

Can cultural ecosystem services contribute to satisfying basic human needs? A case study from the Lofoten archipelago, northern Norway

Bjørn P. Kaltenborn^{a,*}, John D.C. Linnell^b, Erik Gómez-Baggethun^{c,d}

^a Norwegian Institute for Nature Research, Fakkeltgården, Storhove, N-2624, Lillehammer, Norway

^b Norwegian Institute for Nature Research, PO Box 5685, Sluppen, 7485, Trondheim, Norway

^c Department of International Environment and Development Studies (Noragric), Norwegian University of Life Sciences (NMBU), P.O. Box 5003, Ås N-1432, Norway

^d Norwegian Institute for Nature Research (NINA), Gaustadalleen 21, Oslo 0349, Norway

ARTICLE INFO

Keywords:

Cultural ecosystem services

Satisfiers

Basic human needs

Lofoten

Well-being

Resource policy

ABSTRACT

There is gradual recognition that cultural ecosystem services are critical building blocks for human well-being. Cultural and provisioning services are often intertwined, difficult to separate, and play salient roles in maintaining local identities. However, multiple studies assume links between cultural ecosystem services and human well-being, without quantifying relationships. We surveyed a representative sample of the population in the Lofoten archipelago in northern Norway, a region faced with great policy challenges around resource harvesting options. Our objective was to examine how public interest in management issues and attachment to place influences the appreciation of cultural ecosystem services benefits and if these benefits can act as satisfiers of well-being. Findings suggest that cultural ecosystem services provide a salient contribution to quality of life in this region, and help satisfy the needs of affection, understanding, creation, subsistence, identity, freedom, participation, protection and leisure. Cultural ecosystem services also constitute salient environmental attributes which contribute to the basic needs of being, having, doing and interacting. The importance of ecosystem services benefits for well-being increases with increasing attachment to the Lofoten environment. We argue that not only the ecosystem services benefits, but the values that emanate from the relationship between people and land should be given greater attention in land use policy.

1. Introduction

The ecosystem services framework, originally an economic-ecological concept for comparing and valuing biophysical functions and processes, has gradually acknowledged and incorporated a more holistic socio-ecological understanding (Kenter et al., 2015). It has done so by finding ways to include cultural services alongside the more easily valued provisioning, regulating and supporting services (e.g. Chan et al., 2012 a, b, Daniel et al., 2012). One of the most important developments in recent research, especially in terms of cultural services, are the attempts to take a relational approach, i.e. focus on the values and benefits that emanate from people interacting with their surroundings (Chan et al., 2016; Kenter et al., 2015). The ecosystem services framework was originally an instrumental value type approach, but an increasing number of contributions show how cultural services can be better operationalised in socioecological models as services and benefits that are manifested and given meaning through human interactions with

specific environments. A stronger focus on relational values speaks to contextualised approaches and incorporating the importance of place, both in terms of the strength of attachment and in terms of the nature of attachment, i.e. what attributes of place play a role in people's attachment to the local environment (Chan et al., 2016; Gustafson, 2001; Hausmann, Slotow, Burns, & Minin, 2015; Lewicka, 2011).

Working towards sustainable livelihoods and improved well-being inevitably involves value choices and trade-offs (Ceausu, Graves, Killion, Svenning, & Carter, 2018; Martín-López, Gómez-Baggethun, García-Llorente, & Montes, 2014). Importantly, the literature on ecosystem services has noted that sociocultural and environmental values tend to be underweighted relative to material ones in economic decisions and these are often intangible, implicit, unstated, difficult to express, and poorly represented in public policy processes (Chan et al., 2012a,b). Furthermore, adequately expressing and debating the trade-offs between instrumental and intrinsic environmental values is complicated at best, and few public processes are designed to handle this in a systematic

* Corresponding author.

E-mail address: bjorn.kaltenborn@nina.no (B.P. Kaltenborn).

fashion.

Many northern regions face important and difficult choices in terms of future development paths due to a range of factors associated with global change. Increasing national and global demands for energy and food resources, rapid growth in nature-based tourism and increasing public demand for experiences resting on non-consumptive and non-market mediated environmental values, challenge any policy exercise in these regions (Grydehøj & Grydehøj, 2012; Kristoffersen & Young, 2010). In this paper, we take an exploratory approach and examine how ecosystem services can be a contributing factor in satisfying basic human needs among the population in the Lofoten region in northern Norway (Fig. 1). The objective of the paper is to examine how public interest in management issues and attachment to place influences the appreciation of cultural ecosystem services and if cultural ecosystem services act as satisfiers of well-being. We also discuss how this information can contribute to informing future policy and planning strategies for the region.

1.1. Ecosystem services as input for policy choices in Lofoten

The Lofoten archipelago (Fig. 1) is a classic example of a resource-rich rural region facing difficult choices about the best strategies to

adopt when moving towards a sustainable future. From a superficial view, the main decisions about the future of Lofoten concern the ongoing political debate about opening up for off-shore oil- and gas development, an issue subject to local as well as regional, national and international political decisions, or reserving the waters and islands for traditional fisheries and world class nature-based tourism (Høgi, 2010; Misund & Olsen, 2013). Research shows that the local population is very much divided in their views on petroleum exploration (Buck & Kristoffersen, 2011; Kristoffersen & Dale, 2014). Also embedded in this environmental and socio-political context are other complicated issues like climate change (Correll, 2006; Olsen et al., 2011), military tensions and securitisation of the Barents Sea region (Young, 2009; Arbo, Iversen, Knol, Ringholm, Sander, 2013; MacDonald, 2015; Haftendorn, 2011), circumpolar arctic policies, battles over transportation priorities and policies, and regionalisation, localisation and restructuring of public services. (Dodds, 2010; Kristoffersen & Young, 2010; Noble, Ketilson, Aitken, & Poelzer, 2013).

In the recent scientific debate over Lofoten's future, much of the attention has been structured through an ecosystem services framework, with focus on potentials, benefits and trade-offs (Magnussen, 2012). Considering that well-being and quality of life are a composite of both material and non-material needs, it is crucial to recognise the

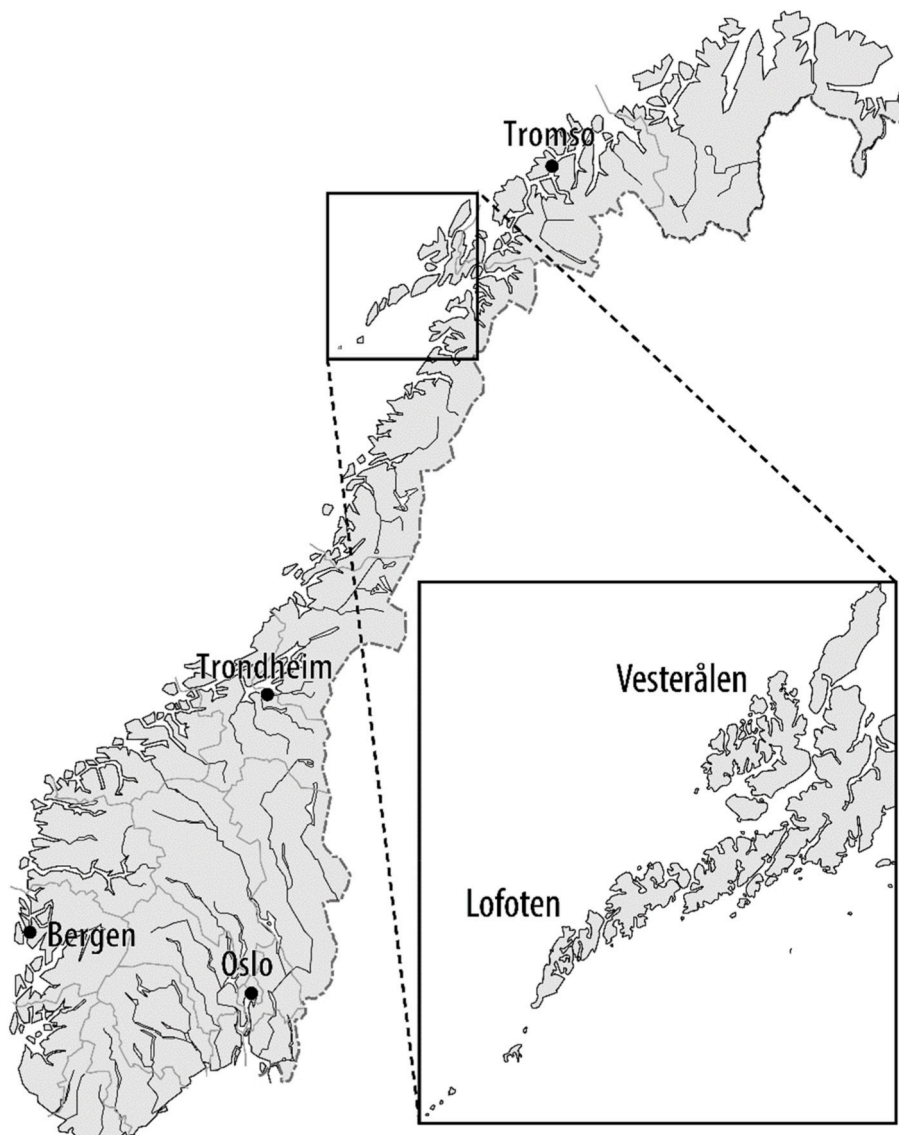


Fig. 1. The study area.

complexity of ecosystem services when evaluating the role of the environment for future livelihoods. Life in Lofoten has always revolved around the rich marine resources. It is virtually impossible to separate the culture and history from the natural environment, which in ecosystem services terms often translates to a strong interconnectedness between provisioning and cultural services (Reyes-García et al., 2015). This concerns both the cultural services that are meaningful to the local residents and those that form the basis of the tourism economy.

Opting for the traditional industrial type resource exploitation rather than developing and expanding new economies that rely on non-consumptive and non-material benefits, can lead to widely different consequences for future livelihoods. From a natural resource perspective, this can be framed as a question of concerning which types of ecosystem services should be the pillars of future economic and social development. However, in practice most northern regions currently manage economies that build on a mixture of locally generated revenues, often from (1) primary resources like fish, livestock, minerals or forest products, (2) service industries like tourism, and (3) state funded public services. Future economic options rarely, if ever, present themselves as exclusively flowing from one or the other avenue, but rather as a patchwork of activities that vary greatly in their mutual compatibility. What is common to many of these scenarios is the fact that most options involve trade-offs between different ecosystem services. (Rodríguez et al., 2006; Nelson et al., 2009; Gómez-Baggethun, Martín-López, Lomas, Zorrilla, & Montes, 2011). For example, a key message of the Millennium Ecosystem Assessment is that global development over the past decades has resulted in increased exploitation of provisioning services at the expense of supporting, regulating and cultural ecosystem services (Millennium Ecosystem Assessment, 2005). As a consequence, there is a need for policy makers to make clear choices between development paths that explicitly recognise these trade-offs. Ecosystem services are increasingly recognised as building blocks in well-being and are therefore fundamental for human development (e.g. Gould et al., 2014; Diaz, Demissew, Joly, Lonsdale, Larigauderie, 2015; Chan et al., 2016).

There are multiple pathways to local versions of the good life in rural regions undergoing environmental, social and economic change. Moreover, communities and the public may have great difficulties agreeing on what constitutes the best path towards well-being, and how this can be expressed through policy (Zorondo-Rodríguez et al., 2014). A prerequisite to more informed decision making is to better understand and articulate the way that different ecosystem services are valued as components of the good life, or as satisfiers of local needs.

1.2. Concepts and study aims

Recent ecosystem services literature is increasingly emphasising the links between well-being and nature, biodiversity and ecosystem services (e.g. Carrus et al., 2015; Diaz et al., 2018; Guo, Zhang, & Li, 2010; Sandifer, Sutton-Grier, & Ward, 2015; Sarkki, 2017; TEEB, 2013; Wang, Tang, & Xu, 2017). However, as Cruz-Garcia et al. (2017) point out, while a range of studies assume multiple relationships between ecosystem services and well-being, few studies actually try to quantify these relationships. The main contribution of our present study is that we attempt to qualify in a robust way how cultural ecosystem services are linked to basic human needs, which in various combinations comprise the foundations of well-being.

Our analytical approach rests on four assumptions. (1) The environment plays a vital role in shaping a good quality of life (Millennium Ecosystem Assessment, 2003; Constanza et al., 2006; Harrison et al., 2014; Zorondo-Rodríguez et al., 2016; Diaz et al., 2015, 2018). (2) Environmental policies are expressions of preferred or prioritized value sets by actors with conflicting interests and uneven power relations (e.g. Mace, 2014). (3) The ecosystem services framework provides a useful, albeit in some ways imperfect and incomplete, framework for assessing and comparing the social values attached to nature and human

interactions with nature (Chan, Satterfield, & Goldstein, 2012b; Martín-López et al., 2014; Satterfield, Gregory, Klain, Roberts, & Chan, 2013). (4) Perceptions and valuations of ecosystem services are influenced by how interested people are in the management of local resources, and how attached they are to their local environment (e.g. Gaitán-Cremaschi, Baraibar, Palomo, de Groot, & Gómez-Baggethun, 2017). It is now widely accepted that well-being is intricately linked to a healthy environment, in the sense of ecological functioning (Constanza et al., 2006; Duraiappah, 2011; Millennium Ecosystem Assessment, 2005; Marans, 2003; Sandifer et al., 2015). Furthermore, there is increasing agreement that there are a range of positive relationships between biodiversity attributes and ecosystem services of social and cultural importance (Cebrián-Piqueras, Karrasch, & Kleyer, 2017; Clark et al., 2014; Harrison et al., 2014).

We outline the conceptual framework in Fig. 2. We suggest that cultural ecosystem service benefits can be manifested both as (contextualised, subjective) good experiences as well as contributions to well-being. Both categories of benefits are influenced by how interested people are in the management of the environment and how attached they are to the place(s) comprising the cultural ecosystem services. Place attachment then, is also a cultural ecosystem service. In turn, the subjective experiences of cultural ecosystem services and perceived contributions to quality of life and well-being both act as building blocks or satisfiers of more fundamental needs since they enable complex forms of interacting with the environment, and ultimately a sense of well-being.

We use the term ‘good quality of life’ and ‘well-being’ to broadly express a perception of how local people experience their life situation, encompassing both subjective and objective factors (e.g. Kahnemann, Diener, & Schwartz, 1999). Subjective experiences can be idiosyncratic such as individually experienced satisfaction linked to particular contexts and situations, while objective factors can be defined without reference to individuals, e.g. environmental elements like forests, sea, mountainscapes etc. In most cases, the sense of a good life is shaped both by subjective perceptions of happiness, pleasure fulfilment and so forth, as well as more quantifiable basic needs. We see these domains as more or less inseparable, much in line with how Diener, Lucas, Schimmack, and Helliwell (2008) argue that objective conditions affect subjective perceptions indirectly through comparisons with other possible alternatives. However, in our analysis we focus on how cultural ecosystem services can contribute to a sense of fundamental needs being met. This is somewhat different from a subjective well-being approach focusing more on preferences and satisfaction (e.g. Angner, 2010; Stone & Mackie 2013) or the role of human capabilities in contributing to well-being and a sense of a “good life” (Sen, 1993; Alkire, 2002, 2005).

In terms of human-environment interactions, we contend that ecosystem services benefits can function as satisfiers of human needs using the concepts of the needs and satisfiers framework of Max-Neef (1992). In this theory of human needs for development, needs are understood as interrelated and interactive, where human needs are related in complex ways and often involve trade-offs in the process of needs satisfaction. This framework has become prominent in recent research on energy provision and sustainability, showing that communities perceive energy services (i.e. material and consumptive resources) as satisfiers of basic human needs (Brand-Correa, Martín-Ortega, & Steinberger, 2018, Centgraf, 2018). We expand this line of thinking by applying the framework to cultural ecosystem services, i.e. non-consumptive resources, however, with the qualification that cultural services often rest on and are intertwined with provisioning services. Max-Neef (1992) organised basic needs into existential and axiological categories, as a way of showing how the needs of *being*, *having*, *doing* and *interacting* on the one hand can interact with the fundamental needs of *subsistence*, *protection*, *affection*, *understanding*, *participation*, *creation*, *leisure*, *identity* and *freedom*. Reflecting central tenets of value theory (e.g. Schwartz et al., 2001) and psychological approaches to human values and well-being theorems (e.g. Brown & Kasser, 2005; Kahneman & Kruger 2006), this particular concept argues

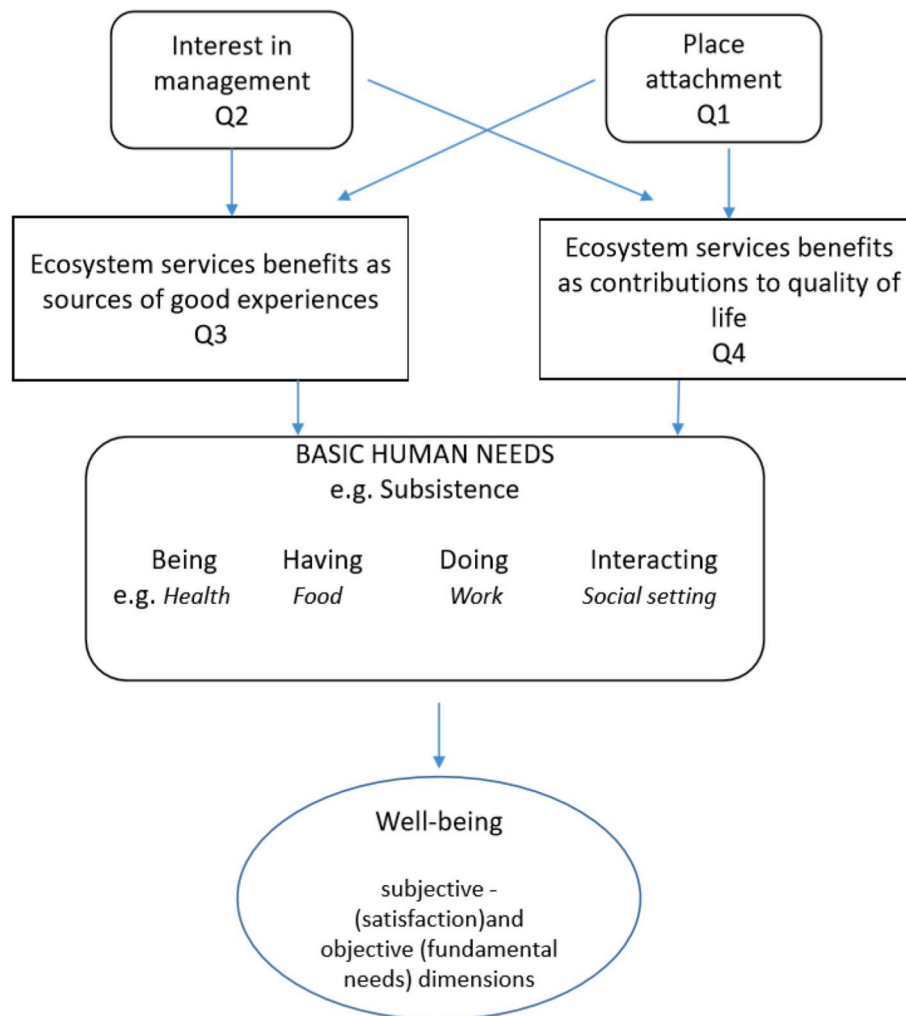


Fig. 2. Conceptual framework linking ES to basic needs and well-being. The letter Q refers to question numbers in the survey and methods section.

that there is a clear distinction between needs and satisfiers, and that one fundamental need can be linked to multiple satisfiers. A 'satisfier', the way it is used here, is not the direct benefit or goods associated with a resource of ecosystem service, but rather the way a culture, community or society may describe or operationalise a need.

A relational understanding of the role and purpose of the ecosystem services framework also permeates institutional perspectives. The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) now explicitly states that a 'good quality of life' is the core of its conceptual framework (Diaz et al., 2015) and underlines the critical importance of cultural, ecological and other non-economic values for human well-being (Gómez-Baggethun, Barton, Berry, Dunford, & Harrison, 2016; Pascual et al., 2017). In this perspective, cultural ecosystem services can perhaps be best understood as filters through which other ecosystem services and nature (natural capital) derive importance (Chan et al., 2016).

For instance, the local need for subsistence can be satisfied in a number of ways from buying a fish in the local store, fishing it yourself, being supported by friends or family, or relying on a range of other food sources. One type of satisfier can also address several types of needs. Furthermore, the framework postulates that fundamental human needs are few, finite and possible to classify. Secondly, basic needs are viewed as being the same across cultures and human history. However, the way these needs are satisfied over time and space can change. In other words, the fundamental human needs remain stable, but culture and time determine the type and shape of the satisfiers of those needs (Max-Neef,

1992).

Building on this need – satisfier framework in combination with a relational values approach to human-environment interactions, we assume that ecosystem services benefits can act as important satisfiers of fundamental human needs and hence as critical building blocks of well-being. Cultural ecosystem services reflect context as well as current expressions of benefits of nature that are valid within certain time-space frames. In this study we focus predominantly on benefits provided by cultural ecosystem services, but we have also included a few provisioning services. In much of the ecosystem services literature, provisioning and cultural services are treated as distinct, and by implication, independent categories. One could argue that provisioning services have no logical place in the conceptual framework we use here since we are dealing with benefits in the non-consumptive domain. However, there is often an important interconnectedness between cultural and provisioning services (e.g. Kaltenborn, Linnell, Gómez-Baggethun, et al., 2017; Reyes-García et al., 2015). In fact, the cultural services and benefits are often contingent upon the provisioning services, and both types of services and benefits can be satisfiers of both physical and emotional human needs. Hence, for the purposes of this study, we do not assume that there is necessarily a trade-off between cultural and provisioning services, but rather that one and the same environmental attribute can provide alternative services (e.g. Auer, Maceira, & Nahuelhual, 2017; Martín-López et al., 2013).

2. Methods and data collection

2.1. Study area

The Lofoten archipelago in Northern Norway lies between latitudes 67° and 68° N, including seven major islands and a large number of smaller ones (Fig. 1). The group of islands has a land area of 1.300 km² spread across six municipalities with a total population of approximately 25.000 residents, which does not include large numbers of seasonal workers in the tourist and fish processing industries. The landscape is characterised by rugged mountains (rising to 1000 masl), fjords and inlets, small and medium sized towns, and smaller areas suitable for agriculture and livestock. Fisheries, other marine industries, and tourism are the key economic sectors. Lofoten is the key base for cod fishing in the North Atlantic, and has shaped the livelihoods, the commercial sector, cultural heritage, local identity, settlements, harbour facilities and other infrastructure for centuries. In 2014 the direct income from marine fisheries and aquaculture in the three northernmost Norwegian counties, Nordland (where Lofoten is located), Troms, and Finnmark, was estimated to be around 2 billion euros annually (Directorate of Fisheries 2014). The tourism industry is also important for the local economy. The Lofoten-Vesterålen region (a geographically distinct region, where the Vesterålen islands connect Lofoten with the mainland), house around 180 tourism companies employing approximately 800 persons, and generate around 40 million euros annually (Enger et al., 2013, p. 159).

2.2. Data collection and analysis

To obtain a representative sample of adult residents (above age 18) we interviewed people in five of the six municipalities in Lofoten. We refrained from including respondents from the small, westernmost municipality of Røst (population ca. 540 persons) to avoid interfering with another study being conducted there at the time. Data was collected by a polling agency using telephone interviews. Each interview lasted approximately 20 min. The sample of 403 persons was stratified and weighted to be representative of the population in the region and consisted of 53.1% men and 46.9% women. If a respondent declined to participate in the survey when contacted by the interviewer, the latter would then contact new respondents with the same socio-demographic characteristics until reaching compliance to fulfil the stratification scheme. The average age of respondents was 51 years, and 41.5% had completed at least one year of higher education, 18.4% had completed four or more years of higher education.

The survey contained four sets of questions, a) place attachment to the Lofoten islands (Table 1), b) interest in management issues, c) the role of ecosystem services benefits as a source of good experiences

Table 1
Key dimensions of place attachment (Mean scores, N = 391).

NATURAL DIMENSIONS	Mean scores	Std. dev.
The sea	4.58	0.793
The recreational opportunities*	4.56	0.795
The natural light	4.40	0.928
The mountains	4.34	0.992
Wind and weather	3.64	1.232
SOCIAL DIMENSIONS		
Family and relatives	4.19	1.105
Friends and acquaintances	4.16	1.105
The local community where I live	4.06	1.1030
The employment opportunities	4.05	1.090
Cultural relicts/prehistoric sites	3.26	1.286

We consider recreational opportunities to be co-produced by natural elements, built infrastructure and social practice.

Response format: 1: Absolutely no importance, 2: Unimportant, 3: Some importance, 4: Fairly large importance, 5: Very large importance.

(Table 2), and d) the contribution of various explicitly named environmental attributes to quality of life (Table 3).

We measured place attachment by focusing on the key dimensions of attachment as well as the strength of attachment (Q1 in Fig. 2). In selecting items exploring the key dimensions, we followed the tradition of place-oriented research emphasising that people tend to be attached to social, as well as physical and cultural/historical attributes of places (Williams, Patterson, Roggenbuck, & Watson, 1992; Norton & Hannon, 1997; Kyle, Mowen, & Tarrant, 2004; Raymond, Brown, & Weber, 2010, Lewicka, 2011). This was measured asking the question: “The experience of belonging can be influenced by many factors: How important are the different aspects of nature and society for the attachment you feel to Lofoten as a home?” on a five-point scale ranging from ‘Absolutely no importance’ to ‘Of great importance’ (Table 1).

Interest in environmental management issues (Q2 in Fig. 2) was measured by asking; “How interested would you say you are in questions about the use and management of natural resources in Lofoten?” on a three-point scale; ‘Not at all interested’, ‘A little interested’, ‘Very interested’. We also recorded the background of the respondents (age, gender, education, profession, and location of residence).

To analyse how ecosystem services can act as satisfiers of basic human needs, we first asked about the importance of a selection of contextualised ecosystem service benefits for environmental experiences (Q3 in Fig. 2). We posed the question: “The natural and cultural environment in Lofoten can be a source of different types of experiences. To what extent do you agree with the following (18) statements”, on a five-point scale from 1: “Completely disagree” to 5: “Absolutely agree” (Table 2). The statements were articulated by the research team based on our own experience with the Lofoten area.

This was followed by a question (Q4 in Fig. 2) about how quality of life related to aspects of the environment through the following question: “Quality of life depends on many aspects of your surroundings. Here we are interested in your opinions about how different aspects of Lofoten contribute to quality of life”. This was rated for another 10 items along the same response format as the previous question (Table 3). Here, we formed the set of statements by drawing on the quality-of-life literature (Angner, 2010; Kahneman & Krueger, 2006; Marans, 2003; Stone and Mackie 2013) to cover key factors like feelings of safety and freedom, pleasure, happiness, creativity, reflexivity and contrast, and putting them into a local context.

We then classified each of the 18 statements about ecosystem services benefits and the 10 quality of life elements according to some of the most common/standardised cultural ecosystem services benefits typologies in addition to the generic category of ‘provisioning’ services (e.g. Millennium Ecosystem Assessment, 2003, 2005; TEEB, 2013), and descriptively compared these to Max-Neef’s (1992) typology of fundamental or generic human needs (Tables 2 and 3). As mentioned above, we included a series of provisioning services since they form the material foundation of the cultural services (e.g. fish, other natural resources). They also correspond with fundamental human needs (e.g. protection, subsistence, Table 2). We emphasize that the link between ecosystem services and basic needs is our own interpretation. Insofar as it reflects the theory that ecosystem services satisfiers can be assessed in different ways, and also that multiple satisfiers can be linked to the same need. We also acknowledge that some of the above mentioned statements reflect personal valuation, while other statements tap into generic opinions. The lack of a clear distinction between individual and community rationalities is potentially a confounding aspect of this research.

We used analysis of variance (SPSS Oneway) to test for the effects of interest in environmental management issues, and level of place attachment on the rating of importance of ecosystem services for environmental experiences and quality of life factors (Tables 4 and 5). When testing for the effects of interest, we used this as a dichotomous variable, and excluded the small segment (N = 12,3%) who were ‘Not at all interested’. We also constructed the level of place attachment as a dichotomous predictor with two groups; low (N = 203) and high (N =

Table 2

The links between ecosystem services as a source of good experiences and basic human needs and effects of levels of place attachment (mean scores, N = 391).

Q3. The natural and cultural environment as a source of experiences	Basic human needs	Ecosystem service category	Mean scores	Effects of place attachment		
				F. value	Sign.	
The Lofoten environment gives me many beautiful experiences of nature	Affection	Aesthetics	4.87	0.526	4.373	0.037
Cultural heritage artifacts are an important part of the environmental experience in Lofoten	Understanding	Heritage	4.20	1.038	16.179	0.000
The natural- and cultural landscape in Lofoten is an inspiration for my work	Creation	Inspiration	3.81	1.280	18.884	0.000
The importance of the Lofoten environment as inspiration for art and other activities is exaggerated	Creation	Inspiration	2.34	1.354	11.116	0.001
My identity is strongly linked to the Lofoten environment	Identity	Identity	4.27	1.159	71.310	0.000
I could just as well live in other places rather than Lofoten	Identity	Identity	2.07	1.421	26.939	0.000
Cultural heritage has little importance in terms of how we should manage today's natural environment.	Understanding	Education/knowledge systems	2.57	1.370	0.077	0.781
Nature has little to tell us about how to meet the future in order to secure good livelihoods in Lofoten	Understanding	Education/knowledge systems	2.61	1.545	2.065	0.152
My interest in nature and the environment means I have a lot of contact with people who share my interests	Identity, participation	Social relations	3.78	1.297	32.438	0.000
Those who live in Lofoten today should decide how the resources in Lofoten can best be utilised	Participation	Social relations	4.19	1.057	25.681	0.000
Lofoten's nature has little importance for my social life	Identity	Social relations	2.25	1.453	0.640	0.424
Those of us who live here enjoy material benefits like fish and other natural resources	Subsistence	Provisioning	4.66	0.750	5.882	0.016
We exploit Lofoten's natural resources at a far too slow a pace	Protection	Provisioning	2.85	1.289	0.432	0.512
We have little direct use for the natural resources that exist here	Subsistence	Provisioning	2.31	1.445	0.432	0.512
Future generations should decide if oil- and gas resources should be utilised or not.	Protection	Provisioning	3.53	1.485	7.649	0.006
The natural environment and natural resources are vital for future employment opportunities in Lofoten	Subsistence	Provisioning	4.03	1.160	3.402	0.066
New types of employment must be based on other things than fishing and tourism.	Protection	Provisioning	3.41	1.325	2.616	0.107
It is good to know that Lofoten has rich natural resources, even if they are not exploited yet.	Subsistence	Provisioning	4.20	1.085	7.811	0.005

Response format: 1: Completely disagree – 5: Completely agree.

Table 3

The links between ecosystem services as contributors to aspects of quality of life and basic human needs (Mean scores, N = 391).

Q. The importance of different aspects of the Lofoten environment for quality of life	Basic human needs	Cultural ecosystem category	Mean scores	St. dev.	Effects of place attachment	
					F. value	Sign.
Lofoten is a good place for children to grow up.	Participation	Sense of place	4.86	0.487	6.589	0.011
The landscape and the surroundings in Lofoten give me a feeling of freedom.	Freedom	Sense of place	4.78	0.579	23.369	0.000
It is nice and peaceful here compared with the conditions in large cities	Freedom	Sense of place	4.78	0.636	7.506	0.006
I have good social connections with other people around here.	Participation	Social relations	4.67	0.685	22.212	0.000
For me, nature is an arena for awe and creativity	Creation	Spiritual	4.43	0.907	33.939	0.000
I often feel joy with respect to the nature in Lofoten.	Affection	Inspiration	4.84	0.580	10.648	0.001
For me, nature and outdoor recreation are an important counterweight to hectic days	Leisure	Recreation	4.53	0.901	31.418	0.000
The nature and culture in Lofoten suits my personality	Identity	Identity	4.52	0.835	33.955	0.000
The nature in Lofoten is a good basis for a good life because it offers a clean environment and rich natural resources.	Subsistence	Provisioning	4.82	0.488	5.013	0.0026
The natural environment is managed in a way, which will provide good living conditions in the future.	Protection	Provisioning	4.09	0.988	19.275	0.000

Response format: 1: Completely disagree – 5: Completely agree.

188) levels of attachment using an NTILES procedure in SPSS, which sorts the responses into two roughly equal size groups (Tables 2 and 3). Strength of attachment was computed as an index based on the sum of scores on each of the ten items, divided by the number of items.

3. Results

3.1. Interest in management and attachment to place

The majority of the Lofoten residents (60.3%) stated that they are very interested in questions dealing with the use and management of the archipelago's natural resources. 36.5 percent are a little concerned about these topics, whereas a mere 3 percent show no concern at all. There was no significant difference between men and women in levels of concern ($F = 0.617, p = 0.433$). Age however, had an effect on level of interest ($F = 2.299, p = 0.026$). Increasing age was positively correlated with a greater interest in management issues up to the age of 70. Those

older reported a slightly lower interest than the 50–70 years of age group, but still higher than those younger than 50 years of age.

The respondents reported that all the attributes/dimensions of place included in the survey play a positive role in terms of the attachment they feel to the Lofoten environment and their residence. High mean scores (Table 1) indicate that for each dimension of place, there was only a small percentage of respondents who judged this as being unimportant; generally, in the order of 20–30 percent. Conversely, two-thirds to three-quarters of the population stated that these attributes of the environment and society play a fairly large, or very large, positive role in their attachment to Lofoten as a place.

Dimensions of nature and the associated recreational opportunities received slightly higher scores in terms of importance for attachment than social dimensions. The traditional hallmarks of the Lofoten islands such as the mountains and the seascape, as well as weather and light conditions, were deemed as quite significant in the local sense of place. However, as numerous other studies of place attachment have shown (e.

Table 4
Effects of level of place attachment on ecosystem services benefits as satisfiers (Oneway analyses of variance).

The natural and cultural environment as a source of experiences	Ecosystem services category	Mean scores	F.	Sign.
The Lofoten environment gives me many beautiful experiences of nature	Aesthetics	4.87	4.373	0.037
Cultural remains is an important part of the environmental experience in Lofoten	Heritage	4.20	16.179	0.000
The natural- and cultural landscape in Lofoten is an inspiration for my work	Inspiration	3.81	18.884	0.000
The importance of the Lofoten environment as inspiration for art and other activities is exaggerated	Inspiration	2.34	11.116	0.001
My identity is strongly linked to the Lofoten environment	Identity	4.27	71.310	0.000
I might as well live other places than Lofoten	Identity	2.07	26.939	0.000
The cultural history has little importance in terms of how we should manage today's natural environment.	Education/ knowledge systems	2.57	0.077	0.781
Nature has little to tell us about how we should meet the future in order to secure good livelihoods in Lofoten	Education/ knowledge systems	2.61	2.065	0.152
My interest in nature and the environment means I have a lot of contact with people who share my interests	Social relations	3.78	32.438	0.000
Those who live in Lofoten now should decide how the resources in Lofoten can best be utilised	Social relations	4.19	25.681	0.000
Lofoten's nature has little importance for my social life	Social relations	2.25	0.640	0.424
We who live here enjoy material benefits like fish and other natural resources	Provisioning	4.66	5.882	0.016
We exploit Lofoten's natural resources at a much too slow a pace	Provisioning	2.85	0.432	0.512
We have little direct use of the natural resources that exist here	Provisioning	2.31	0.432	0.512
Future generations should decide if oil- and gas resources shall be exploited or not.	Provisioning	3.53	7.649	0.006
The natural environment and natural resources are vital for future employment opportunities in Lofoten	Provisioning	4.03	3.402	0.066
New types of employment must be based on other things than fishing and tourism.	Provisioning	3.41	2.616	0.107
It is good to know that Lofoten has rich natural resources, even if they are not exploited yet.	Provisioning	4.20	7.811	0.005

g. Hidalgo & Hernández, 2008; Lewicka, 2011; Madgin, Bradley, & Hastings, 2016), social dimensions such as family, friends, community, neighbourhood, are also important elements in the construction of place attachment. Family and other social networks, the community and the employment opportunities that are available locally were also ranked as quite salient. The cultural heritage realm received the lowest ranking of all the attributes included here (Table 1).

Table 5
Effects of level of place attachment on ecosystem services experiences as satisfiers (Oneway analysis of variance).

Q. The importance of different aspects of the Lofoten environment for quality of life	Ecosystem services category	Mean scores	F value	Sign.
Lofoten is a good place for children to grow up.	Sense of place	4.86	6.589	0.011
The landscape and the surroundings in Lofoten give me a feeling of freedom.	Sense of place	4.78	23.369	0.000
It is nice and peaceful here compared the conditions in large cities	Sense of place	4.78	7.506	0.006
I have good connections with other people around here.	Social relations	4.67	22.212	0.000
For me, nature is and arena for awe and creativity	Spiritual	4.43	33.939	0.000
I often feel joy with respect to the nature in Lofoten.	Inspiration	4.84	10.648	0.001
For me, nature and outdoor recreation is an important counterweight to hectic days	Recreation	4.53	31.418	0.000
The nature and culture in Lofoten suits my personality	Identity	4.52	33.955	0.000
The nature in Lofoten is a good base for a good life through a clean environment and rich natural resources.	Provisioning	4.82	5.013	0.0026
The natural environment is managed in a way, which will provide good living conditions in the future.	Provisioning	4.09	19.275	0.000

3.2. Ecosystem services as satisfiers of human needs

Tables 2 and 3 show how respondents perceived and ranked the 28 items measuring benefits deriving from different aspects of cultural and provisioning ecosystem services. The cultural ecosystem services included here cover the range of services included in the established ecosystem services typologies such as, aesthetics, cultural heritage, spirituality, social relations, sense of place, identity, inspiration and education/knowledge (e.g. Millennium Ecosystem Assessment, 2003; TEEB, 2010; Haines-Young & Potschin, 2013; Satterfield et al., 2013). The general picture is that all of these services provide benefits as sources of good experiences, and/or contribute to quality of life. A high value placed on the role of ecosystem services in terms of quality of life is not surprising since this is largely the foundation for the ES framework. A majority of the residents showed a particularly high level of agreement that aesthetics, inspiration, sense of place, and social relations are positive contributions to good experiences and quality of life, but benefits from all of the cultural services are rated in the somewhat to completely agree range (Table 2).

The provisioning services receive similar scores in terms of contributing to good experiences and quality of life. As mentioned above, provisioning services often forms the basis of cultural services and benefits (Reyes-García et al., 2015; Kaltenborn, Linnell, Gómez-Baggethun, et al., 2017). Here, it is evident that the material benefits like fish and other natural resources are perceived as quite important for life in Lofoten. Furthermore, statements that negate the value of provisioning services like 'We have little direct use for the natural resources that exist here' and 'We exploit Lofoten's natural resources at a far too slow a pace' receives little agreement. We take this to support the notion that in the case of Lofoten, there is a certain interdependency between cultural and provisioning services and benefits.

Tables 2 and 3 also show the correspondence between ecosystem services as satisfiers and suppliers of basic human needs. Here all the basic human needs according to Max-Neef's framework (1992), i.e. affection, understanding, subsistence, creation, identity, participation, protection, leisure and freedom can be linked to ecosystem services as

satisfiers. We did not obtain direct measures of the respondents' perceptions of the importance of basic human needs, but the scores on ecosystem services as satisfiers of fundamental needs indicate that the traditional categories of ecosystem services correlate with several of the basic human needs and likely play a role in satisfying these. Satisfiers such as sense of place, social relations, aesthetics and inspiration are particularly important and point towards the fundamental needs of *participation*, *freedom* and *affection*. We have used provisioning services as a collective category here, and obviously, this term can include a diversity of services. However, in the simplistic form applied here, it shows how some of the provisioning services in Lofoten address fundamental aspects of life such as the needs for subsistence and protection. The results also show that some cultural ecosystem services, such as social relations and sense of place, and some provisioning services can act as satisfiers for more than one basic human need. For instance, social relations link to identity and participation, and sense of place to freedom and participation.

3.3. Relationships between ecosystem services, interest in management and attachment to place

Although the majority of the respondents reported a high level of interest in questions regarding the use and management of natural resources in Lofoten, level of interest had limited effect on the sociocultural assessment of ecosystem services benefits in the sense how people attribute meaning and importance to nature and its benefits. Interest level had a statistically significant effect on the ratings of seven out of twenty-four ecosystem services. The statements include; 'Cultural heritage is an important part of the environmental experience in Lofoten ($F = 6.155$, $p = 0.002$)', 'We exploit Lofoten's natural resources at much too slow a pace' ($F = 3.024$, $p = 0.050$), 'The natural and cultural landscape in Lofoten is an inspiration for my work ($F = 8.173$, $p = 0.000$)', 'My interest in nature and the environment means I have a lot of contact with people who share my interests ($F = 10.658$, $p = 0.000$)', 'Nature has little to tell us about how we should meet the future in order to secure good livelihoods in Lofoten ($F = 10.872$, $p = 0.000$)', 'Lofoten's nature has little importance for my social life ($F = 6.684$, $p = 0.001$)', 'My identity is strongly linked to the Lofoten environment ($F = 6.100$, $p = 0.002$)'. For these items, a higher level of interest in management issues was associated with increasing positive assessment of the importance of the ecosystem services for good environmental experiences and quality of life. Likewise, the negatively worded statements, received less support from those reporting a higher level of interest in management issues.

The degree to which people feel attached to the Lofoten environment is a far better indicator for the assessment of ecosystem services than interest in management issues in the sense that level of place attachment has more effect on how people consider the importance of ecosystem services. Although we grouped levels of place attachment only into two groups, low- and high attachment, this variable discriminates significantly for twenty-two out of the twenty-nine items.' (Tables 4 and 5). Consistently, there is a positive correlation between increasing attachment to Lofoten as a place and positive valuation of the importance of the selected ecosystem services' contributions to good experiences and quality of life.

4. Discussion

4.1. Cultural ecosystem services as a relational concept

The majority of Lofoten residents expressed a strong interest in how the natural resources of the area are managed. This is not surprising, considering the extent of political, media, and public focus on some of the choices and dilemmas facing the region. To some degree, these questions imply choosing between long-term, and highly different, development paths. From a local stakeholder perspective this is a

positive sign. It indicates motivation for participating in exchanges about the future of the area, as opposed to expressing apathy or disinterest and feeling disempowered. However, we posed this as a broad question without any kinds of qualifiers or associated commitments, so we cannot compare the general interest in this sector with other political or public service sectors such as for instance education, health and welfare, transportation or commerce. Other recent research has done this and documented a relatively low level of concern among Lofoten residents for environmental issues as compared to more immediate issues like public services and infrastructure development, apart from questions relating to oil- and gas development (Kaltenborn, Linnell, Gómez-Baggethun, et al., 2017, b).

Place attachment, in itself a cultural ecosystem service, appears as a key factor for understanding how people in Lofoten assess other ecosystem services. First of all, our results corroborate the main findings from a large array of place attachment studies conducted during the last couple of decades, namely that attachment is formed through relationships with nature as well as social networks. 'Place' is a relational concept where attachment develops over time with interaction (physical and emotional investment), and the strength and level of experienced benefits in most cases increases with time. Local understandings of ecosystem services benefits arguably represent expressions of relational values (Chan et al., 2016) linked to the environment. These values are formed over time as people interact with, become attached to, and develop value judgments on desirable and appropriate uses of the environment. Theory and other studies suggest that attachment to place increases with time and level of interaction, particularly with respect to the cultural ecosystem services that embrace the non-market and non-material values. Moreover, this underscores the fact that cultural ecosystem services and derived benefits are not inherent qualities of nature, but 'outcomes' of human-environment relationships where the nature and strength of attachment plays a significant role in terms of how ecosystem services are perceived and valued (Chan et al., 2016). Our interpretation here is also that attachment to place can be viewed as an expression of meaning, i. e. that Lofoten allows people certain desirable ways of life unique to that place. Hence, the Lofoten environment is imbued with particular sets of meaning. We contend that contextualised, place-based understandings of ecosystem services provide more in-depth and dynamic understandings of these resource-based values than de-contextualised typologies, at least from the perspective of the rural communities that occupy the ecosystems in question (e.g. Camps-Calvet, Langemeyer, Calvet-Mir, & Gómez-Baggethun, 2016).

Our emphasis on the relational perspective may need some elaboration. One can argue that any evaluative process of environmental conditions contains an innate relationality. Subsequently, other evaluative processes may yield similar insights as those we arrive at in this study. So how then are relational values and benefits different from held, assigned, moral, instrumental, social and non-material values and benefits (Chan, Gould, & Pascual, 2018)? The crucial issue is to distinguish between the process of valuation and the content of valuation (Himes & Muraca 2018; Saxena, Chatti, Overstreet, & Dove, 2018). While all human evaluation of the environment entails some kind of relationship with the surroundings, the relationship can in some cases be merely a means to an end, i.e. in the case of instrumental values, or in terms of held values which are abstract representations. Relational values are more grounded in particular contexts than held values. Likewise, relational values are never purely instrumental, and they are not equivalent to non-material values, but can pertain to material or non-material benefits (Chan et al., 2016). In the case of relational values, the relationship in itself is significant and imbued with particular meanings that are not substitutable, in contrast to other types of values which may be found, experienced and exploited in multiple locations.

We may have arrived at the conclusions we do in this paper in terms of how certain environmental attributes play a role for human well-being using other approaches. However, what we want to emphasize is how ecosystem services benefits can emanate from the unique

interactions in specific contexts where the particular relationships people who live in Lofoten develop with their surroundings. These idiosyncratic links are not substitutable, or at least only to a limited extent, with other human-environment relationships in other places.

The basic needs categories of; subsistence, freedom, protection, affection, understanding, participation, creation, leisure, and identity, were originally coined as a cross-cultural typology of finite needs that can be interpreted both as fundamental dimensions and values of human existence. We have also argued that in a relational values perspective, cultural and provisioning ecosystem services can act as filters or mediators for an exploration of local constructions and understandings of nature. It follows from this line of reasoning that ecosystem services can act as satisfiers of basic human needs in different existential forms or modes. For instance, the needs for 'being' and 'interacting' can correspond with the cultural ecosystem services of identity and sense of place. The needs for 'doing' and 'being' can link to ecosystem services terms for recreation and social relations. The need for 'having' can link to provisioning services as well as social relations, sense of place and heritage. The fundamental need of 'interaction' points to the ecosystem services of social relations, identity and heritage. Since the fundamental cross-cultural needs arguably do not exist in hierarchies, and can be fulfilled in different modes, ecosystem services can contribute to satisfaction of needs in multiple ways across sets of needs. For instance, one can easily envision that the fishing for cod professionally and/or recreationally in the waters around Lofoten can contribute to the basic needs of subsistence, leisure, affection, understanding, freedom, and perhaps identity. Acting in Lofoten's rugged sea- and landscape can also speak to the needs of being, doing and interacting with other people as well as the environment. The relevance of this for more practical purposes is that these insights can be used in vernacular terms to expose values, dilemmas and trade-offs. In public debates, potential benefits from ecosystem services and options tend to be polarised and pitted against one another. Showing, as an example, that the traditional cod-fisheries speak to multiple aspects of the culture and well-being as well the economic foundations of communities, can help in bringing the material and non-material values more on par. Complex choices over future resource options require qualitative deliberations in public meetings and other fora, and a relational understanding of cultural ecosystem services can be a vital contribution.

Is there a plausible link between ecosystem services benefits, perceived quality of life and more fundamental human needs? And furthermore, is the relational process between the outer environment and the inner human condition a critical aspect to understand? That fact that all of the ecosystem service statements examined here received high scores in terms of contributing to good experiences and quality of life at least show a correlation, indicate that they are linked to human needs and may (to some extent) function as satisfiers. The results from this study support other research on the link between ecosystem services and well-being, where ecosystem services can play a pivotal role in addressing both subjective well-being (satisfaction through fulfilment of stated preferences), as well as more basic human needs (e.g. Butler & Oluoch-Kosura, 2006; Constanza et al., 2006; Raudsepp-Hearne et al., 2010). We do not suggest that a relational values perspective supplants other value and benefit categories for all purposes. However, a relational approach to preferences, principles and virtues about human-nature interactions can encompass a spectrum of social science perspectives needed for applied sustainability science and decision-making (Chan et al., 2016). Therefore, it is perhaps more suited to bringing together different scientific disciplines on questions on environmental challenges. We acknowledge that the relational values concept borrows theories and concepts from the many-faceted field of evaluative environmental research. We portend however, along with a number of other researchers, that a relational approach may offer more space in environmental management for qualitative issues with the stronger emphasis on values about relationships and moral issues, i.e. how we all judge the appropriateness of the dealings with our surroundings. Thus,

we see linking the ecosystem services concept with wellbeing in a relational perspective as a way of bringing together the ideas of environmental attributes as critical building blocks for both basic sustenance - and quality of life in a way that can inform decisions about future sustainability. Moreover, this can be a way of sorting out what is the contribution of environmental attributes to well-being relative to other social, economic and political factors.

4.2. Policy implications

The challenges Lofoten faces in making wise decisions about future development paths are mirrored in multiple coastal communities along the Norwegian coast. Albeit a case study building on a limited data set in a particular setting, we believe the findings have wider relevance for the discussion of how to achieve a more complete assessment of key values at stake in controversial land use decisions. How to sustain rural livelihoods in the face of globalisation and centralisation of governance systems and public services, and what values should inform these debates, is indeed a broad, international challenge (e.g. Beer, 2014; Zimmerer, 2007). Options are seldom clear-cut as environmental management typically involves complex trade-offs between bundles of ecosystem services. As we see in Lofoten in northern Norway, these services are often interlocked in complex ways, which complicates evaluations of the consequences of different policy directions.

Well-being, often coined as a good quality of life, increasingly emerges as a key objective of ecosystem services informed policy (Millennium Ecosystem Assessment, 2005; Diaz et al., 2015, 2018). Improved concepts and methods for identifying how the environment contributes to quality of life emerges as a paramount challenge cross-culturally. This study is intended as a small step in that direction. Since well-being is dependent on satisfying both subjective and more objective human needs, environmental management needs to find ways to account for and integrate material and non-material needs and values in management strategies. This study shows that both cultural and provisioning ecosystem services can act as satisfiers, or proxies of fundamental human needs. Identifying the perceived importance and monitoring these needs can be an effective approach to chart ecosystem values in planning and policy process, as part of weighing consumptive needs against non-consumptive. By linking the ecosystem services framework to local context as well as basic human needs, it becomes apparent that ecosystem services should be understood as a dynamic concept dependent upon human interaction with the environment, and that particular values and benefits evolve from the relationships. Cultural ecosystem services are difficult to express or quantify in economic terms, hence they often lose out, or are under-communicated, in policy development. However, our research shows that viewing the less tangible ecosystem services as salient satisfiers of fundamental human needs and understanding that their valuation is based on relationships and place, can increase their recognition as building blocks in the 'good life' and elevate their importance in resource policy development.

Land use planning and conservation inherently involves trade-offs between commensurable and incommensurable values. For long, the instrumental/intrinsic value dichotomy has been the dominant value yardstick in weighting competing interests. However, in formulating concrete policy decisions and planning measures 'apples and oranges' need to be compared, which means including a range of information sources such as statistics, deliberations, statements, survey data and so forth. The only way to deal effectively with such an array of different data sources is through communication, deliberation and synthesis. Methodologically, this is a qualitative type of exercise where effort needs to be put towards creating a 'language' where different types of values and benefits can be assessed and ranked. () Directing emphasis on the relational values involved in almost any land use policy and planning exercise exposes power asymmetries and allows for better epistemic justice (e.g. Himes & Muraca, 2018). From a stakeholder perspective this would in most instances be a more just and beneficial

development, since there is often a quarrel over who are legitimate stakeholders, i.e. have recognised power (e.g. Mikalsen & Jentoft, 2001; Vacaro et al., 2013), and different interests may represent and argue for widely different types of values. Ultimately this can boil down to the question of whose conservation interests are recognised (Mace, 2014). Indeed, the essence for many local stakeholders is precisely the relationship they have to special places and meanings evolving from these relationships that are difficult to compare to economic measures or other quantifiable properties of the environment.

Funding

This study was funded by the Norwegian Research Council (grant numbers: 230307/50 and 251112).

CRediT authorship contribution statement

Bjørn P. Kaltenborn: Conceptualization, Data curation, Formal analysis, Writing - original draft. **Erik Gómez-Baggethun:** Conceptualization, Writing - original draft.

References

- Alkire, S. (2002). Dimensions of human development. *World Development*, 30(2), 181–205.
- Alkire, S. (2005). *Valuing freedoms: Sen's capability approach and poverty reduction*. Oxford: Oxford University Press.
- Angner, E. (2010). Subjective well-being. *The Journal of Socio-Economics*, 39(3), 361–368. <https://doi.org/10.1016/j.socrec.2009.12.001>.
- Arbo, P., Iversen, A., Knol, M., Ringholm, T., & Sander, G. (2013). Arctic futures: Conceptualizations and images of a changing arctic. *Polar Geography*, 36(3), 163–182.
- Auer, A., Maceira, N., & Nahuelhual, L. (2017). Agriculturisation and trade-offs between commodity production and cultural ecosystem services: A case study in balcarce county. *Journal of Rural Studies*, 53, 88–101.
- Beer, A. (2014). Leadership and the governance of rural communities. *Journal of Rural Studies*, 34, 254–262.
- Brand-Correa, L. I., Martín-Ortega, J., & Steinberger, J. K. (2018). Human scale energy services: Untangling a 'golden thread'. *Energy Research & Social Science*, 38, 178–187.
- Brown, K. W., & Kasser, T. (2005). Are psychological and ecological well-being compatible? The role of values, mindfulness, and lifestyle. *Social Indicators Research*, 74, 349. <https://doi.org/10.1007/s11205-004-8207-8>.
- Buck, M., & Kristoffersen, R. (2011). Boring etter olje og gass i nord. Lokal strid langs nasjonale skillelinjer? *Ottar*, 2, 48–54 (In Norwegian).
- Butler, C. D., & Oluoch-Kosura, W. (2006). Linking future ecosystem services and future human well-being. *Ecology and Society*, 11(1), 30. <http://www.ecologyandsociety.org/vol11/iss1/art30/>.
- Camps-Calvet, M., Langemeyer, J., Calvet-Mir, L., & Gómez-Baggethun, E. (2016). Ecosystem services provided by urban gardens in Barcelona, Spain: Insights for policy and planning. *Environmental Science & Policy*, 62, 14–23.
- Carrus, G., Scopelliti, M., Laforteza, R., Colangelo, G., Ferrini, F., Salbitano, F., et al. (2015). Go greener, feel better? The positive effects of biodiversity on the well-being of individuals visiting urban and peri-urban green areas. *Landscape and Urban Planning*, 134, 221–228.
- Ceausu, S., Graves, R. A., Killion, A. K., Svenning, J., & Carter, N. H. (2018). Governing trade-offs in ecosystem services and disservices to achieve human-wildlife coexistence. *Conservation Biology*. <https://doi.org/10.1111/cobi.13241>.
- Cebrián-Piqueras, M. A., Karrasch, L., & Kleyer, M. (2017). Coupling stakeholder assessments of ecosystem services with biophysical ecosystem properties reveals importance of social contexts. *Ecosystem Services*, 23, 108–115.
- Centgraf, S. (2018). Supporting civic engagement in German energy cooperatives – transdisciplinary research based on the reflection of individual needs. *Energy Research and Social Science*, 44, 112–121.
- Chan, K. M. A., Balvanera, P., Benessaiah, K., Chapman, M., Díaz, S., Gómez-Baggethun, E., et al. (2016). Why protect nature? Rethinking values and the environment. *Proceedings of the National Academy of Sciences*, 113(6), 1462–1465. <https://doi.org/10.1016/j.ecolecon.2011.11.011>.
- Chan, K. M. A., Gould, R. K., & Pascual, U. (2018). Editorial overview: Relational values: What are they, and what's the fuss about? *Current Opinion in Environmental Sustainability*, 35, A1–A7.
- Chan, K. M. A., Guerry, A. F., Balvanera, P., Klain, S., Satterfield, T., Basurto, X., et al. (2012a). Where are cultural and social in ecosystem services? A framework for constructive engagement. *BioScience*, 62(8), 744–756. <https://doi.org/10.1525/bio.2012.62.8.7>.
- Chan, K. M. A., Satterfield, T., & Goldstein, J. (2012b). Rethinking ecosystem services to better address and navigate cultural values. *Ecological Economics*, 74, 8–18. <https://doi.org/10.1016/j.ecolecon.2011.11.011>.
- Clark, N. E., Lovell, R., Wheeler, B. W., Higgins, S. L., Depledge, M. H., & Norris, K. (2014). Biodiversity, cultural pathways, and human health: A framework. *Trends in Ecology & Evolution*, 29(4), 198–203.
- Constanza, R., Fishera, B., Alib, S., Beerc, C., Bondd, L., Boumansa, B., et al. (2006). Quality of life: An approach integrating opportunities, human needs, and subjective well-being. *Ecological Economics*, 61, 267–276. <https://doi.org/10.1016/j.ecolecon.2006.02.023>.
- Correll, R. W. (2006). Challenges of climate change: An arctic perspective. *Ambio*, 35(4), 148–152.
- Cruz-Garzia, 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? *Ecosystem Services*, 25, 201–212.
- Daniel, T. C., Muhar, A., Arnberger, A., Aznar, O., Boyd, J. W., Chan, K. M. A., et al. (2012). Contributions of cultural services to the ecosystem services agenda. *Proceedings of the National Academy of Sciences*, 109(23), 8812–8819. <https://doi.org/10.1073/pnas.1114773109>.
- Diaz, S., Demissew, S., Joly, C., Lonsdale, W. M., & Larigauderie, A. (2015). A rosetta Stone for nature's benefits to people. *PLoS Biology*. <https://doi.org/10.1371/journal.pbio.1002040>.
- Diaz, S., Pascual, U., Stenseke, M., Martín-López, atson, R. T., Molnár, Z., et al. (2018). Assessing nature's contribution to people. *Science*, 359(6373), 270–272.
- Diener, E., Lucas, R. E., Schimmack, U., & Helliwell, J. (2008). *Well being and public policy*. Oxford University Press.
- Directorate of Fisheries. (2014). *Statistics for fisheries*. <http://www.fiskeridir.no/English/Fisheries/Statistics>.
- Dodds, K. (2010). Flag planting and finger pointing: The Law of the Sea, the Arctic and the political geographies of the outer continental shelf. *Political Geography*, 29, 63–73.
- Duraiappah, A. K. (2011). Ecosystem services and human well-being: Do global findings make any sense? *BioScience*, 6(1), 7–8. <https://doi.org/10.1525/bio.2011.61.1.2>.
- Enger, A., Jakobsen, E. W., Grünfeld, L. A., Løvland, J., Kildal Iversen, E., & Bøgh Holmen, R. (2013). *Sektoranalyse av reiselivsnæringen i nord-norge. Menon business economics, menon publikasjon 14/2013* (In Norwegian).
- Gaitán-Cremaschi, D., Baraibar, S., Palomo, I., de Groot, R., & Gómez-Baggethun, E. (2017). Applicability of economic instruments for protecting ecosystem services from cultural agrarian landscapes in Doñana, SW Spain. *Land Use Policy*, 61, 185–195.
- Gómez-Baggethun, E., Barton, D., Berry, P., Dunford, R., & Harrison, P. (2016). Concepts and methods in ecosystem services valuation. In M. Potschin, R. Haines-Young, R. Fish, & R. K. Turner (Eds.), *Routledge handbook of ecosystem services* (pp. 99–111). London and New York: Routledge.
- Gómez-Baggethun, E., Martín-López, B., Lomas, P., Zorrilla, P., & Montes, C. (2011). Evolution of ecosystem services in a Mediterranean cultural landscape: Doñana case study, Spain (1956–2006). In A. Sofo (Ed.), *Biodiversity* (pp. 27–46). InTech.
- Gould, R. K., Klain, S. C., Ardoin, N. M., Satterfield, T., Woodside, U., Hannahs, N., et al. (2014). A Protocol for eliciting nonmaterial values through a cultural ecosystem services frame. *Conservation Biology*, 29(2), 575–586.
- Grydehøj, A., & Grydehøj, A. (2012). The globalization of the arctic: Negotiating sovereignty and building communities in svalbard, Norway. *Island Studies Journal*, 7 (1), 99–118.
- Guo, Z., Zhang, L., & Li, Y. (2010). Increased dependence of humans on ecosystem services and biodiversity. *PLoS One*, 5(10), e13113. <https://doi.org/10.1371/journal.pone.0013113>.
- Gustafson, P. (2001). Meanings of place: Everyday experience and theoretical conceptualizations. *Journal of Environmental Psychology*, 21, 5–16.
- Hafendorn, H. (2011). NATO and the arctic: Is the atlantic alliance a cold war relic in a peaceful region now faced with non-military challenges? *European Security*, 20(3), 337–361.
- Haines-Young, R., & Potschin, M. (2013). *Common international classification of ecosystem services (CICES). EEA framework*.
- Harrison, P. A., Berry, P. M., Simpson, G., Haslett, J. R., Blicharska, M., Bucur, M., et al. (2014). Linkages between biodiversity attributes and ecosystem services: A systematic review. *Ecosystem Services*, 9, 191–203.
- Hausmann, A., Slotow, R., Burns, J. K., & Minin, E. R. (2015). The ecosystem service of sense of place: Benefits for human well-being and biodiversity conservation. *Environmental Conservation*, 1–11.
- Hidalgo, M. C., & Hernández, B. (2008). Place attachment: Conceptual and empirical questions. *Journal of Environmental Psychology*, 21, 273–281.
- Himes, A., & Muraca, B. (2018). Relational values: The key to pluralistic valuation of ecosystem services. *Current Opinion in Environmental Sustainability*, 35, 1–7.
- Høgi, M. (2010). *Risky businesses: A perspective on Fishers' risk in the oil versus fish dilemma in lofoten and vesterålen. Masters thesis, international fisheries management. Norway: Norwegian College of Fisheries Science, University of Tromsø*.
- Kahneman, D., & Krueger, A. B. (2006). Developments in the measurement of subjective well-being. *The Journal of Economic Perspectives*, 20(1), 3–24(22).
- Kahnemann, D., Diener, D., & Schwartz, N. (Eds.). (1999). *Well-Being: The Foundations of Hedonic Psychology*. New York: Russel Sage Foundation.
- Kaltenborn, B. P., Linnell, J. D. C., Gómez-Baggethun, E., Thomassen, J., Lindhjem, H., & Chan, K. (2017). Ecosystem services and cultural values as building blocks for 'The good life'. A case study in the community of Røst, Lofoten Islands, Norway. *Ecological Economics*, 140, 166–176.
- Kaltenborn, B. P., Linnell, J. D. C., Thomassen, J., & Lindhjem, H. (2017). Complacency or resilience? Perceptions of environmental and social change in lofoten and vesterålen in northern Norway. *Ocean & Coastal Management*, 138, 29–37.

- Kenter, J. O., O'Brien, L., Hockley, N., Ravenscroft, N., Fazey, I., Irvine, K. N., et al. (2015). What are shared and social values of ecosystems? *Ecological Economics*, *111*, 86–99.
- Kristoffersen, B., & Dale, B. (2014). Post petroleum security in lofoten: How identity matters. *Arctic Review on Law and Politics*, *5*, 201–226, 2/2014.
- Kristoffersen, B., & Young, S. (2010). Geography of security and statehood in Norway's 'Battle of the North'. *Geoforum*, *41*, 577–584.
- Kyle, G. T., Mowen, A. J., & Tarrant, M. (2004). Linking place preferences with place meaning: An examination of the relationship between place motivation and place attachment. *Journal of Environmental Psychology*, *24*, 439–454.
- Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology*, *31*, 207–230.
- MacDonald, A. (2015). The militarization of the arctic: Emerging reality, exaggeration, and distraction. *Canadian Military Journal*, *15*(3), 18–28.
- Mace, G. M. (2014). Whose conservation? *Science*, *345*(6204), 1558–1560.
- Madgin, R., Bradley, L., & Hastings, A. (2016). Connecting physical and social dimensions of place attachment: What can we learn from attachment to urban recreational spaces? *Journal of Housing and the Built Environment*, *31*, 677–693. <https://doi.org/10.1007/s10901-016-9495-4>.
- Magnussen, K. (2012). Marine ecosystem services in the Barents Sea and lofoten islands, a scoping assessment. In M. Kettunen, P. Vihervaara, S. Kinnunen, D. D'Amato, T. Badura, M. Argimon, et al. (Eds.), *2012. Socio-economic importance of ecosystem services in the nordic countries. Synthesis in the context of the economics ecosystems and biodiversity (TEEB)* (Vol. 559, pp. 262–267). Nordic Council of Ministers, Copenhagen TemaNord 2012. <https://doi.org/10.6027/TN2012-559>.
- Marans, R. W. (2003). Understanding environmental quality through quality of life studies: The 2001 DAS and its use of subjective and objective indicators. *Landscape and Urban Planning*, *65*, 73–83. [https://doi.org/10.1016/S0169-2046\(02\)00239-6](https://doi.org/10.1016/S0169-2046(02)00239-6).
- Martín-López, B., Gómez-Baggethun, E., García-Llorente, M., & Montes, C. (2014). Trade-offs across value-domains in ecosystem service assessment. *Ecological Indicators*, *37*, 220–228.
- Max-Neef, M. (1992). Development and human needs. In P. Ekins, & M. Max-Neef (Eds.), *Real-life economics: Understanding wealth creation* (pp. 197–213).
- Mikalsen, K. H., & Jentoft, S. (2001). From user-groups to stakeholders? The public interest in fisheries management. *Marine Policy*, *25*, 281–292.
- Millennium Ecosystem Assessment. (2003). *Ecosystems and human well-being: A framework for assessment*. Washington: Island Press.
- Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being: Biodiversity synthesis*. Washington: World Resources Institute.
- Misund, O. A., & Olsen, E. (2013). Food for thought. Lofoten-vesteraalen: For for cod and cod fisheries, but not for oil? *ICES Journal of Marine Science*, *70*(4), 722–725. <https://doi.org/10.1093/icesjms/fst086>.
- Nelson, E., Mendoza, G., Regetz, J., Polasky, S., Tallis, H., Cameron, D., et al. (2009). Modeling multiple ecosystem services, biodiversity conservation, commodity production, and tradeoffs at landscape scales. *Frontiers in Ecology and the Environment*, *7*(1), 4–11.
- Noble, B., Ketilson, S., Aitken, A., & Poelzer, G. (2013). Strategic environmental assessment opportunities and risk for Arctic offshore energy planning and development. *Marine Policy*, *39*, 296–302.
- Norton, B. G., & Hannon, B. (1997). Environmental values: A place-based theory. *Environmental Ethics*, *9*(3), 227–245.
- Olsen, M. S., Callaghan, T. V., Reist, J. D., Reiersen, L. O., Dahl-Jensen, D., Granskog, M. A., et al. (2011). The changing arctic cryosphere and likely consequences: An overview. *Ambio*, *40*, 111–118. <https://doi.org/10.1007/s13280-011-0220-y>.
- Pascual, U., Balvanera, P., Diaz, S., Pataki, G., Roth, E., Stenseke, M., et al. (2017). Revealing the diversity of values of nature and its benefits to people for a good quality of life: The IPBES approach, 41 authors *Current Opinion in Environmental Sustainability* 2017, *26*, 7–16.
- Raudsepp-Hearne, C., Peterson, G. D., Tengö, M., Bennett, E. M., Holland, T., Benessaiah, K., et al. (2010). Untangling the environmentalist's paradox: Why is human well-being increasing as ecosystem services degrade? *BioScience*, *60*(8), 576–589.
- Raymond, C. M., Brown, G., & Weber, D. (2010). The measurement of place attachment: Personal, community, and environmental connections. *Journal of Environmental Psychology*, *30*, 422–434.
- Reyes-García, V., Menéndez-Baceta, G., Aceituno-Mata, L., Calvet-Mir, L., Garnatje, T., Gómez-Baggethun, E., et al. (2015). From famine foods to delicatessen: Interpreting trends in the use of wild edible plants through cultural ecosystem services. *Ecological Economics*, *120*, 303–311.
- Rodríguez, J., Beard, T. D., Jr., Bennett, E., Cumming, G., Cork, S., Agard, J., et al. (2006). Trade-offs across space, time, and ecosystem services. *Ecology and Society*, *11* (1).
- Sandifer, P. A., Sutton-Grier, A. E., & Ward, B. P. (2015). Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: Opportunities to enhance health and biodiversity conservation. *Ecosystem Services*, *12*, 1–15.
- Sarkki, S. (2017). Governance services: Co-producing human well-being with ecosystem services. *Ecosystem Services*, *27*, 82–91.
- Satterfield, T., Gregory, R., Klain, S., Roberts, M., & Chan, K. (2013). Culture, intangibles and metrics in environmental management. *Journal of Environmental Management*, *117*, 103–114.
- Saxena, A. K., Chatti, D., Overstreet, K., & Dove, M. R. (2018). From moral ecology to diverse ontologies: Relational values in human ecological research, past and present. *Current Opinion in Environmental Sustainability*, *35*, 54–60.
- Schwartz, S. H., Meleh, G., Lehman, A., Burgess, S., & Harris, M. (2001). Extending the cross-cultural validity of the theory of basic human values with a different method of measurement. *Journal of Cross-Cultural Psychology*, *32*(5), 519–542.
- Sen, A. K. (1993). Capability and well-being. In M. C. Nussbaum, & A. K. Sen (Eds.), *The quality of life*. Oxford: Clarendon Press.
- Stone, A. A., & Mackie, C. (Eds.). (2013). *Subjective well-being: Measuring happiness, suffering, and other dimensions of experience*. Washington, D.C: The National Academies Press. www.nap.edu.
- TEEB. (2010). In P. Kumar (Ed.), *The economics of ecosystems and biodiversity: Ecological & economic foundations*. London: Earthscan.
- TEEB. (2013). *The economics of ecosystems and biodiversity: Guidance manual for TEEB country studies* Version 1. .
- Vaccaro, I., Beltran, O., & Paquet, P. A. (2013). Political ecology and conservation policies: Some theoretical genealogies. *Journal of Political Ecology*, *20*, 255–272.
- Wang, B., Tang, H., & Xu, Y. (2017). Integrating ecosystem services and human well-being into management practices: Insights from a mountain-basin area, China. *Ecosystem Services*, *27*, 58–69.
- Williams, D. R., Patterson, M., Roggenbuck, J., & Watson, A. (1992). Beyond the commodity metaphor: Examining emotional and symbolic attachment to place. *Leisure Sciences*, *14*(1), 29–46.
- Young, O. R. (2009). Whither the arctic? Conflict or cooperation in the circumpolar north. *Polar Record*, *45*(1), 73–82.
- Zimmerer, K. S. (2007). Agriculture, livelihoods, and globalization: The analysis of new trajectories (and avoidance of just-so stories) of human-environment change and conservation. *Agriculture and Human Values*, *24*, 9–16.
- Zorondo-Rodríguez, F., Gómez-Baggethun, E., Demps, K., Ariza-Montobbio, P., García, C., & Reyes-García, V. (2014). What defines quality of life? The gap between public policies and locally defined indicators among residents of kodagu (India). *Social Indicators Research*, *115*, 441–456.
- Zorondo-Rodríguez, F., Grau-Satorras, M., Kalla, J., Demps, K., Gómez-Baggethun, E., García, C., et al. (2016). Contribution of natural and economic capital to subjective well-being: Empirical evidence from a small-scale society in kodagu (Karnataka), India. *Social Indicators Research*, *127*, 919–937.