	0	0	21	13	0	0	0	8
	Tourism	4	17	13	13	13	0	21	4	13	0	13	13	10
	Octopus	46	75	13	0	54	42	46	79	79	50	50	58	49
	Fish	50	96	21	0	75	71	79	96	96	63	75	96	68
	Shells	0	54	0	0	29	38	29	67	46	25	33	29	29
	Total	17	22	14	1	19	15	20	23	25	13	19	20	

Note: Darker shading within cells represents a higher importance attributed to the relationship between an ecosystem service and a wellbeing domain. Refer to SPACES data explorer (SPACES, 2017) for information for each ecosystem service, <http://www.espa-spaces.org/resources/spaces-data-explorer/>.

in Mozambique, all of these services were given some level of importance to specific wellbeing domains across all sites. Whilst illegal brewing is a sensitive topic, questions were asked on behalf of the community rather than targeting specific individuals which enabled participants to discuss this activity openly. The fact that the mangroves and their cover are not considered a service for illegal brewing in Mozambique may indicate the fact that brewing does not occur in these sites or that cover is not required due to lack of enforcement in these areas. It should also be noted, however, that these are solely ecosystem service goods and benefits identified by respondents. The list provided here includes easily perceived services and benefits with a predominance of cultural and provisioning services rather than regulating and supporting services.

Overall, similarities in perceived importance of ecosystem services for wellbeing domains occurred between Kenya and Mozambique, with

reef-associated fishery benefits being scored as the most important overall, followed by mangrove poles. Some ecosystem services such as mangrove honey and mangrove firewood, or mangrove sanitation in the case of Kenya, did not significantly contribute to specific wellbeing domains but consistently contributed moderately or minimally to many wellbeing domains and therefore were ranked as relatively important services for wellbeing overall. Certain wellbeing domains were consistently mentioned as being impacted by a majority of ecosystem services. Health, education, food security, economic security and relationships for example were closely associated to the majority of perceived ecosystem services at both sites.

### 3.2. Mechanisms through which ecosystem services contribute to wellbeing

A wide range of mechanisms were identified from across monetary,

**Table 3**  
Mechanisms through which ecosystem services contribute to human wellbeing domain.

Wellbeing Domain	Monetary	Use	Experience
Health	(+)money from fish to buy medicine	(+)mangrove medicine can cure stomach pains or headaches	(-) collecting mangrove poles can be dangerous (for e.g. access can be treacherous and heavy poles can cause injury)
Education	(+)money from selling mangrove firewood used to pay for school fees and equipment	(+)students study, eat, and play in the mangrove shade	(-)girls collect shells instead of going to school
Physical security	(+)money from octopus to improve one's house	(+)mangrove reference point prevents getting lost at sea	(-)fishing can be dangerous (for e.g. whilst at sea in stormy conditions)
Water	(+)money from tourism to buy or treat water	(-)mangrove toilets contaminate the water	
Autonomy	(+)money from mangrove poles used to make own plans	(+)use reference point to find your way on your own	(+)can collect and sell mangrove firewood when you choose
Shelter	(+)money from fishing for house & electricity	(+)shells can be used to make paint and walls	
Food	(+)sell mangrove honey to buy food	(+)firewood needed to make a fire to cook	
Economic Security	(+)money from mangrove firewood, mangrove honey, fish, etc.		(+)fishing increases borrowing/ loan availability
Participation	(+)fishing creates an income to attend ceremonies	(+)mangrove brewing is used during ceremonies and events	(+)can use shade during events to relax together under
Sanitation	(+)money from selling octopus used to buy soap or toilet	(-)using mangrove toilet is unhygienic	
Relationships	(+)share money made from selling mats made with mangrove dye	(+)shells used as decoration are given to friends	(-)mangrove brewing can create conflicts (for e.g. between local government and brewers as it is an illegal activity)
Respect	(+)catching octopus gives income and respect	(+)people go to those with knowledge of mangrove medicine first if they are sick	(+)collecting honey is a dangerous activity that brings respect

Note: (+) denote positive effects and (-) denote negative effects.

use and experience types (Table 3). The perceived type and extent of contributions to wellbeing differed significantly between ecosystem services.<sup>3</sup> These are exemplified clearly by octopus and mangrove firewood, and their contributions to wellbeing (Fig. 4).

Octopus was perceived to contribute relatively strongly to many aspects of wellbeing (Fig. 4a). Monetary mechanisms that were identified included the catching and selling of octopus contributed strongly to economic security. The money obtained from selling octopus was also argued to contribute to buying equipment for school and paying school fees as well as being able to buy soap and cleaning products for general hygiene and thus contributing to sanitation. Use mechanisms were identified where eating octopus was also perceived at most sites to contribute to health and to cure certain diseases. It obviously would also contribute to food security. Finally, experiential mechanisms were identified whereby the practice of catching octopus itself was an activity that required no boss and therefore gave individuals a feeling of autonomy. Catching octopus was sometimes perceived to have a negative effect in terms of participating in community affairs and community wide relationships as there was tension between octopus fishermen and those involved in catching fish.

On the other hand, mangrove firewood was perceived to play a moderate role overall in contributing to wellbeing (Fig. 4b). Women perceived mangrove firewood to be considerably more important for wellbeing than men. Through monetary mechanisms, selling firewood was considered to be quite a small contribution to economic security but was deemed by women to be important for buying scholarly materials and led to a sense of empowerment and autonomy as women were often in charge of selling firewood and could decide how to spend the money. Firewood was deemed important through use mechanisms as it was essential for ceremonies to cook for large amounts of people (participation) and would be used by many as main source of fuel for cooking (food security). Finally, through an experiential mechanisms, the practice of collecting firewood allowed women to discuss issues privately and was considered moderately important for forging and cementing relationships.

Links mostly described services positively affecting individual wellbeing domains, but occasionally negative impacts on wellbeing

were suggested, such as a negative effect of shells on education if children miss school in order to collect them (Table 3). Certain ecosystem services were frequently associated with particular wellbeing mechanism types (Fig. 5). For example, in both countries, shells, octopus, tourism, fish and mangrove firewood were more frequently explained as contributing to wellbeing through monetary mechanisms. Conversely mangrove shade, mangroves providing privacy for use as toilets, as reference points or used for illegal brewing were mostly associated with direct use mechanisms. Experiential mechanism types typically represented 10–30% of mechanisms across ecosystem services in both countries.

The different mechanism types identified (e.g. Table 3) were consistently associated with specific subsets of wellbeing domains (Fig. 6). Contribution of ecosystem services to relationships, respect, participation and autonomy were most commonly through experiential mechanisms. Comparatively, those contributions to economic security, shelter, education were most likely through monetary mechanisms. Ecosystem services rarely contributed to individual wellbeing domains significantly through more than two different mechanisms, except for autonomy. In this case, respondents across the FGDs mentioned ecosystem services could provide money with which you can make your own plans. They also argued that the activities involved in collecting certain resources made sure people were independent and could carry out these activities whenever they wanted. Finally, some ecosystem services such as mangrove poles, for example, supported people to autonomously build one's own shelter without help from others.

## 4. Discussion

### 4.1. Ecosystem services and benefits through a multidimensional wellbeing approach

Identifying the benefits of ecosystems to wellbeing depends on how human wellbeing is defined in the first place. The Theory of Human Needs enabled a structured but multidimensional view of wellbeing, revealing the multiplicity of possible ways people benefit from ecosystem services. Similarly to other inductive studies on ecosystem services in coastal East Africa (Rönnbäck et al., 2007), a variety of different ecosystem services and benefits were uncovered in this study. In addition, the multiple wellbeing domains from the Theory of Human Needs elicited a myriad of links between ecosystem services and

<sup>3</sup> For more information about each ecosystem service see SPACES data explorer: <http://www.espa-spaces.org/resources/spaces-data-explorer/>.



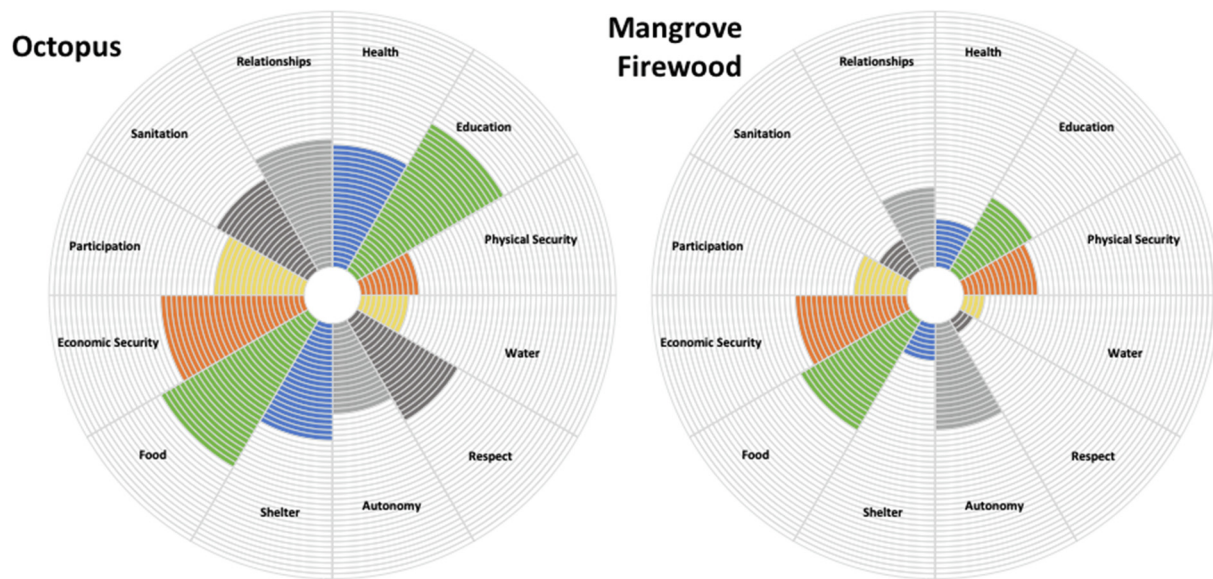


Fig. 4. Perceived contribution of octopus (a) and mangrove firewood (b) to the 12 wellbeing domains.

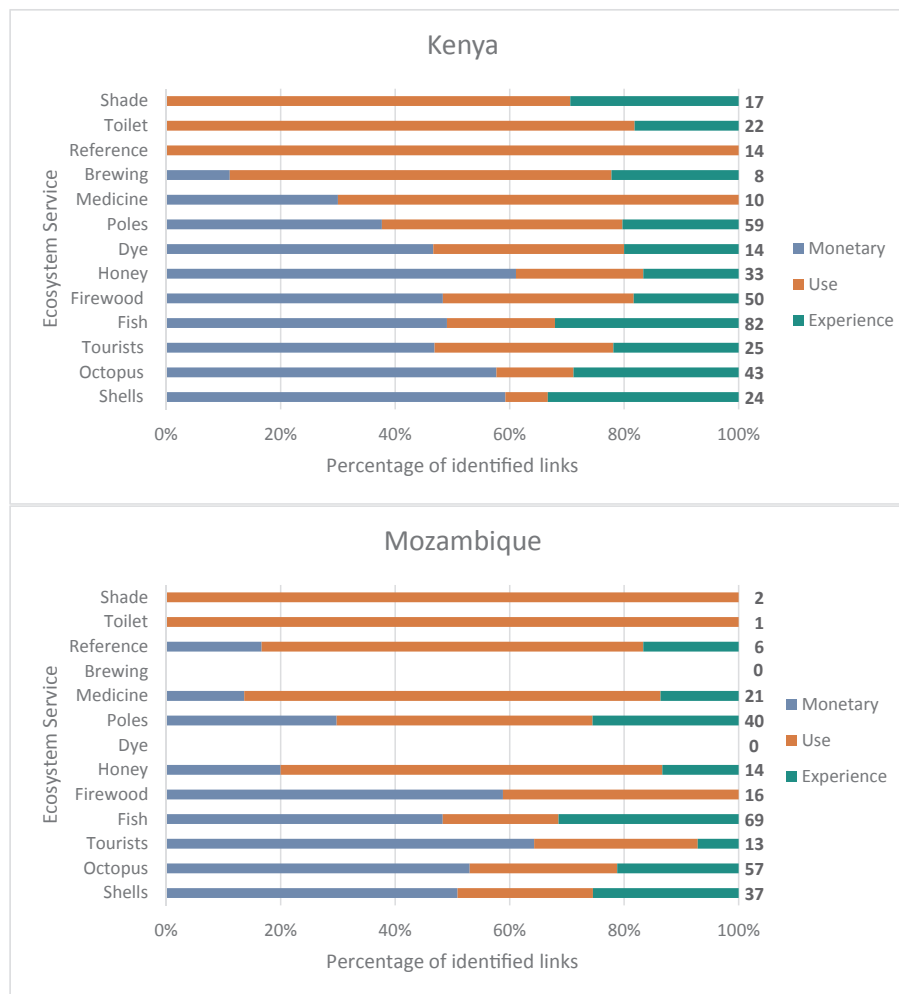


Fig. 5. Relative frequency of different mechanism types associated with coastal ecosystem services expressed. Note: The frequency is expressed as a proportion of the total number of links (in bold) between an ecosystem service and wellbeing domains identified in the FGDs.

different wellbeing domains (Table 2).

The monetary benefits of fish, octopus and mangrove poles were consistently rated as important for wellbeing in both Mozambique and

Kenya. However, we also uncovered less frequently discussed ecosystem service benefits that are rarely incorporated into environmental and ecosystem-service assessments (Chan et al., 2012a), especially

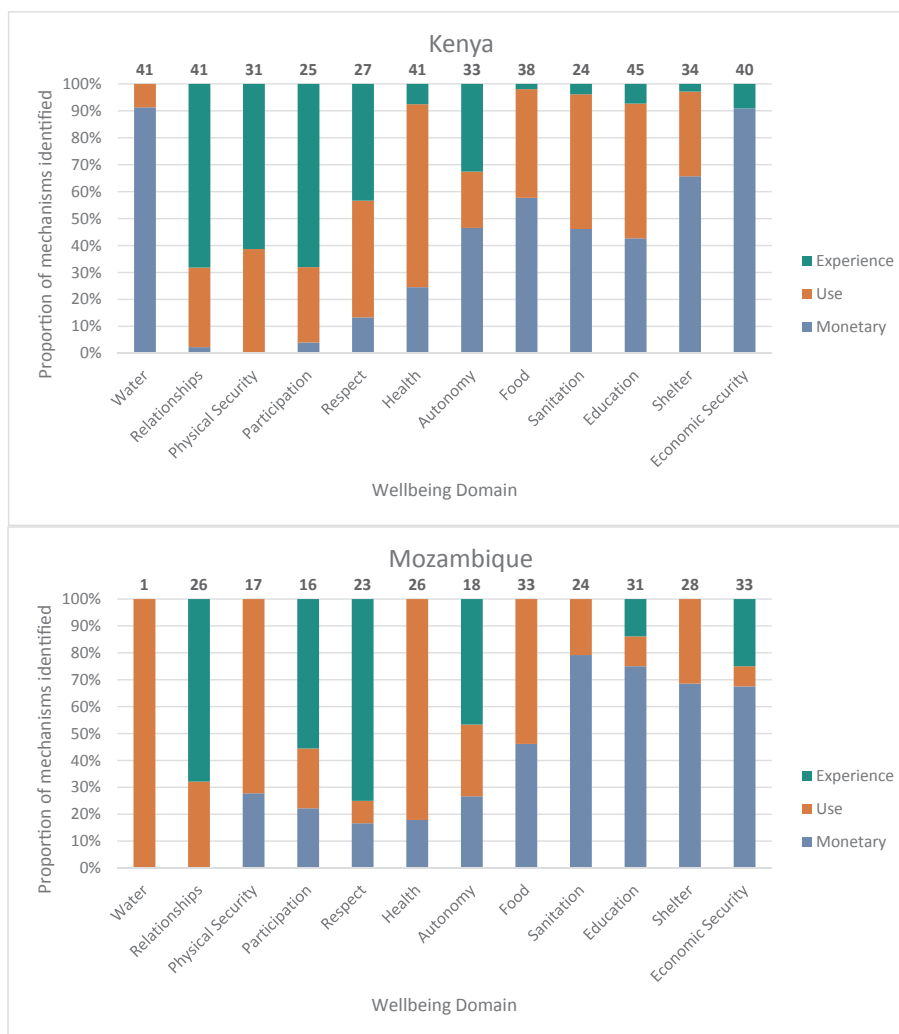


Fig. 6. Types of mechanism associated with each wellbeing domain. Note: Mechanisms are expressed as a proportion of the total number of links (in bold) between a wellbeing domain and ecosystem services identified in the FGDs.

intangible benefits considered important for specific wellbeing domains. Mangrove honey, or the benefits associated with shade from mangrove cover, for example, were both perceived as important contributors to health, through medicine for wounds/burns or sun protection (Table 2).

Whilst these types of benefits receive less attention than more tangible goods, their contributions to wellbeing may still be essential for three reasons. Firstly, they may contribute greatly to particular wellbeing domains, as is the case for mangrove medicine for health (Table 2). Secondly, they may be of great importance for a specific subset of individuals within the community, as is the case with mangrove firewood which women perceived as very important for education purposes (Fig. 3). Finally, they may contribute a small amount to a large number of different wellbeing domains, as is the case for mangrove firewood or honey (Table 2). These findings underpin the need to better articulate the wellbeing contribution of intangible ecosystem services within policy discourses (Costanza et al., 2017; Small et al., 2017).

#### 4.2. Capability approach for exploring benefit mechanisms

The capability approach inspired us to shift from a narrow focus on wellbeing outcomes from ecosystem services, towards the nature of these links and the mechanisms on which these wellbeing outcomes depend. Through a semi-inductive process, we identified three different

kinds of mechanism (i.e. use, monetary, experience) through which ecosystem services are converted into wellbeing. This categorisation contrasts with the MA definition of supporting, regulating, provisioning and cultural services, and recognises that any particular good can be associated with different benefit mechanisms even for an individual person. In particular, the non-material benefits of ‘provisioning services’ become visible, as well as the material benefits of ‘cultural services’ such as tourism. By separating out monetary mechanisms, this categorisation also draws attention to non-monetary mechanisms, while still acknowledging the central role of money as a mechanism for ecosystems to support wellbeing (Abunge et al., 2013).

Our findings illustrate that the three mechanism types are interlinked, facilitating wellbeing both directly and indirectly, by means of underpinning one another. For example, on the one hand, the mechanism of experience has been shown to shape fishers’ identity, sense of autonomy, and relationships with others in the community (Reed et al., 2013; Urquhart and Acott, 2014). On the other hand, being part of the fishing community and having good relations with fellow fishers can facilitate access to fishing grounds, or even gear, in an economy that subscribes to values of reciprocity (Adams et al., 2013). Therefore, what is seen as a wellbeing outcome from experiences gained from interactions with the environment (e.g. through fishing, gathering, performing communal or collective tasks) can also facilitate a use mechanism (e.g. by harnessing access), which in turn can underpin a monetary mechanism (e.g. through the sale of caught fish). These

findings then also provide an empirical validation of Polishchuk and Rauschmayer's (2012) suggestion that ecosystem services take the role of both sources of wellbeing and conversion factors, or mechanisms, by which further benefits from other services can be derived.

#### 4.3. Repercussions of solely focussing on monetary mechanisms

In contrast to Maslovian notions of a hierarchy of needs (Maslow, 1948), which argue that meeting basic needs of survival are most important, the Theory of Human Need argues that all needs (including subjective and relational needs) must be met to avoid individuals being in "serious harm" (Doyal and Gough, 1991). This distinction becomes relevant in the light of our findings that different mechanisms are more associated with certain ecosystem services (Fig. 5) and contribute to different wellbeing domains (Fig. 6, Table 2). This argues against an over-emphasis or prioritisation of ecosystem services that contribute to one particular mechanism, and for the importance of broad bundles of ecosystem services contributing to wellbeing through diverse mechanisms.

Despite this, many interventions focus exclusively on monetary mechanisms, for example increasing access to markets, which is core to many poverty alleviation strategies (Sanderson and Redford, 2003). However, monetary mechanisms such as these are more likely to be subject to elite capture and consolidation of benefits by more powerful members of society (Ribot and Peluso, 2003), which can limit benefits to those most in need, and failing to alleviate of multidimensional poverty. Furthermore, some ecosystem services, such as using mangroves for sanitation, as a reference point or for shade, cannot easily be privatised and therefore cannot be exchanged economically.

In addition, recent work has posited that the mechanisms through which people benefit from the environment can help explain social-ecological feedbacks which can shape ecosystem service flows (Fedele et al., 2017; Masterson et al., 2019). Here, we argue, a focus on monetary mechanisms may have negative repercussions for sustainability. Monetary mechanisms clearly contribute to a range of basic material needs, reflecting previous research on the central role of money in contexts of poverty, coastal ecosystems and wellbeing (Abunge et al., 2013). However, the usefulness of money to meet a wide range of wellbeing needs also implies an insatiability, which can be extenuated by comparison within the community, reference points from outside, penetration of markets, and availability of consumer goods in rural areas. On the other hand, use mechanisms, such as personal or household consumption, while extractive, are more likely to be satiable and therefore less likely to trigger continuous overexploitation (e.g. subsistence fishing versus fishing for the market). Experiential benefit mechanisms, in contrast, may be non-extractive or unrelated to extraction levels. For example, fishing or collecting firewood can foster social relationships and support autonomy regardless of the volumes caught or collected (beyond a certain threshold to make the activity viable). This suggests that interventions supporting experience mechanisms may have fewer negative repercussions on the ability of the environment to provide services for future generations.

#### 4.4. Importance of use and experiential mechanisms

The general focus on monetary mechanisms acts as a focussing or anchoring effect and introduces a cognitive bias whereby we tend to weigh attributes and factors unevenly, putting more importance on some aspects and less on others (Tversky and Kahneman, 1974). Therefore, policy emphasis on the monetary valuation of ecosystem services leads to a mutually re-enforcing cycle, whereby the monetary mechanisms that facilitate the translation of ecosystem goods and services into capabilities are over emphasized at the expense of less economically valuable or cultural ecosystem services that may be important for other dimensions of wellbeing. The contributions of certain services such as firewood collection to relationships through

experiential mechanisms can build social capital, which is an important asset for the poor (Narayan, 2002; Narayan-Parker, 1997) and can shape societies, cultures, and value systems, with implications for environmental change (Small et al., 2017). A narrow focus on economic fixes for alleviating poverty through ecosystem services has conversely been found to disrupt the social fabric of communities, worsening conditions for the poor in the long term (Adams et al., 2013). Ignoring less economically valuable, non-monetary benefits from ecosystem services might hide the negative wellbeing effects of environmental change. In contrast, exploring these less visible use and (particularly) experience mechanisms may identify alternative windows of opportunity for using less tangible ecosystem services for poverty alleviation and sustainable development (Masterson et al., In Press.).

The results clearly show that monetary and use mechanisms are more frequently associated with a wider range of wellbeing domains. This may be because the perceptions detected in our research may be subject to the anchoring effect mentioned above, leading to a higher weighting of monetary mechanisms. However, whilst the experience mechanism type may not be associated with all wellbeing domains (Table 3), our evidence does not necessarily imply it is less important for wellbeing, but rather that it contributes to more specific aspects of one's life (Fig. 6).

Nevertheless, of the three mechanism types, the intangible mechanisms based on experience, which emerged inductively from our analysis, is least explored in the literature, yet crucial for entitlement (Leach et al., 1999; Sen, 1981) to important ecosystem services. The experiences derived from people's interaction with their environment become endowments, in the form of social capital, which support access to further services and thus broaden people's capability sets. For example, the IPBES conceptual framework (Díaz et al., 2018) explicitly recognizes non-material contributions to wellbeing by means of social cohesion experiences. Therefore, our findings support emerging work that recognizes the necessity of moving away from measures of aggregate ecosystem service availability (Daw et al., 2011) and solely economic valuation approaches (e.g. Costanza et al., 2017; Kenter et al., 2011), to better integrate the intangible aspects that can provide novel insights into the complex mechanisms and multi-layered links between ecosystem services and wellbeing (Chan et al., 2012b; Small et al., 2017).

Some advances in this direction are already emerging, both in research and practice. For example, participatory and integrated valuation research approaches have made important theoretical and empirical advances towards recognizing multiple ecosystem services values that go beyond a solely economic or monetary focus (e.g. Jacobs et al., 2016). Meanwhile, examples where policy and decision-making take a more holistic approach towards ecosystem services that capture cultural and social values are emerging at a slow pace (Costanza et al., 2017). However, the debates around 'nature's contributions to people' in the context of IPBES further open the framing of human-environment links beyond the economic and ecological grounding of much ecosystem service policy and practice (Díaz et al., 2018).

#### 4.5. Exploring mechanisms and the implications for access

Recent research suggests that understanding differential access to ecosystem services can provide useful insights for poverty alleviation rather than simply assuming homogenous access to benefits (Berbés-Blázquez et al., 2017). Our findings support this and highlight how an appreciation of the three types of mechanisms can help to unpack some of the questions around access and power dynamics embedded within the social and political fabric of communities which are not captured adequately in the current policy mainstream of economic valuation and aggregate cost-benefit analyses (Costanza et al., 2017).

An appreciation of the different mechanisms at play is therefore an opportunity to identify more potential levers of intervention to alleviate poverty or to increase or protect the contribution of ecosystem services

to the wellbeing of poor people. It provides a framing, for example, to consider differing access to ecosystem goods or services. The ability of individuals to benefit from ecosystem services is determined by 'mechanisms of access' (Ribot and Peluso, 2003) and these will be different for the different types of benefit mechanisms identified in this study. For example, in terms of fish, being able to benefit through the monetary mechanism of selling requires access to a market. The use mechanism of food requires either fishing gears, opportunities and skills, money to buy fish, or social relations to receive gifts, as well as culinary knowledge and culture that supports its preparation and consumption. Meanwhile the experiential mechanism of independence and autonomy requires the skills, gears and opportunity to fish.

## 5. Conclusion

This study combined the "Theory of Human Need" and the "Capability Approach" into an analytic-interpretive framework, which enabled us to elucidate the perceived contribution of coastal ecosystem services to different wellbeing domains. In the process we identified three types of mechanism through which ecosystem services contribute to wellbeing: namely money, use and experience. This implies that improving the ability of individuals to gain wellbeing through ecosystem services does not only rely on monetary mechanisms, but also through use and experience mechanisms.

We argue that there are three reasons why all these three mechanisms should be considered across different contexts. Firstly, these mechanisms are associated with different sets of wellbeing domains. Solely focusing on monetary mechanisms would confine our focus only on certain aspects of wellbeing, despite the mounting evidence that different domains are important in ensuring poverty alleviation. Secondly, enhancing wellbeing from ecosystem services through specific mechanisms may have important implications for the long term sustainability of different social-ecological systems. A strong focus on experiential and use mechanisms may reduce the likelihood of overexploitation of natural resources, hence fostering the future availability of ecosystem services. Finally, our findings also suggest that these three mechanisms are interlinked and underpin each other. Benefitting through one mechanism can act as an outcome in itself, but can also serve as an enabler, i.e. by enhancing the capacities of individuals to convert ecosystem services for wellbeing through other mechanisms.

We argue that it is important to understand the importance of ecosystem services for multiple wellbeing domains, as well as the underlying mechanisms. This can facilitate wellbeing improvements through better ecosystem services management and the prevention of the unintended consequences of conservation and development interventions on the wellbeing of affected communities. A look at the processes through which ecosystem services are converted into wellbeing serves as a departure from descriptive approaches, and can help us to identify social feedbacks and provide a more dynamic view of the ecosystem services-wellbeing relationship.

Whilst the empirical data was collected in coastal Kenya and Mozambique, we propose that this approach can (and should) be applied to other contexts. However, it is likely that the mechanisms will manifest differently, due to differences in cultural and structural factors that shape wellbeing, as well as individual values and ecosystem services preferences. It is also possible that some mechanisms may be classified differently by other research teams due to their subjective nature. Nevertheless, we argue that it is both important and relevant to consider monetary, use and experiential mechanisms for wellbeing, environmental management and sustainability across different contexts.

## Acknowledgements

This paper results from the project Sustainable Poverty Alleviation

from Coastal Ecosystem Services (SPACES) project number NE/K010484/1, funded by the Ecosystem Services for Poverty Alleviation (ESPA) programme. The ESPA programme is funded by the Department for International Development (DFID), the Economic and Social Research Council (ESRC), and the Natural Environment Research Council (NERC). We are very grateful to the wider SPACES team members for their help in generating these ideas and in particular to Anchinha Abdul, Amisse Abel, Caroline Abunge, Ezidio Cuamba, Dominique Gonçalves, Jane Nyanapah, Siran Offman, Bernard Owuor and Amini Tengeza for being involved in data collection. We further thank Bjorn Schulte-Herbrüggen, Christina Hicks and Chris Sandbrook for their comments on earlier drafts. Finally, we thank Lucy Rose Kerr for her patience in creating illustrations for a variety of perceived ecosystem derived benefits.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ecoser.2019.100957>.

## References

- Abunge, C., Coulthard, S., Daw, T.M., 2013. Connecting marine ecosystem services to human well(-)being: insights from participatory well(-)being assessment in Kenya. *Ambio* 42, 1010–1021. [https://doi.org/10.1007/s13280-013-0456\(-\)9](https://doi.org/10.1007/s13280-013-0456(-)9).
- Adams, H., Adger, W.N., Huq, H., Rahman, R., Salehin, M., 2013. Wellbeing-Ecosystem Service Links: Mechanisms and Dynamics in the Southwest Coastal Zone of Bangladesh. ESPA Deltas Working Paper.
- Agarwala, M., Atkinson, G., Fry, B.P., Homewood, K., Mourato, S., Rowcliffe, J.M., Wallace, G., Milner-Gulland, E.J., 2014. Assessing the relationship between human well-being and ecosystem services: a review of frameworks. *Conserv. Soc.* 12, 437. <https://doi.org/10.4103/0972-4923.155592>.
- Bavinck, M., Pollnac, R., Monnereau, I., Failler, P., 2012. Introduction to the special issue on job satisfaction in fisheries in the global south. *Social Indic. Res.* 109, 1–10. <https://doi.org/10.1007/s11205-012-0051-7>.
- Berbés-Blázquez, M., Bunch, M.J., Mulvihill, P.R., Peterson, G.D., van Wendel de Joode, B., 2017. Understanding how access shapes the transformation of ecosystem services to human well-being with an example from Costa Rica. *Ecosyst. Serv.* 28, 320–327. <https://doi.org/10.1016/j.ecoser.2017.09.010>.
- Carpenter, S.R., Mooney, H.A., Agard, J., Capistrano, D., DeFries, R.S., Díaz, S., Dietz, T., Duraipappah, A.K., Oteng-Yeboah, A., Pereira, H.M., Perrings, C., Reid, W.V., Sarukhan, J., Scholes, R.J., Whyte, A., 2009. Science for managing ecosystem services: beyond the Millennium Ecosystem Assessment. *Proc. Natl. Acad. Sci. U.S.A.* 106, 1305. <https://doi.org/10.1073/pnas.0808772106>.
- Caveen, A., Polunin, N., Gray, T., Stead, S.M., 2014. *The Controversy Over Marine Protected Areas: Science Meets Policy*. Springer.
- Chaigneau, T., Coulthard, S., Brown, K., Daw, T., Schulte-Herbrüggen, B., 2018. Incorporating basic needs to reconcile poverty and ecosystem services. *Conserv. Biol.* <https://doi.org/10.1111/cobi.13209>.
- Chan, K., Guerry, A.D., Balvanera, P., Klain, S., Satterfield, T., Basurto, X., Bostrom, A., Chuenpagdee, R., Gould, R., Halpern, B.S., Hannahs, N., Levine, J., Norton, B., Ruckelshaus, M., Russell, R., Tam, J., Woodside, U., 2012a. Where are cultural and social in ecosystem services? A framework for constructive engagement. *Bioscience* 62, 744–756. <https://doi.org/10.1525/bio.2012.62.8.7>.
- Chan, K., Satterfield, T., Goldstein, J., 2012b. Rethinking ecosystem services to better address and navigate cultural values. *Ecol. Econ.* 74, 8–18. <https://doi.org/10.1016/j.ecolecon.2011.11.011>.
- Chan, K.M., Goldstein, J., Satterfield, T., Hannahs, N., Kikiloi, K., Naidoo, R., Vadeboncoeur, N., Woodside, U., 2011. Cultural services and non-use values. In: *Natural Capital: Theory & Practice of Mapping Ecosystem Services*. Oxford University Press, Oxford, UK, pp. 206–228.
- Cinner, J., 2014. Coral reef livelihoods. *Curr. Opin. Environ. Sustain.* 7, 65–71. <https://doi.org/10.1016/j.cosust.2013.11.025>.
- Cordier, M., Pérez Agúndez, J.A., Hecq, W., Hamaide, B., 2014. A guiding framework for ecosystem services monetization in ecological-economic modeling. *Ecosyst. Serv.* 8, 86–96. <https://doi.org/10.1016/j.ecoser.2014.03.003>.
- Costanza, R., de Groot, R., Braat, L., Kubiszewski, I., Fioramonti, L., Sutton, P., Farber, S., Grasso, M., 2017. Twenty years of ecosystem services: how far have we come and how far do we still need to go? *Ecosyst. Serv.* 28, 1–16. <https://doi.org/10.1016/j.ecoser.2017.09.008>.
- Cruz-García, G.S., Sachet, E., Blundo-Canto, G., Vanegas, M., Quintero, M., 2017. To what extent have the links between ecosystem services and human well-being been researched in Africa, Asia, and Latin America? *Ecosyst. Serv.* 25, 201–212. <https://doi.org/10.1016/j.ecoser.2017.04.005>.
- Daw, T., Brown, K., Rosendo, S., Pomeroy, R., 2011. Applying the ecosystem services concept to poverty alleviation: the need to disaggregate human well-being. *Environ. Conserv.* 38, 370–379. <https://doi.org/10.1017/S0376892911000506>.
- Daw, T., Hicks, C., Brown, K., Chaigneau, T., Januchowski-Hartley, F., Cheung, W., Rosendo, S., Crona, B., Coulthard, S., Sandbrook, C., 2016. Elasticity in ecosystem

- services: exploring the variable relationship between ecosystems and human well-being. *Ecol. Soc.* 21.
- Dawson, N., Martin, A., 2015. Assessing the contribution of ecosystem services to human wellbeing: a disaggregated study in western Rwanda. *Ecol. Econ.* 117, 62–72. <https://doi.org/10.1016/j.ecolecon.2015.06.018>.
- Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R.T., Molnár, Z., Hill, R., Chan, K.M.A., Baste, I.A., Brauman, K.A., Polasky, S., Church, A., Lonsdale, M., Larigauderie, A., Leadley, P.W., van Oudenhoven, A.P.E., van der Plaats, F., Schröter, M., Lavorel, S., Aumeeruddy-Thomas, Y., Bukvareva, E., Davies, K., Demissew, S., Erpul, G., Failler, P., Guerra, C.A., Hewitt, C.L., Keune, H., Lindley, S., Shirayama, Y., 2018. Assessing nature's contributions to people. *Science* 359, 270–272. <https://doi.org/10.1126/science.aap8826>.
- Diener, E., Seligman, M.E., 2004. Beyond money: toward an economy of well-being. *Psychol. Sci. Public Interest* 5, 1–31. <https://doi.org/10.1111/j.0963-7214.2004.00501001.x>.
- Doyal, L., Gough, I., 1991. *A Theory of Human Need*. Palgrave Macmillan.
- Farley, J., 2012. Ecosystem services: the economics debate. *Ecosyst. Serv.* 1, 40–49. <https://doi.org/10.1016/j.ecoser.2012.07.002>.
- Fedele, G., Locatelli, B., Djoudi, H., 2017. Mechanisms mediating the contribution of ecosystem services to human well-being and resilience. *Ecosyst. Serv.* 28, 43–54. <https://doi.org/10.1016/j.ecoser.2017.09.011>.
- Gough, I., 2014. Lists and thresholds: comparing the Doyal–Gough theory of human need with Nussbaum's capabilities approach. In: Comin, F., Nussbaum, M.C. (Eds.), *Capabilities, Gender, Equality. Towards Fundamental Entitlements*. Cambridge University Press, Cambridge.
- Gough, I., McGregor, J.A., Camfield, L., 2006. Wellbeing in developing countries: Conceptual foundations of the WeD programme. *Wellbeing in Developing Countries (WeD) Working Paper* 19.
- Hicks, C.C., Cinner, J.E., 2014. Social, institutional, and knowledge mechanisms mediate diverse ecosystem service benefits from coral reefs. *PNAS* 111, 17791–17796. <https://doi.org/10.1073/pnas.1413473111>.
- Jacobs, S., Dendoncker, N., Martín-López, B., Barton, D.N., Gomez-Baggethun, E., Boeraeve, F., McGrath, F.L., Vierikko, K., Geneletti, D., Sevecke, K.J., 2016. A new valuation school: Integrating diverse values of nature in resource and land use decisions. *Ecosyst. Serv.* 22, 213–220. <https://doi.org/10.1016/j.ecoser.2016.11.007>.
- Kenter, J.O., Hyde, T., Christie, M., Fazey, I., 2011. The importance of deliberation in valuing ecosystem services in developing countries—evidence from the Solomon Islands. *Global Environ. Change* 21, 505–521. <https://doi.org/10.1016/j.gloenvcha.2011.01.001>.
- Leach, M., Mearns, R., Scoones, I., 1999. Environmental entitlements: dynamics and institutions in community-based natural resource management. *World Dev.* 27, 225–247. [https://doi.org/10.1016/S0305-750X\(98\)00141-7](https://doi.org/10.1016/S0305-750X(98)00141-7).
- Liquete, C., Piroddi, C., Drakou, E.G., Gurney, L., Katsanevakis, S., Charef, A., Egoh, B., 2013. Current status and future prospects for the assessment of marine and coastal ecosystem services: a systematic review. *PLoS One* 8, e67737. <https://doi.org/10.1371/journal.pone.0067737>.
- Liu, J., Opdam, P., 2014. Valuing ecosystem services in community-based landscape planning: introducing a wellbeing-based approach. *Landscape Ecol.* 29, 1347–1360. <https://doi.org/10.1007/s10980-014-0045-8>.
- Maslow, A.H., 1948. “Higher” and “lower” needs. *J. Psychol.* 25, 433–436. <https://doi.org/10.1080/00223980.1948.9917386>.
- Masterson, V.A., Vetter, S., Chaigneau, T., Daw, T.M., Selomane, O., Hamann, M., Wong, G.Y., Melleghard, V., Cocks, M., Tengö, M., 2019. Revisiting human well-being and ecosystem services in dynamic social-ecological systems: implications for stewardship and development. *Global Sustainability* 2 (e8), 1–14. <https://doi.org/10.1017/S205947981900005X>.
- Millennium Ecosystem Assessment, 2005. *Ecosystems and Human Well-being*. Island Press, Washington, DC.
- Milner-Gulland, E.J., McGregor, J.A., Agarwala, M., Atkinson, G., Bevan, P., Clements, T., Daw, T., Homewood, K., Kumpel, N., Lewis, J., Mourato, S., Palmer Fry, B., Redshaw, M., Rowcliffe, J.M., Suon, S., Wallace, G., Washington, H., Wilkie, D., 2014. Accounting for the Impact of Conservation on Human Well-Being. *Conserv. Biol.* 28, 1160–1166. <https://doi.org/10.1111/cobi.12277>.
- Narayan, D., 2002. Bonds and bridges: social capital and poverty. In: Isham, J., Kelly, T., Ramaswamy, S. (Eds.), *Social Capital and Economic Development: Well-Being in Developing Countries*. Edward Elgar, Northampton, MA, pp. 58–81.
- Narayan-Parker, D., 1997. *Voices of the Poor: Poverty and Social Capital in Tanzania*. World Bank Publications.
- Polishchuk, Y., Rauschmayer, F., 2012. Beyond “benefits”? Looking at ecosystem services through the capability approach. *Ecol. Econ.* 81, 103–111. <https://doi.org/10.1016/j.ecolecon.2012.06.010>.
- Reed, M., Courtney, P., Urquhart, J., Ross, N., 2013. Beyond fish as commodities: understanding the socio-cultural role of inshore fisheries in England. *Mar. Policy* 37, 62–68. <https://doi.org/10.1016/j.marpol.2012.04.009>.
- Ribot, J.C., Peluso, N.L., 2003. A theory of access\*. *Rural Sociol.* 68, 153–181. <https://doi.org/10.1111/j.1549-0831.2003.tb00133.x>.
- Robeyns, I., 2005. The capability approach: a theoretical survey. *J. Hum. Dev.* 6, 93–117. <https://doi.org/10.1080/146498805200034266>.
- Rönnbäck, P., Crona, B., Ingwall, L., 2007. The return of ecosystem goods and services in replanted mangrove forests: perspectives from local communities in Kenya. *Environ. Conserv.* 34, 313–324. <https://doi.org/10.1017/S0376892907004225>.
- Russell, R., Guerry, A.D., Balvanera, P., Gould, R.K., Basurto, X., Chan, K.M.A., Klain, S., Levine, J., Tam, J., 2013. Humans and nature: how knowing and experiencing nature affect well-being. *Annu. Rev. Environ. Resour.* 38, 473–502. <https://doi.org/10.1146/annurev-environ-012312-110838>.
- Sanderson, S.E., Redford, K.H., 2003. Contested relationships between biodiversity conservation and poverty alleviation. *Oryx* 37, 389–390. <https://doi.org/10.1017/S003060530300070X>.
- Sangha, K.K., Preece, L., Villarreal-Rosas, J., Kegamba, J.J., Paudyal, K., Warmenhoven, T., RamaKrishnan, P.S., 2018. An ecosystem services framework to evaluate indigenous and local peoples' connections with nature. *Ecosyst. Serv.* 31, 111–125. <https://doi.org/10.1016/j.ecoser.2018.03.017>.
- Sen, A., 1999. *Commodities and Capabilities*. OUP Catalogue.
- Sen, A., 1981. Ingredients of famine analysis: availability and entitlements. *Q. J. Econ.* 96, 433–464. <https://doi.org/10.2307/1882681>.
- Sen, A., 1977. Starvation and exchange entitlements: a general approach and its application to the Great Bengal Famine. *Camb. J. Econ.* 1, 33–59. <https://doi.org/10.1093/oxfordjournals.cje.a035349>.
- Small, N., Munday, M., Durance, I., 2017. The challenge of valuing ecosystem services that have no material benefits. *Global Environ. Change* 44, 57–67. <https://doi.org/10.1016/j.gloenvcha.2017.03.005>.
- SPACES, 2016. Study sites [Online]. ESPA Sustainable Poverty Alleviation and Ecosystem Services project. <http://www.espa-spaces.org/study-sites/> [Accessed 31 October 2018].
- SPACES, 2017. Data Explorer [Online]. ESPA Sustainable Poverty Alleviation from Coastal Ecosystem Services project. <http://www.espa-spaces.org/resources/spaces-data-explorer/> [Accessed 31 October 2018].
- Spangenberg, J.H., Settele, J., 2016. Value pluralism and economic valuation – defensible if well done. *Ecosyst. Serv.* 18, 100–109. <https://doi.org/10.1016/j.ecoser.2016.02.008>.
- Suich, H., Howe, C., Mace, G., 2015. Ecosystem services and poverty alleviation: a review of the empirical links. *Ecosyst. Serv.* 12, 137–147. <https://doi.org/10.1016/j.ecoser.2015.02.005>.
- Tversky, A., Kahneman, D., 1974. Judgment under uncertainty: heuristics and biases. *Science* 185, 1124. <https://doi.org/10.1126/science.185.4157.1124>.
- Urquhart, J., Acott, T., 2014. A sense of place in cultural ecosystem services: the case of cornish fishing communities. *Soc. Nat. Resour.* 27, 3–19. <https://doi.org/10.1080/0894920.2013.820811>.
- Vihervaaara, P., Rönkä, M., Walls, M., 2010. Trends in ecosystem service research: early steps and current drivers. *AMBIO* 39, 314–324. <https://doi.org/10.1007/s13280-010-0048-x>.
- Woodhead, A.J., Abernethy, K.E., Szaboova, L., Turner, R.A., 2018. Health in fishing communities: a global perspective. *Fish Fish.* 19, 839–852. <https://doi.org/10.1111/faf.12295>.