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ORIGINAL ARTICLE

Using a combination of *Q*-methodology and survey-based approach for assessing forest ecosystem services of Five Finger Mountains in Northern Cyprus

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Abstract
This paper attempts to identify and assess the distinct stakeholders' perspectives regarding Five Finger Mountain Forest Ecosystem Services (MFESs) at the landscape scale in Kyrenia Region of the Northern Cyprus. The objectives of the study were (1) to identify and assess the stakeholders' perspectives of MFESs and (2) to record the non-wood forest products harvested and associated traditional ecological knowledge. The *Q*-methodology and focus group discussions were used to collect the qualitative and quantitative data on the objectives of the research. Before the *Q*-method, 13 focus groups were implemented to record the quantitative data on the ecological knowledge. Afterwards, the *Q*-method was conducted to identify the perspectives. The quantitative data collected were analysed by performing the *Q*-factor analysis. 96 *Q*-participants sorted 48 *Q*-statements with 11 categories (from + 5 to − 5). The results revealed that the stakeholders hold four distinct perspectives on the MFESs (recreation, heritage, conservation, and symbolic), which reflect the landscape social values. The results of the focus groups showed that the stakeholders collect 30 wild plant and 5 mushroom species from the forests and still hold the relevant traditional knowledge, which represents the natural resource social values. The landscape and natural resource social values are linked through the value dimension of scale; therefore, both values should be recognized as cultural heritage values and integrated into the forest conservation strategy. The values can also help policy-makers to take better decisions for the conservation and sustainable management of the mountain ecosystems and their services.

Keywords Mountain forest ecosystem services · Ecosystem services assessment · *Q*-methodology · Focus group discussions · Social valuation · Northern Cyprus

Introduction

Mountain ecosystems, which cover about 22% of the earth's land surface, contain a substantial portion of the earth forests with a high degree of biodiversity (Baral et al. 2017; FAO 2012; Cantarello et al. 2017). The main characteristics of mountain forests (e.g. altitude) contribute to the formation of forest watersheds that regulate floods, provide clean water, and host an important source of biodiversity worldwide (MEA 2005; Grêt-Regamey et al. 2012; Price et al. 2011; FAO 2012; Cantarello et al. 2017). Relatively high degree of biodiversity in mountain forest ecosystems plays a vital role in providing basic needs of people, stabilizing slopes, regulating the hydrological cycle, mitigating flood and landslide effects, and providing clean water to downstream cities around the world (Baral et al. 2017). The scholars also highlighted that mountain forests contribute to the formation of distinct cultures and social systems, as most mountain forest communities have little opportunity to interact with urban cultures and systems. Thus, mountain forest ecosystems deliver ecological, economic, and socio-cultural benefits for forest communities (MEA 2005; Grêt-Regamey et al. 2012; Price et al. 2011; Paudyal et al. 2015). Within this context, the concept of ecosystem services is a crucial tool to identify and assess the mountain forest ecosystem services.

Ecosystem services are the benefits people obtain from ecosystems (MEA 2005). They are any kind of direct and

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indirect contributions of ecosystems to human wellbeing (TEEB 2010; Kelemen and Gómez-Baggethun 2008; Baral et al. 2017; USAID 2015). They are the products of ecosystem functions and processes (Hawkins 2003). The concept of ecosystem services has been developed to better understand the relationship between biodiversity conservation and sustainable human development (MEA 2005; Daily 1997; Fisher et al. 2011). The global initiatives of the Millennium Ecosystem Assessment (MEA 2005), the Economics of Ecosystems and Biodiversity (TEEB 2010), and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) have been important milestones in the development of the concept of ecosystem services at worldwide (Nijnik and Miller 2017). In addition, at the European Union (EU) level, the Member States of the EU are committed to map and assess the ecosystems and their services on their national territory within the context of Action 5 of the European Biodiversity Strategy for 2020 (European Commission 2011; Maes et al. 2016). All of these global initiatives emphasized that ecosystems (e.g. mountain forests) deliver vital ecosystem services (e.g. food and fibre) for human wellbeing (Paudyal et al. 2015; Nijnik and Miller 2017; Turner et al. 2003; Bernués et al. 2014; Palacios and Bokelmann 2017). For that reason, we should identify, assess, and recognize their diverse values in relevant policies to manage them in a sustainable way (Baral et al. 2017).

Ecosystems and their services comprise different value types (e.g. social and economic) (Kenter 2016). Value refers to 'criteria that people use to select and justify actions and to evaluate people and events' (Schwartz 1992). Value providers can be distinguished as individuals, ad-hoc groups, communities, and societies as a whole. Societies, as a whole, share cultural and societal values, which may be considered shared principles and virtues as well as a shared sense of what is worthwhile and meaningful (Kenter 2016). Valuation of ecosystem services demonstrates how ecosystem services contribute to generating income, wellbeing, identifying beneficiaries, providing evidence on the scale of benefits, and helping to inform policy and land management decisions regarding resource allocation, management practices, and use (Nijnik and Miller 2017; Baral et al. 2017). There are a number of methods for the valuation of ecosystem services (Christie et al. 2012). These methods can be classified into three groups: ecological, social, and economic (TEEB 2010; Christie et al. 2012; Farber et al. 2002, Chan et al. 2012; Baral et al. 2017). The ecological value is determined by the integrity of an ecosystem's provisioning, supporting, regulating functions and by its characteristics (e.g. indicators of ecological relevance such as complexity, diversity, rarity, or naturalness) (Adamowicz 1995; Nijnik and Miller 2017). The biophysical (ecological) quantification of ecosystem services is more adequate and precise to measure and monitor the real condition of ecosystems and guarantee their integrity (Bernués et al. 2014). The economic (monetary) value refers to the worth of something itself or monetary value of something (Kenter 2016). The economic valuation of ecosystem services is assumed to be a driver for the commodification of nature (Bernués et al. 2014). However, the monetary valuation is ill-suited for a broad suite of ecosystem services (e.g. cultural services), as it cannot count for the multiple benefits that people may derive from the same ecosystem service (Mavrommati et al. 2017). The social value refers to shared social perspectives, values, and narratives obtained through social interactions, open dialogue, and social learning (Stagl 2004; Hattam et al. 2015; Brown and Brabyn 2012; Kenter et al. 2015; Kennedy and Thomas 1995). The social valuation methods try to explore the importance, preferences, needs, or demands expressed by people towards nature (Chan et al. 2012; Kelemen et al. 2016; Winkler and Nicholas 2016). The social values play critical roles in sustainable management of mountain forest ecosystems since many communities live in mountain forests and their cultures heavily depend on mountain forest ecosystems. Management of such ecosystems should reflect wider considerations of the social choices and preferences of relevant stakeholders (Baral et al. 2017). In addition, the social values cannot be captured by economic or ecological valuation techniques. Several methods can be used to assess the social values of ecosystem services. The major methods comprise focus group discussions, participatory mapping tools, stakeholder or expert surveys, and *Q* methodology (Baral et al. 2017; Adamowicz 1995; Nijnik and Miller 2017). These techniques are differentiated in terms of required data, technical capacity, time, and cost. The requirements should be considered in selecting the most suitable tool (Bagstad et al. 2013; Baral et al. 2017). The *Q*-methodology and focus group discussions are the most widely used methods among them. Accordingly, this paper attempts to identify and assess the distinct stakeholders' perspectives regarding Five Finger Mountain Forest Ecosystem Services (MFESs) at the landscape scale in Kyrenia Region of the Northern Cyprus. In doing so, the objectives of the study were (1) to identify and assess the stakeholders' perspectives of MFESs and (2) to record the non-wood forest products harvested and associated traditional ecological knowledge. The identified perspectives (the landscape and natural resource social values) can help policy-makers, forest, and resource managers to take better decisions for the conservation and sustainable management of the mountain ecosystems and their services in Kyrenia Region and elsewhere.

Materials and methods

Study area

Cyprus is an island, which is situated between the continents of Europe, Asia, and Africa in the Eastern Mediterranean Basin (Commissioner for the Environment 2016) (Fig. 1). The island is geologically and biogeographically isolated in the region. This situation has led to the colonization of a large number of endemic flora species (Hadjikyriakou and Hadjisterkotis 2002). Evidence of Tsintides et al. (2007) showed that the flora of Cyprus comprises 1800 indigenous plant taxa (128 species are endemics). The diversity of habitats and climatic conditions has made the island one of the biodiversity hotspots in the Mediterranean Basin (Myers et al. 2000). The range of Five Finger Mountains (Beşparmak/GirneDağları), which is the second mountain

Worldatlas (2020).

Fig. 1 Location of the study area: Kyrenia (Girne) Region in the Northern Cyprus

richest in terms of biodiversity after Troodos Mountains in the island, was selected as a case study area.

Five Finger Mountains are a long, narrow mountain range that extends about 160 km along the northern coastline of the island. The mountains are surrounded by the Mesarya plain in the south. The highest peak of the mountains is Selvili Tepe with 1024 m (Stather Hunt et al. 2019). Five Finger Mountains comprise the largest aquifer in the Northern Cyprus (Cyprus Geological Heritage Tool 2004). The mountain forest is an important botanical division in the island (Meikle 1977–1985; Hacıoğulları 2017). Therefore, it has a great natural importance, hosting many habitats, flora, fauna, and endemic species (Commissioner for the Environment 2016; Sfikas 1993). The mountain range is the second most important biodiversity hotspot in Cyprus after the Troodos mountain range (Meikle 1977–1985; Sfikas 1993). According to the European Union's Habitats Directive 92/43/EEC, Five Finger Mountains host 14 important habitats. The mountain range is the habitat for 56 global and national endemic and 15 local endemic plant species (Sfikas 1993), and migratory bird species. For that reason, Five Finger Mountain Forests were declared as an Important Bird Area (IBA). The area was also proposed as a Natura 2000 site within the framework of the LIFE Third Countries Project (LIFE98TCY/CY/172—conducted between 1999 and 2002); however, it was legally not declared as a Natura 2000 site (Özden 2009). The Çamlıbel Region, which is located on the western part of the mountains, was only declared as a Special Protected Area. Assessment of the bio-physical features of the mountain forests shows that Five Finger Mountains constitute the ecological backbone of Kyrenia Region (Commissioner for the Environment 2016), which deliver essential ecosystem services for local people and urban dwellers (Fig. 2). However, this unique mountain landscape has been degraded due to the impact of several drivers (e.g. intensive urbanization, excessive quarrying, and littering). Within this context, the ecosystem services assessment can be a strategic approach to mitigate and control the impacts of the drivers. Accordingly, the ecological, social and economic values of Five Finger Mountains should be identified and assessed, and then, relevant conservation and development policies should be designed. This study focuses on the social values of ecosystem services delivered by Five Finger Mountain forests in Kyrenia Region of the Northern Cyprus.

Methods

Design of a conceptual framework for the assessment of MFESs

Development of a conceptual framework is a priority in the ecosystem services assessment (La Notte et al. 2017). Such a framework helps policy-makers, planners, and other relevant stakeholders to better understand the links between ecosystems, categories of ecosystem services, and their relevant values. Within this context, a relevant conceptual framework was designed for Five Finger Mountains located in Kyrenia City of the Northern Cyprus (Fig. 3).

Figure 3 shows that the assessment of Five Finger MFESs consists of three domains: mountain forest ecosystem, associated ecosystem services, and values. The mountain forest ecosystem consists of ecosystem structures, processes, and functions. The ecosystem structure (biophysical structure) represents the distribution of biotic and abiotic components in the ecosystem (Ciftcioglu 2017; Martín-López et al. 2009; La Notte et al. 2017). Ecosystem processes can be defined as interactions among elements of the ecosystem, which lead to ecosystem functions (regulation, habitat, production, and information) (Scott et al. 1998). Functions biologically and chemically occur in ecosystems and would occur regardless of human presence (Hawkins 2003). They are system properties or processes of ecosystems (Costanza et al. 1997). The structural and functional ecosystem components are mutually interrelated. This interrelation causes the formation of a basis for biodiversity and relevant ecosystem services (Oliver et al. 2015; Palacios and Bokelmann 2017; Farber et al. 2002; Maes et al. 2015), which are essential in supporting human existence, for health, wellbeing, and the provision of livelihoods (Christie et al. 2012). The maintenance of biodiversity contributes to enhancing carbon sequestration processes (Schroth et al. 2011), increasing food security, providing opportunities for health care (Garí 2001), improving livelihoods (Agbogidi and Adolor 2013; Egeland and Harrison 2013; Palacios and Bokelmann 2017), and increasing the communities' market possibilities (Jamnadass et al. 2013). Thus, Five Finger Mountain Forests play an essential role in the flow of ecosystem services for human wellbeing. However, a number of drivers (e.g. mining operation) threaten the forest ecosystems and their services. Therefore, understanding the relationship between biodiversity and ecosystem services is crucial for developing the relevant policies.

Identification of the typology for the assessment of MFESs

The design of any classification of ecosystem services is technically challenging to facilitate the applications of the ideas in decision making (Haines-Young and Potschin 2014). There are several typologies regarding the classification of ecosystem services in literature. The most widely used classification of ecosystem services comes from the MEA (2005), which has divided ecosystem services into a four categories—provisioning services (e.g. food, fibre, and genetic resource), regulating services (e.g. climate regulation, water regulation, and pollination), cultural services (e.g. aesthetic values, recreation, and ecotourism), and

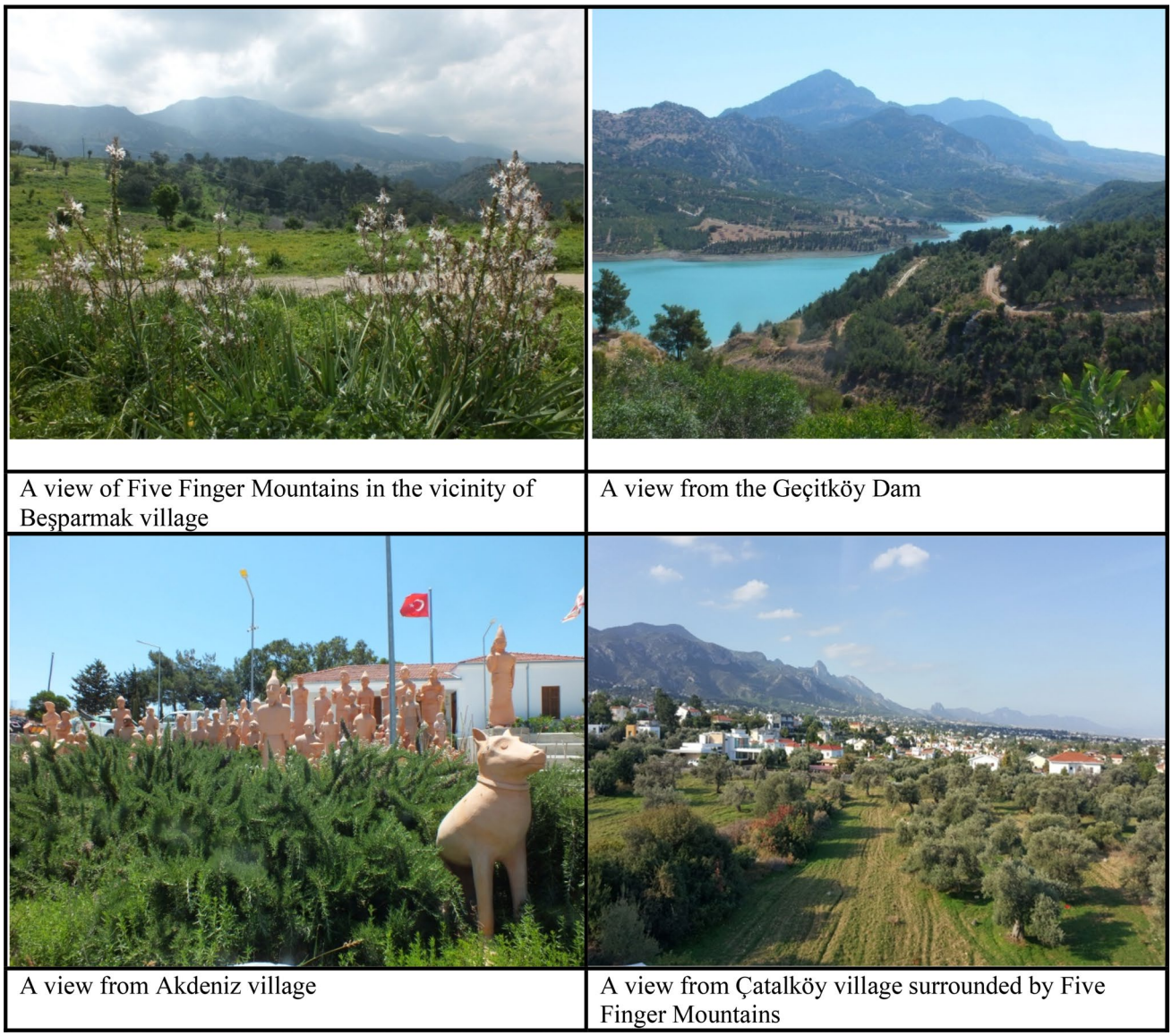

Fig. 2 Several views from Five Finger Mountains located in Kyrenia Region of the Northern Cyprus

supporting services (e.g. nutrient cycling and soil formation) (MEA 2005; Fisher et al. 2011; Christie et al. 2012). The European Union proposed a classification called 'the Economics of Ecosystems and Biodiversity' (TEEB 2010), which has categorized ecosystem services into four groups: provisioning, regulating, habitat, and cultural services. The TEEB initiative has contributed to the better understanding of the economic value of ecosystem services and incorporating their values into decision-making at different levels (Nijnik and Miller 2017). Another important classification, called 'the Common International Classification of Ecosystem Services (CICES)', was proposed by the European Environmental Agency (EEA) in 2009 (Haines-Young and Potschin 2013). The CICES has widely been used in ecosystem services research for designing indicators, mapping, and for the valuation (Haines-Young and Potschin 2018). The CICES has divided services in three categories: provisioning, regulation and maintenance, and cultural (Haines-Young and Potschin 2013, 2018; Potschin and Haines-Young 2016; USAID 2015). The CICES follows a hierarchical structure as a way to allow its users to select the most appropriate level of detail required for their application (Sousa et al. 2016). Each ecosystem service in the typology is divided into divisions, then groups, and then classes. The CICES has been one of the most popular classifications, particularly in Europe (Haines-Young and Potschin 2010). The advantage of this cascade framework is to effectively communicate societal dependence on ecosystems (La Notte et al. 2017). Considering the advantages of the CICES classification at the European level, the relevant typology was integrated into

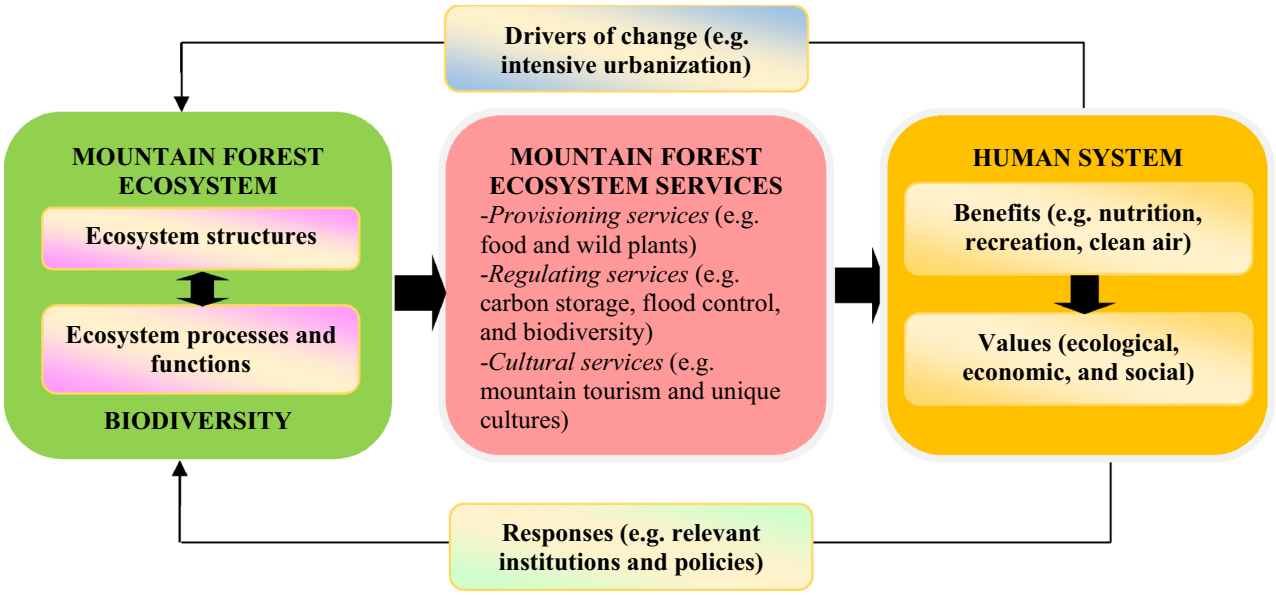

Fig. 3 The conceptual framework designed for the assessment of MFESs in Kyrenia Region (Developed from Baral et al. 2017; Maes et al. 2013)

this study (Columns 2 and 3 in Table 4). Thus, the major classes and components of ecosystem services in this study were identified by examining the CICES.

The methods adapted

A non-monetary deliberative (e.g. *Q*-methodology) and survey-based technique (e.g. focus group discussions) were used to elicit the distinct stakeholders' perspectives regarding the MFESs in Kyrenia Region of the Northern Cyprus. Participatory and deliberative valuation techniques allow people to debate and negotiate their values, to elicit social-cultural values, and relevant social motivations, which are directly related to the good quality of life (e.g. health, life satisfaction, safety, and security). Such approaches engage the public more actively in decision making to reach decisions through deliberation and discourse (Kenter 2016; Dendoncker et al. 2013; EU FP7 OpenNESS Project 2017; Wilson and Howarth 2002, Mavrommati et al. 2017; Fish et al. 2011) (Table 1).

Table 1 shows that the *Q*-method and focus group discussions have strong advantages; therefore, both methods were used to conduct this study.

Focus group discussions are a survey-based method, which is frequently used to gather information about the social-cultural values of ecosystem services (Kelemen and Gómez-Baggethun 2008; Kelemen et al. 2016; Baral et al. 2017; Krueger and Casey 2001). Before applying the *Q*-method, 13 focus group discussions were carried out with 96 community members living in the 13 forest villages of Kyrenia Region. The purpose of the focus group discussions was to collect the quantitative data on the MFESs, which displays the relevant natural resource social values. The major objectives of the focus groups were (1) to record the major natural resources (e.g. wild plants and mushrooms) collected from the mountain forests and associated traditional ecological knowledge (the natural resource social values) and (2) to examine the key drivers that threaten the forest ecosystems and their services. The number of participants in the focus groups ranged between 4 and 11. The focus group discussions continued about 30 min. The date, time, and place of the focus groups were decided with the headmen of the villages. The headmen gathered the target community members in the coffee shops of the villages, where the focus groups and *Q*-studies were carried out. Before starting the focus group discussions, the concept of ecosystem services and the social valuation approaches were explained to the participants. Then, they were asked to explain their knowledge about the objectives (e.g. plant species harvested from the forests and associated traditional ecological knowledge). The focus group discussions and the *Q*-studies (any case study, which involves primarily the application of *Q*-method, is referred to as *Q*-study) were conducted from 12 March 2019 to 08 June 2019 by the author in the following 13 villages of Kyrenia Region: Tepebaşı, Çamlıbel, Kayalar, Akdeniz, Arapköy, Çatalköy, Beşparmak, Akçiçek, Bahçeli, Esentepe, Göçeri, Karşıyaka and Malatya. A total number of 96 local people participated in the focus group discussions as well as the *Q*-sorts in the region (Table 2).

Table 1 The key characteristics of the social valuation methods used in this study (Developed from Fish et al. 2011; Baral et al. 2017; Kelemen et al. 2016; Kelemen and Gómez-Baggethun 2008; Christie et al. 2012; Milcu et al. 2013; Kenter 2016; Mavrommati et al. 2017; EU FP7 OpenNESS Project 2017; Krueger et al. 2001; Watts and Stenner 2005; Brown 1980)

Characteristics of the method	Type of method	
	Deliberative and participatory methods (These methods contribute to developing reasoned assessments of an issue through group debate and learning)	Survey-based methods (These methods contribute to gaining an insight into peoples' attitudes, values, knowledge, and behaviour)
	Q-methodology	Focus group discussion
Short description	This method is used to elicit stakeholders' perceptions about a particular issue	This technique is used to interrogate the perceptions, thoughts, and impressions of a group of people regarding a particular issue
Assessment type	Quantitative, qualitative, and survey based	Qualitative and survey based
Reliability of data	High	Medium
Number of respondents	10–100	6–8 per groups
Speed of analysis	Rapid	Medium
Cost	Modest-medium	Medium-expensive
Strength of the method	The method contributes to giving voice to social groups, for integrating various knowledge forms, to allowing for social learning among the participants, and f analysing the holistic views of diverse stakeholders	The method contributes to social learning, integrating various knowledge forms, and understanding how people think or feel about a certain issue
Limitation of the method	Questions are pre-determined and participants are forced to select a choice	The method does not build consensus and provide empirical reality

Table 2 The profile of *Q*-participants in this study (*n*: 96)

Criteria for the profile of participants	Variable of participants	Total number
Gender	Male	73
	Female	23
Age	Under < 19	1
	20–29	7
	30–39	14
	40–49	22
	50–59	18
	60 and > 60	34
Education	Illiterate	14
	Primary school	23
	High school	47
	University	12
Occupation	Farmer	22
	Fisherman	5
	Public servant	12
	Private sector	11
	Self-employed	15
	Retired	17
	Student	4
	Housewife	10

Table 2 shows that the majority of participants are male, who are between 40 and over 60 years old. A considerable number of the participants have a high school degree and engaged in the agriculture sector and/or retired from a public or private sector.

Q-Methodology This method was developed by the psychologist William Stephenson as a means to systematically study human subjectivity in the 1930s (Hagan and Williams 2016). Although the method originates from the field of psychology (Bredin et al. 2015), it has recently become more popular among researchers in the fields of behavioural, health, political, and environmental sciences to understand stakeholder perceptions (Dasgupta 2005; Eden et al. 2005; Webler et al. 2009; Hagan and Williams 2016; Brown 1980, 1993; Watts and Stenner 2005). The purpose of the *Q*-method is to identify different shared perspectives that people may hold about a given topic (van Exel and de Graaf 2005; Baker 2006; Hagan and Williams 2016; Danielson 2009). The method follows a participatory approach to examine the research question (Donner 2001). The approach combines qualitative and quantitative data through statistical analysis to explore different opinions that exist about a topic (Bredin et al. 2015; Nijnik et al. 2010). Most typically in a *Q*-study, a person is presented with a set of statements about a certain topic, and then asked to rank-order them (usually from "agree" to "disagree") (Brown 1993; Watts and Stenner 2005). Accordingly, the *Q*-method was employed to uncover the distinct social perspectives of stakeholders (the landscape social values) on the MFESs in Kyrenia Region of the Northern Cyprus. The basic steps conducted in this *Q*-study are given in Fig. 4.

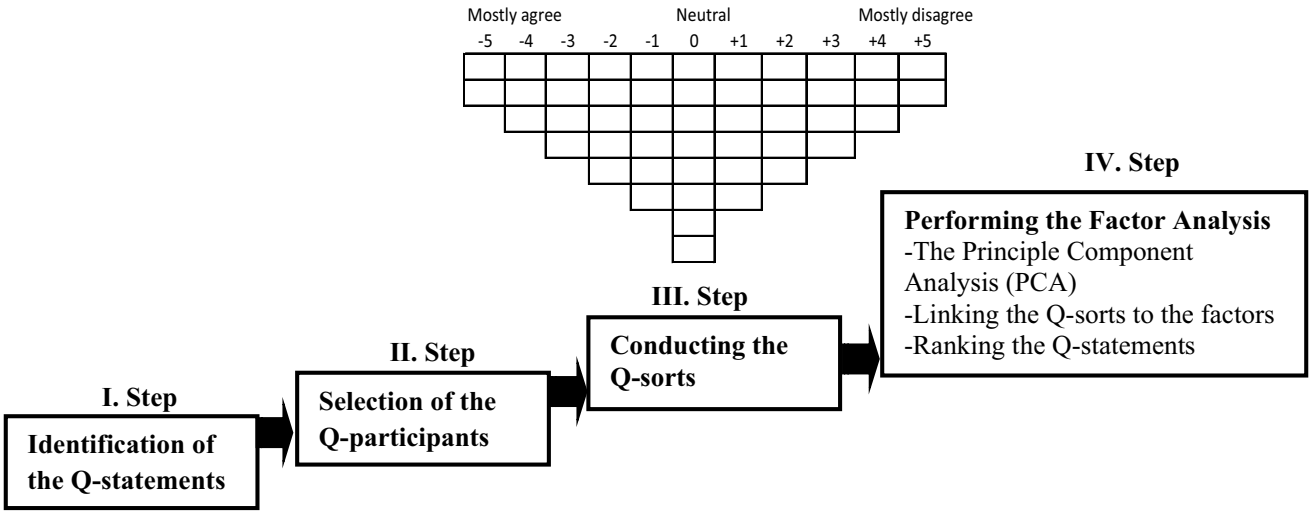

Fig. 4 The process of the *Q*-method in this study consisted of four steps: (i) to identify the *Q*-statements, (ii) to select the *Q*-participants, (iii) to conduct the *Q*-sorts with the selected *Q*-participants, and (iv) to perform the factor analysis to identify the distinct perspectives

Figure 4 shows that this *Q*-study consisted of four steps. The first step was to identify the *Q*-statements (*Q*-sets) that reflect the landscape social values of MFESs: The selection of *Q*-statements is one of the important steps in a *Q*-study (Bredin et al. 2015; Winkler and Nicholas 2016; Nijnik et al. 2010; Baral et al. 2017; Krueger et al. 2001). 48 *Q*-statements were retrieved from the CICES classification. The *Q*-statements were classified into 15 provisioning MFESs, 15 regulating MFESs, and 18 cultural MFESs in this study (second and third columns of Table 4). The *Q*-statements were pre-tested for clarity with several participants and then revised. The identified statements were printed out on the cards.

The second step of the *Q*-study was to select the *Q*-participants (P-set): The selection of *Q*-participants is one of the critical steps in a *Q*-study (Bredin et al. 2015). *Q*-participants are representative of a target population, who are asked to express their opinions about the *Q*-statements by sorting them. A large number of participants are not required for a *Q* study (Stainton Rogers 1995). The number of *Q*-participants in a *Q*-study should be between 8 and 30 (Webler et al. 2009) or between 40 and 60 (Stainton Rogers 1995; Watts and Stenner 2005). *Q*-participants can be recruited through purposive and snowball sampling (Webler et al. 2009; Danielson 2009; Cairns 2012). The purposive sampling was employed to identify the *Q* participants in this study. The headmen of the villages contacted with the knowledgeable community members, who can participate in the *Q*-study. Finally, a total number of 96 stakeholders participated in this *Q*-study.

The third step of the *Q*-study was to conduct the *Q*-sorts: The survey procedure of the *Q*-sorts is conducted by using a quasi-normal distribution with different categories (e.g. + 4 to − 4) (Baral et al. 2017). Sorts can be handled fairly quickly; allow 20 or 25 min for a sort of 30 statements (Krueger et al. 2001). A quasi-normal distribution with 11 categories (from + 5 to − 5) was used for this *Q*-study. The *Q*-participants were asked to indicate their agreements or disagreements with the *Q*-statements. They sorted 48 *Q*-statements into a forced normal distribution. The *Q* process was explained to the *Q*-participants at the beginning of each *Q*-sort. The *Q*-sorts lasted about 30–40 min.

The last step of the *Q*-study was to perform the factor analysis. The factor analysis helps to identify different perspectives on a research topic (Winkler and Nicholas 2016). The PQ Method software (Schmolck 2014), retrieved from https://schmolck.org/qmethod/downpqwin.htm (cited on 22.06.2019), was used to analyse the *Q*-data collected. The Principle Component Analysis (PCA) was performed, and then its results were rotated by using a varimax rotation. The factors (perspectives), whose eigenvalues are higher than 1, were chosen. According to Brown (1980), an eigenvalue shows a percentage of total variance of the data explained by each factor. Application of the criteria resulted in four factors. The *Q*-sorts of four factors were selected, when the factor loadings of *Q* sorts were significant at $p < 0.01$ (based on an equation), as emphasized by Brown (1980) and Jaung et al. (2016). The quantitative and qualitative data obtained from the *Q*-method and focus group discussions were used together to interpret the landscape and natural resource social values of MFESs.

Results

The stakeholders' perspectives on the MFESs

The results of the factor analysis revealed that the stakeholders have four distinct perspectives on the MFESs in Kyrenia Region of the Northern Cyprus. These perspectives are conservation, recreation, aesthetic, and symbolic (Table 3 and 4, and Fig. 5).

Perspective (P) 1: Recreation The recreation perspective indicates the direct non-consumptive use value (e.g. hiking and cycling) and utilitarian value (e.g. collection of wild plants for socialization) associated with the MFESs in Kyrenia Region. The *Q*-participants associated with this perspective emphasized that Five Finger Mountain Forests provide various opportunities for recreational activities (e.g. collection of wild plants and mushrooms, and hiking) (44, 2). Although Five Finger Mountains were declared as an Important Bird Area, the *Q*-participants highlighted that the mountains do not attract many bird-watchers (45) due to the international embargo towards the Northern Cyprus since 1974 and its consequences, the lack of a national ecotourism strategy, and ineffective nature conservation initiatives for the region. The *Q*-participants are aware of the importance of the forests for maintaining the ecological processes (16); however, they pointed out that efforts to protect and maintain the mountain forests are inadequate (21, 28, 30). The representatives of this perspective ranked 2 and 44 with the highest and 10 and 47 with the lowest degree. Finally, most of the *Q*-participants expressed their concern about the pressure of urbanization on the forest ecosystems (e.g. the loss of biodiversity, degradation of forest ecosystems, and fragmentation of forest landscapes).

Perspective (P) 2: Aesthetic The aesthetic perspective shows the non-use bequest value of the MFESs (e.g. feeling good). In other words, the stakeholders do not use the forest resources directly. Within this context, the *Q*-participants with the aesthetic perspective strongly emphasized that Five Finger Mountain forests make the region one of the national outstanding landscapes (31), which contributes to enabling aesthetic experience of the local people as well as visitors (32). Therefore, the representatives of this perspective ranked 31 and 32 with the highest degree. On the other hand, the *Q*-participants strongly pointed out that Five Finger Mountains are the symbols of Kyrenia Region (46). In addition, they were highly aware of the important role of the forests for the life-supporting systems such as micro climate regulation (16) and erosion control (22). The *Q*-participants strongly disagreed that 'fuel wood is not an important source of energy' (14), as the local people mostly use the solar energy due to the suitable climate conditions all over the island. They were also disagreed on the *Q*-statement of 'grazing causes serious soil erosion' (23), as they do not deal with livestock husbandry due to the impacts of arid climatic conditions, expensive forage plants, and lack of incentives for livestock husbandry in the Northern Cyprus.

Perspective (P) 3: Conservation The conservation perspective indicates the insurance value of the mountain forests and relevant ecosystem services for Kyrenia Region. In other words, the *Q*-participants strongly highlighted the important role of the conservation and maintenance of biodiversity and forest ecosystems for meeting the needs of current and future generation. Within this context, the *Q*-participants ranked 21 and 33 with the highest and 4 and 47 with the lowest degree. They strongly emphasized that 'reforestation initiatives are insufficient' to protect the forests (21). The *Q*-participants strongly ranked the *Q*-statement regarding 'duty of the local people to protect the forests' (33) due to the lack of relevant governmental initiatives. In addition, they strongly agreed on 'the important role of forests for connecting us with the natural spirit' (48) and 'contributing to our aesthetic experience' (32). On the other hand, they strongly disagreed on the *Q*-statement of 'wild animal meat is not an ecological product' (4). Hunting, which is carried out as a traditional activity in the region, is regulated by the hunting-related wildlife regulation law (No. 18/2009). Despite all, hunting is considered as a threat to the wildlife.

Table 3 The identified perspectives in relation to the Five Finger MFESs in Kyrenia region

Category of MFESs	Perspective	Type of value
Culture-based MFESs	Recreation	This value focuses on the 'direct non-consumptive use value (e.g. recreation)' and 'direct consumptive use/utilitarian value' (e.g. collection of wild plants and mushrooms for the purpose of recreation, socialization, and traditional diet system)
	Aesthetic	This value focuses on the 'non-use bequest value', associated with the conservation of outstanding landscape features for the use (e.g. landscape experience and perception) of future generations
	Symbolic	This value focuses on the 'non-use existence value', associated with the maintenance of Five Finger forest ecosystems and landscape in Kyrenia Region
Regulating-based MFESs	Conservation	This value focuses on the 'option (insurance)' value, associated with the conservation and maintenance of forest ecosystems and landscape for future generations as well as the maintenance of key life-supporting processes

Table 4 The *Q*-statements in relation to the MFESs delivered by Five Finger Mountains in Kyrenia Region of the Northern Cyprus (*n*: 96)

Perspectives (P)			P1: Recreation	P2: Aesthetic	P3: Conservation	P4: Symbolic
No	**Class of MFESs**	**Q-statement**				
Provisioning MFESs (Nutrition, genetic materials, and energy source)						
1	Nutrition	Wild plants and mushrooms are important ecological non-wood forest products	1	1	-2	1
2		Wild plants and mushrooms are collected for nutritional purpose	**5**	3	3	2
3		Forests have a high diversity of important plants for honey production	1	1	1	-2
4		Wild animal meat is an important ecological product	-3	-4	-5	-1
5		Collection of wild plants and mushrooms is an important income generation activity	-3	-3	0	-3
6		Honey production is an important economic activity for local people	-3	-2	-3	-2
7	Nutrition (Conservation)	Overharvesting is an important threat to wild plants and mushrooms	0	0	0	-1
8		Game hunting is a threat to wildlife conservation	-1	-1	-1	-4
9		Grazing is a threat to forest conservation	-1	-2	-2	-4
10	Nutrition (Water)	The reservoir of Geçitköy dam meets the water needs of local people	-5	-1	4	-5
11		Groundwater meets the water need of local people	0	3	-3	1
12	Materials	Forests are an important biota for genetic materials	-2	2	1	0
13		Forests are poor in timber tree species	-2	3	-1	-1
14	Energy	Plant-based fuel wood is an important source of energy	2	-5	-4	-2
15		Plant-based fuel wood is insufficient for meeting the energy need of local people	0	0	0	-2
Regulation MFESs (Maintenance of physical, chemical, and biological conditions)						
16	Climate regulation	Forests play a significant role for micro and regional climate regulation	4	4	3	**5**
17	Soil formation and composition	Forests play a significant role for decomposition and fixing process	0	3	-3	0
18		The costs for soil restoration are insufficient	-2	0	0	1
19	Water regulation	Forests are important ecological units for water infiltration and flood control	0	1	-1	0
20		Drought and water scarcity are a threat to forest conservation	-1	1	1	1
21		Reforestation initiatives are insufficient	4	-3	**5**	0
22	Erosion control	Forests play a significant role for erosion control	2	4	1	3
23		Grazing causes a serious problem of soil erosion	0	-5	-3	-1
24		Mining operation is a threat to the loss and degradation of forests	-4	-4	-4	-5
25	Pollination	Forests host a high number of pollinator species (e.g. bees, butterflies, ants, and mosquitoes)	-2	2	0	2
26		Forest modification causes pollinator rarity or decline	0	-1	0	-3

Perspective (P) 4: Symbolic The symbolic perspective displays 'the non-use existence value' of the mountain forests and their services in the region. In other words, the *Q*-participants derive benefits from simply knowing that the mountain forests and their services exist, even if they are never used or experienced. Within this context, the *Q*-participants strongly ranked 'the symbolic value of Five Finger Mountains for Kyrenia Region' (46) and 'its significant role for climate regulation' (16). In addition, they strongly agreed on the aesthetic (31 and 32) and existence (the benefits we

Table 4 (continued)

27	Pest and disease control	Invasive species threat the health of forests	1	-3	-1	2
28		The damage cost of pests is high for forests	4	-1	2	-3
29	Maintaining nursery populations and habitats	Forests were designated as a protected area	-1	-2	-2	0
30		Investments are insufficient for the conservation of protected areas	3	1	-4	-1
Cultural MFESs (Physical, intellectual, spiritual, symbolic, and other interactions with forest landscapes)						
31	Aesthetic	Mountain forests make the region one of the nation's outstanding landscapes	3	**5**	-2	4
32		Characteristics of forest landscapes contribute to enabling aesthetic experience	-1	**5**	4	4
33	Bequest	Mountain forest communities have a duty to conserve forests and associated resources for the next generation	-1	-1	**5**	2
34	Educational	A visit to forests can teach us a lot about forest ecosystems and associated biota	-2	-1	-1	1
35	Scientific	Mountain forest ecosystems serve as a foundation for many forest ecosystem and wildlife researches	1	1	0	0
36	Experiential interaction	Forest landscapes are important places to contact with nature	0	2	0	3
37		We can experience and enjoy the seasonal changes in forests	-4	0	2	0
38	Heritage	Living in a mountain forest village is a traditional lifestyle that should be preserved	-4	-2	2	-1
39		Changes in forests ultimately weaken traditional lifestyle and identity	1	2	-2	-3
40		Wild plants and other collected species have an important role in traditional diet system	2	2	3	-2
41		Game hunting is a traditional activity maintained	3	0	2	3
42	Existence	It is a joy to know that forest landscapes are maintained	1	-2	1	4
43		Characteristics of forest landscapes have an existence value	2	0	2	1
44	Physical use and entertainment	Forest landscapes provide opportunities for recreational activities (e.g. walking, hiking, and cycling) and ecotourism	**5**	-3	3	3
45		Important Bird Areas attract many bird-watchers	-3	-4	-1	2
46	Symbolic	The Five Finger Mountains are the symbols of Kyrenia Region	3	4	1	**5**
47	Spiritual	Forests help to fulfil spiritual needs	-5	0	-5	-4
48		Being in the forests connects us to the natural spirit	2	-1	4	0

The bold values indicate the Q-statements with the highest degree of importance at the base of each perspective

obtain from knowing that the mountain forests, landscapes, and associated wildlife exist in the region) (42) values of the forests. On the other hand, they mostly disagreed on the *Q*-statements of 'insufficiency of water resources' (10) and 'the impact of mining operations on the forest landscape' (24). The field surveys in the region showed that mining operation and urbanization pressure are the major driving forces that have caused the degradation of the forest landscapes in the region. The *Q*-participants mostly disagreed with this *Q*-statement since no mining operation has been conducted by their villages.

Assessment of the identified perspectives showed that the stakeholders mostly appreciate the culture-based MFESs in Kyrenia Region. This finding indicates that the stakeholders are not heavily dependent on the MFESs in terms of their economic and basic needs, because at least one person at the household level works in the public or private sector. The identified perspectives demonstrate the landscape social values of MFESs. They are important policy instruments; therefore, they should be integrated into the forest conservation strategy for better conservation and sustainable management of the forest landscape and associated ecosystems in Kyrenia Region. The landscape social values are linked with the natural resource social values through the dimension of scale.

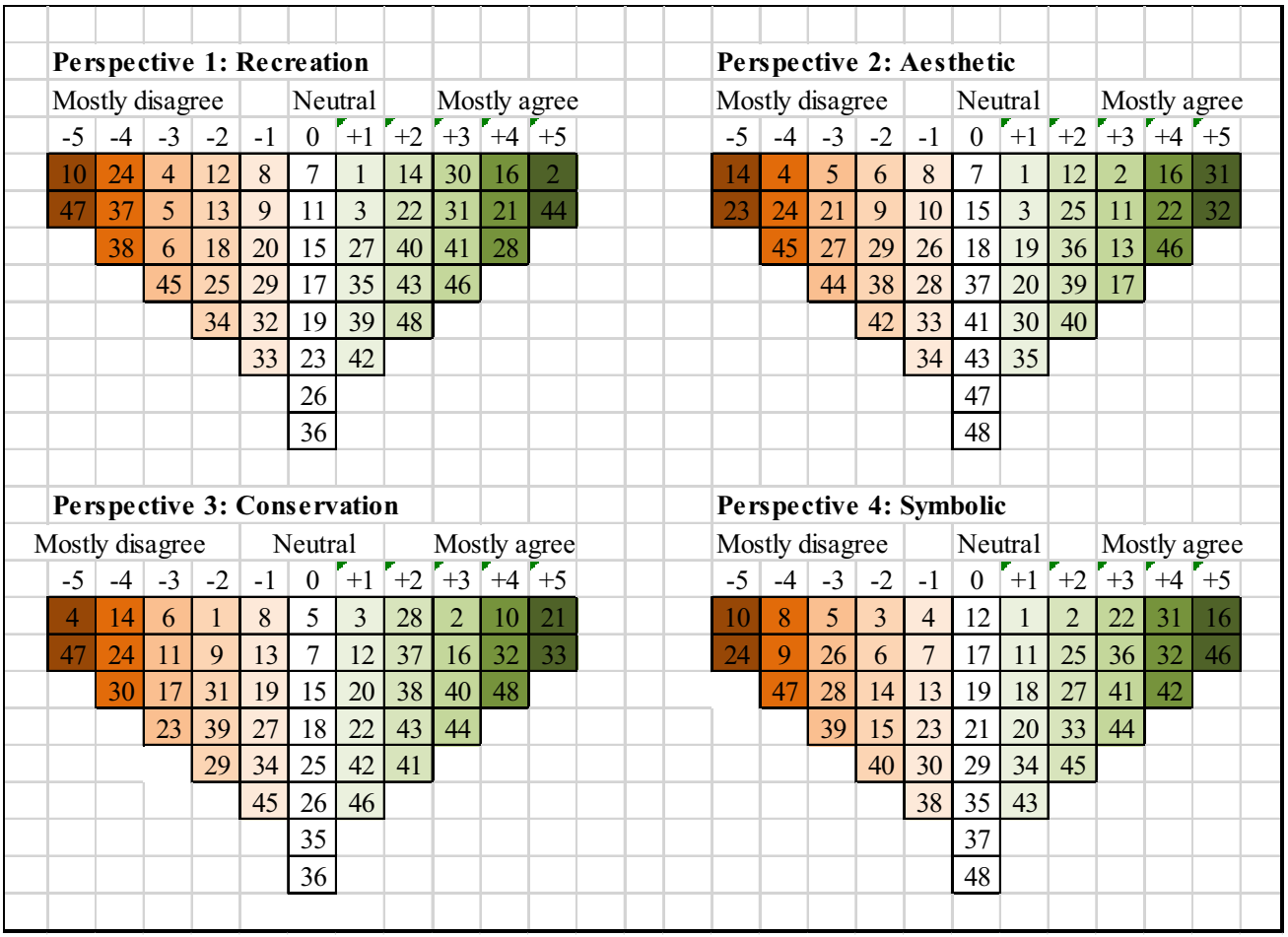

Fig. 5 The distinct perspectives and related *Q*-sets of the MFESs in Kyrenia Region

The non-wood forest products and associated traditional ecological knowledge

Five Finger mountain forest ecosystems host a diverse number of wild plant and mushroom species. The diversity of natural resources has caused the accumulation of relevant traditional ecological knowledge. The results of the focus group discussions revealed that the stakeholders collect 30 wild plant (medicinal, aromatic, and edible plants) and 5 mushroom species from the forests for a variety of purposes (e.g. food, flavouring, and herbal tea) (Tables 5 and 6).

Both tables show that the local people collect the identified plant and mushroom species for own private use (e.g. food and herbal tea), recreation (e.g. hiking), socialization with the community members, and income generation (in a very limited amount). The relevant traditional ecological knowledge displays the natural resource social values of MFESs, which are important cultural values and policy instruments; therefore, they should be integrated into the forest conservation strategy.

Discussion

In this paper, two major questions were addressed: (1) what are the distinct stakeholders' perspectives of MFESs (the landscape social values)? and (2) what are the major non-wood forest products harvested and associated traditional ecological knowledge (the natural resource social values)? In other words, the major landscape and natural resource social values of MFESs were explored in this study. In so doing, the *Q*-methodology was found to be an efficient technique to elicit the landscape social values of MFESs. The focus group discussions were a helpful survey-based approach to record the natural resource social values. The results demonstrated that the human interaction with the mountain forest ecosystems has caused the origination of four distinct landscape social values (recreation, heritage, conservation and symbolic) in Kyrenia Region. In addition, the local people collect 30 wild plant and 3 mushroom species from the forests, and still hold and practice the relevant traditional ecological knowledge. The linkage between the both value

Table 5 The wild plant species collected from the Five Finger Mountain Forests in Kyrenia Region (*n*: 96)

No	Family name	Species name	Common name	Local name	Location of collection (village)	Purpose of use
1	Apiaceae	*Eryngium creticum* L	Eryngo, sea holly	Gazayağı, Mangallo	Çatalköy, Beşparmak, Akçiçek, Esentepe, Bahçeli, Kayalar, Göçeri, Tepebaşı, Malatya, Arapköy, Akdeniz	Food, pickle
2		*Foeniculum vulgare* Mill	Fennel	Dereotu, maraho, arapsaçı	Arapköy	Food
3	Asteraceae/ Compositae	*Cynara cornigera* Lindley	Artichokes	Hostes, dikenotu	Çatalköy, Beşparmak, Akçiçek, Karaağaç, Esentepe, Göçeri, Tepebaşı, Malatya, Bahçeli, Arapköy, Akdeniz, Karşıyaka	Food
4		*Matricaria recutita* L.	Wild chamomile	Papatya	Malatya	Herbal tea
5		*Cynara cardunculus* L.	Wild artichoke	Cinara, yabani enginar, gafgarit	Beşparmak, Karaağaç, Bahçeli, Göçeri, Arapköy, Akdeniz	Food
6		*Onopordum cyprium* Eig.	Echinops	Saracino, Tatlı gavulya	Akçiçek, Esentepe	Food, medicine
7		*Centaurea hyalolepis* Boiss	Centaury	Kadın kasığı	Akdeniz	Food
8		*Scolymus hispanicus* L.	Spanish oyster-plant	Garaot, garadiken, sahura	Çatalköy, Akçiçek, Karaağaç, Esentepe, Tepebaşı, Malatya, Arapköy, Akdeniz	Food
9	Brassicaceae	*Sinapis alba* L.	Mustard	Lapsana	Malatya, Akdeniz	Food
10	Capparaceae	*Capparis spinosa* L.	Caper bush	Gabbar	Çatalköy, Beşparmak, Akçiçek, Esentepe, Bahçeli, Kayalar, Göçeri, Çamlıbel, Malatya, Arapköy	Food, pickle
11	Caryophyllaceae	*Silene vulgaris* (Moench) Garcke	Bladder campion, maidenstears	Yumurta otu, serçe otu, gıcır	Beşparmak, Karaağaç, Esentepe, Bahçeli, Kayalar, Malatya, Akdeniz	Food
12	Lamiaceae/ Labiatae	*Thymus capitatus* (L.) Hoffmanns & Link	Thyme	Tülümbe	Beşparmak, Göçeri, Tepebaşı, Çamlıbel, Malatya, Arapköy, Akdeniz, Karşıyaka	Flavouring, herbal tea, food, broom
13		*Origanum majorana* L.	Marjoram	Dağ kekiği, şapşişa	Tepebaşı, Çamlıbel, Bahçeli, Akdeniz, Karşıyaka	Flavouring, herbal tea, food
14		*Salvia fruticosa* Miller	Sage	Adaçayı	Çatalköy, Beşparmak, Akçiçek, Karaağaç, Esentepe, Bahçeli, Kayalar, Göçeri, Tepebaşı, Çamlıbel, Malatya, Arapköy, Akdeniz, Karşıyaka	Herbal tea
15		*Calamintha incana* (Sibth. & Sm.) Boiss. Ex Benth	Calamints	Yabani nane, pirinç otu, brancolos, glifoni	Tepebaşı	Food, flavouring
16	Leguminosae/ Fabaceae	*Ceratonia siliqua* L.	Carob	Harnıp	Beşparmak, Akçiçek, Karaağaç	Fruit and carob syrup
17	Liliaceae	*Asparagus stipularis* Forrsk	Wild asparagus	Ayrelli	Çatalköy, Beşparmak, Akçiçek, Karaağaç, Esentepe, Bahçeli, Kayalar, Göçeri, Çamlıbel, Tepebaşı, Malatya, Arapköy, Akdeniz, Karşıyaka	Food, pickle
18		*Asparagus officinalis*				
19		*Allium ampeloprasum* L.	Wild leek	Yabani/Yalancı pırasa	Akçiçek, Kayalar, Tepebaşı, Akdeniz	Food
20	Malvaceae	*Malva sylvestris* L.	Mallow	Gömeç, Ebegömeci	Çatalköy, Beşparmak, Akçiçek, Karaağaç, Bahçeli, Kayalar, Malatya, Arapköy, Akdeniz	Food
21	Myrtaceae	*Myrtus communis* L.	Myrtle	Yabani mersin	Göçeri, Tepebaşı	Fruit
22	Oleaceae	*Olea europaea* L.	Olive	Zeytin	Akçiçek, Karaağaç, Bahçeli	Food
23	Oxalidaceae	*Oxalis pes-caprae* L.	Cape sorrel	Ekşilice	Tepebaşı	Food
24	Plantaginaceae	*Plantago coronopus* L. ssp. Commutata (Guss.) Pilger	Buck's-horn plantain	Daşkıran/ Taşkıranotu	Tepebaşı	Medicine
25	Polygonaceae	*Rumex conglomerates* Murray	Clustered dock	Yabani ıspanak, ova ıspanağı	Akçiçek, Karaağaç, Esentepe, Akdeniz	Food
26	Rhamnaceae	*Ziziphus lotus* (L.) Lam	Lotus tree	Gonnara	Göçeri	Fruit
27	Rosaceae	*Crataegus azarolus* L.	Azarole	Alıç	Beşparmak, Akçiçek, Göçeri, Bahçeli	Fruit, jam
28		*Prunus dulcis* D.A. Webb	Almond	Badem	Akçiçek	Fruit
29		*Mespilus germanica*	Medlar tree	Muşmula	Göçeri, Bahçeli, Akçiçek	Fruit
30	Urticaceae	*Urtica urens* L.	Small nettle	Isırganotu	Beşparmak, Bahçeli, Tepebaşı	Food and tea

Table 6 The mushroom species collected from the Five Finger Mountain Forests in Kyrenia Region (*n*: 96)

No	Family name	Scientific name	Local name	Village	Mode of use
1	Agaricaceae	*Agaricus campestris*	Mantar brudi, ova mantarı	Tepebaşı	Food
2		*Coprinus comatus*			
3	Pleurotaceae	*Pleurotuseryngii* var. *ferulae*	Gavcar mantarı	Çatalköy, Karaağaç, Esentepe, Bahçeli, Göçeri, Çamlıbel, Tepebaşı, Malatya, Karşıyaka	Food, pickle, income generation
4	Russulaceae	*Lactarius deliciosus*	Çam/Kırmızı mantar, Çıntar	Çatalköy, Beşparmak, Akçiçek, Karaağaç, Esentepe, Bahçeli, Göçeri, Çamlıbel, Tepebaşı, Malatya, Arapköy, Akdeniz, Karşıyaka	Food, pickle, income generation
5	Russulaceae	*Russula delica*	Beyaz mantar	Bahçeli	Food

types can be expressed with the value dimension of 'scale', as emphasized by Kenter et al. (2015).

The landscape social values reflect the attributes of places and/or locations for people (Brown and Brabyn 2012). Such social values have existed and functioned on this planet thousands of years (Kennedy and Thomas 1995). Assessment of the identified landscape social values of MFESs in Kyrenia Region showed that the stakeholders are still active participants in the landscape. Thus, they think, act, feel, and attach meaning and values to the landscape. Brown and Brabyn (2012) argued that the landscape social values originate in the minds of stakeholders as a collective perception. These values are shared by the local people; therefore, they can be addressed as a common knowledge of cultural values that reflect the community's interest. This argument supports the findings of Kenter et al. (2015). The landscape social values should be used as guiding principles, which can help policymakers to develop the relevant institutions for the conservation and sustainable management of MFESs in Kyrenia Region and elsewhere. The landscape social values are linked with the natural resource social values through a number of cross-scale interactions.

The natural resource social values can be expressed as the values of a particular natural resource (e.g. traditional ecological knowledge about wild edible plants). This knowledge is accumulated, learned, inherited, and transmitted through 'learning by doing' practices. In this study, the major non-wood forest products and relevant traditional ecological knowledge were recorded. Assessment of the results showed that the natural resource social values are still practiced and used in the region. The inherited natural resource social values foster the enhancement and maintenance of the landscape social values at the upper scale. Within this context, it can be argued that both social value types are interlinked. Thus, a decrease in one value type can cause a decrease in the other value type. For example, mining operation has caused the degradation of the forest ecosystems and landscape in some parts of Five Finger Mountains. This degradation can result in the loss or decline of biodiversity, the landscape and natural resource social values, and the relationship between the human and landscape systems in the region. This argument supports the findings of Brown and Brabyn (2012), Kenter et al. (2015), and Kennedy and Thomas (1995).

Finally, the landscape and natural resource social values identified reflect the cultural attachment of the local people to Five Finger Mountains, the community's interest, the values people hold in the social system, which contribute to their wellbeing and welfare. For that reason, both social value types should be recognized as cultural heritage values and integrated into the forest management strategy in Kyrenia Region and elsewhere.

Conclusion

This paper aimed at identifying and assessing the distinct stakeholders' perspectives on the Five Finger MFESs in Kyrenia Region of the Northern Cyprus. The results revealed that the *Q*-participants hold four distinct perspectives on the MFESs. Assessment of the perspectives showed that the *Q*-participants mostly value the culture-based MFESs. In addition, the results of the quantitative data showed that the local people harvest 30 wild plants (medicinal, aromatic and edible plants) and 5 mushroom species from the mountains forests for a variety of purposes (e.g. own needs, socialization, and recreation). Unfortunately, Five Finger Mountain forests and associated ecosystem services have degraded due to the impacts of several drivers of change. Therefore, there is a need to integrate the concept of Ecosystem Services Assessment into the National Biodiversity Conservation, Protected Areas, and/or development plans in the Northern Cyprus. The relevant landscape and natural resource social values should be adapted into those strategies as a policy

instrument to contribute to the better conservation and sustainable management of the mountain forest ecosystems and their services. In addition, mapping of the ecosystem services (ecological, economic, and social) should be carried out to identify and strengthen the sustainability of ecosystems and their services at different scales. On the other hand, payments for ecosystem services, a scheme designed to trade services between users and providers (Wunder 2015), can be a strategic tool to support the cost-efficient management of the MFESs in the region. The scheme of payments for ecosystem services in the Northern Cyprus can trigger to develop a strong institutional capacity and to define property rights of MFESs as well.

The *Q*-methodology was employed to collect the quantitative data on the research objectives in this study. Several limitations of the *Q*-method were detected during the implementation of the *Q*-sets. Firstly, the profile of the *Q*-participants strongly influences the process of the *Q*-study. For example, the low degree of education (e.g. illiteracy) among the *Q*-participants caused difficulties to conduct the *Q*-sets. Illiteracy was one of the major reasons why women did not participate in this *Q*-study. Secondly, a large number of *Q*-statements led to a decrease in the degree of concentration of the *Q*-participants during the process of the *Q*-sets. Therefore, the number of *Q*-statements should be limited between 20 and 30 for those people with a low degree of education.

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References

Adamowicz WL (1995) Alternative valuation techniques: a comparison and movement to a synthesis. In: Willis KG, Corkindale JT (eds) Environmental valuation: new directions. CAB International, Wallingford, pp 144–159

Agbogidi O, Adolor E (2013) Home garden in the maintenance of biological diversity. Appli Sci Rep 1(1):19–25. https://pdfs.semanticscholar.org/9b58/e627e9699abd8bb1a4af517a96b9d9e87d07.pdf. Accessed 10 Dec 2019

Baker RM (2006) Economic rationality and health and lifestyle choices for people with diabetes. Soc Sci Med 63:2341–2353. https://doi.org/10.1016/j.socscimed.2006.06.007

Bagstad KJ, Semmens DJ, Waage S, Winthrop R (2013) A comparative assessment of decision support tools for ecosystem services quantification and valuation. Ecosyst Serv 5:27–39. https://doi.org/10.1016/j.ecoser.2013.07.004

Baral H, Jaung W, Bhatta LD, Phuntsho S, Sharma S, Paudyal K, Zarandian A, Sears R.R, Sharma R, Dorji T, Artati Y (2017) Approaches and tools for assessing mountain forest ecosystem services. Working Paper 235, CIFOR, Bogor, Indonesia. 10.17528/cifor/006755

Bernués A, Rodríguez-Ortega T, Ripoll-Bosch R, Alfnes F (2014) Socio-cultural and economic valuation of ecosystem services provided by Mediterranean Mountain Agroecosystems. PLoS ONE 9(7):e102479. https://doi.org/10.1371/journal.pone.0102479

Bredin YK, Lindhjem H, van Dijk J, Linnell JDC (2015) Mapping value plurality towards ecosystem services in the case of Norwegian wildlife management: a *Q* analysis. Ecol Econ 118:198–206. https://doi.org/10.1016/j.ecolecon.2015.07.005

Brown SR (1980) Political subjectivity: applications of Q methodology in political science. Yale University Press, New Haven and London

Brown SR (1993) A primer on *Q*-methodology. Oper Subj 16:91–138

Brown G, Brabyn L (2012) The extrapolation of social landscape values to a national level in New Zealand. Appl Geogr 35:84–94. https://doi.org/10.1016/j.apgeog.2012.06.002

Cairns R (2012) Understanding science in conservation: a *Q* method approach on the Gal´apagos islands. Conserv Soc 10:217–231. https://doi.org/10.4103/0972-4923.101835

Cantarello E, Newton AC, Martin PA, Evans PM, Gosal A, Lucash MS (2017) Quantifying resilience of multiple ecosystem services and biodiversity in a temperate forest landscape. Ecol Evol 7:9661–9675. https://doi.org/10.1002/ece3.3491

Chan KMA, Guerry AD, Balvanera P, Klain S, Satterfield T, Basurto X, Bostrom A, Chuenpagdee R, Gould R, Halpern BS, Hannahs N, Levine J, Norton B, Ruckelshaus M, Russell R, Tam J, Woodside U (2012) 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

Christie M, Fazey I, Cooper R, Hyde T, Kenter JO (2012) An evaluation of monetary and non-monetary techniques for assessing the importance of biodiversity and ecosystem services to people in countries with developing economies. Ecol Econ 83:67–78. https://doi.org/10.1016/j.ecolecon.2012.08.012

Ciftcioglu GC (2017) Assessment of the relationship between ecosystem services and human wellbeing in the social-ecological landscapes of Lefke Region in North Cyprus. Landsc Ecol 32(4):897–913. https://doi.org/10.1007/s10980-017-0494-y

Commissioner for the Environment (2016) Pentadaktylos Mountain range—a unique natural heritage at risk. Republic of Cyprus. https://www.ec.gov.cy/environment/environment.nsf/All/A72CE0AB9F9E2155C22580AD003C48BD/$file/Οροσειρά%20του%20Πενταδακτύλου-Μια%20μοναδική%20φυσική%20κληρονομιά%20σε%20μεγάλο%20κίνδυνο.pdf. Accessed 09 Dec 2019

Costanza R, d'Arge R, de Groot R, Farber S, Grasso M, Hannon B, Naeem S, Limburg K, Naeem S, O'Neill RV, Peruelo J, Raskin RG, Sutton P, van den Belt M (1997) The value of the world's ecosystem services and natural capital. Nature 387:253–260. https://doi.org/10.1016/S0921-8009(98)00020-2

Cyprus Geological Heritage Tool (2004) General classifications of the aquifers in Cyprus. https://www.cyprusgeology.org/english/4_2_aquifers.htm. Accessed 24 Sep 2019

Danielson S (2009) *Q* method and surveys: three ways to combine *Q* and R. Field Methods 21(3):219–237. https://doi.org/10.1177/1525822X09332082

Dasgupta P (2005) *Q* methodology' for mapping stakeholder perceptions in participatory forest management. Annex B3 of the Final Technical Report of project R8280. Delhi: Institute of Economic Growth, p 44

Daily G (1997) Nature's services: societal dependence on natural ecosystems. Island Press, Washington, DC

Dendoncker N, Keune H, Jacobs S, Gomez-Baggethun E (2013) Inclusive ecosystem services valuation. In: Jacobs S, Dendoncker S, Keune N (eds) Ecosystem services: global issues, local practices. Elsevier, San Diego, pp 3–12

Donner JC (2001) Using Q-sorts in participatory processes: an introduction to the methodology. In: Krueger AR, Casey MA, Donner J, Kirshe S, Maack JN (eds) Social analysis selected tools and

techniques, social development papers, paper no: 36, June 2001. The World Bank, Washington, DC, pp 24–49
Eden S, Donaldson A, Walker G (2005) Structuring subjectivities? Using *Q* methodology in human geography. Area 37:413–422. https://doi.org/10.1111/j.1475-4762.2005.00641.x
Egeland G, Harrison G (2013) Health disparities: promoting indigenous peoples' heath through traditional food systems and self-determination. In: Kuhnlein H, Erasmus B, Spigelski D, Burlingame B (eds) Indigenous peoples' food systems and well-being interventions and policies for healthy communities. FAO, Canada, pp 9–22
European Commission (2011) The EU Biodiversity Strategy to 2020. Publications Office of the European Union, 2011, Luxembourg. 10.2779/39229.
EU FP7 OpenNESS Project (2017) Integrated valuation of ecosystem services, Guidelines and experiences (eds: Barton DN and Harrison PA), Deliverable 33–44. European Commission FP7. https://www.openness-project.eu/sites/default/files/OpenNESS%20D3.3_D4.4_FINAL.pdf. Accessed 10 Dec 2019
FAO (2012) State of the World's forests (2012) Food and Agriculture Organization of the United Nations (FAO). Italy, Rome
Farber SC, Costanza R, Wilson MA (2002) Economic and ecological concepts for valuing ecosystem services. Ecol Econ 41(3):375–392. https://doi.org/10.1016/S0921-8009(02)00088-5
Fish R, Burgess J, Chilvers J, Footitt A, Haines-Young R, Russel D, Turner K, Winter DM (2011) Participatory and deliberative techniques to embed an ecosystems approach into decision making: an introductory guide (Defra Project Code: NR0124). Defra, London
Fisher B, Bateman I, Turner RK (2011) Valuing ecosystem services: Benefits, values, space and time. Ecosystem Services Economics (ESE) Working Paper Series, Division of Environmental Policy Implementation, Paper No 3. UNEP, Kenya
Garí J (2001) Biodiversity and indigenous agroecology in Amazonia: the indigenous peoples of Pastaza. Etnoecológica 5(7):21–37
Grêt-Regamey A, Brunner SH, Kienast F (2012) Mountain ecosystem services: who cares? Mt Res Dev 32(S1):23–S34. https://doi.org/10.1659/MRD-JOURNAL-D-10-00115.S1
Hacıoğulları İ (2017) Saliva species of Cyprus and spatial distribution analysis of Salvia Veneris Hedge endemic to Northern Cyprus. Near East University. MS Thesis in Landscape Architecture. Nicosia. https://docs.neu.edu.tr/library/6674841274.pdf. Accessed 13 Mar 2019
Hadjikyriakou G, Hadjisterkotis E (2002) The adventive plants of Cyprus with new records of invasive species. Zeitschrift fur Jagdwissenschaft 48(Supplement):9–71. https://link.springer.com/content/pdf/10.1007%2FBF02192393.pdf. Accessed 10 Dec 2019
Hagan K, Williams S (2016) Oceans of discourses: utilizing *Q* Methodology for analyzing perceptions on marine biodiversity conservation in the Kogelberg Biosphere Reserve, South Africa. Front Mar Sci 3:188. https://doi.org/10.3389/fmars.2016.00188
Haines-Young R, Potschin MB (2010) The links between biodiversity, ecosystem services and human well-being. Ecosys Ecol 1:110–139. https://doi.org/10.1017/CBO9780511750458.007
Haines-Young RH, Potschin M (2013) Common International Classification of Ecosystem Services (CICES): consultation on Version 4, August–December 2012. EEA Framework Contract No EEA/IEA/09/003. https://cices.eu/content/uploads/sites/8/2012/07/CICES-V43_Revised-Final_Report_29012013.pdf. Accessed 05 Dec 2019
Haines-Young RH and Potschin M (2014) Typology/Classification of ecosystem services. In: Potschin M and Jax K (eds) OpenNESS Ecosystem Services Reference Book, EC FP7 Grant Agreement No. 308428. Available at: https://www.openness-project.eu/sites/default/files/SP_Classification_of_ecosystem_services.pdf (cited on 05.12.2019).
Haines-Young R, Potschin MB (2018) Common International Classification of Ecosystem Services (CICES) V5.1 and guidance on the application of the revised structure. https://cices.eu/content/uploads/sites/8/2018/01/Guidance-V51-01012018.pdf. Accessed 05 Dec 2019
Hattam C, Böhnke-Henrichs A, Börger T, Burdon D, Hadjimichael M, Delany A, Atkins JP, Garrard S, Austen MC (2015) Integrating methods for ecosystem service assessment and valuation: mixed methods or mixed messages? Ecol Econ 120:126–138. https://doi.org/10.1016/j.ecolecon.2015.10.011
Hawkins K (2003) Economic valuation of ecosystem services. University of Minnesota, October 2003. https://www.unepscs.org/Economic_Valuation_Training_Materials/01%20Values%20of%20Coastal%20Habitat%20Goods%20and%20Services/11-Economic-Valuation-Ecosystem-Goods-Services.pdf. Accessed 10 May 2018
Jamnadass R, Place F, Torquebiau E, Malézieux E, Iiyama M, Sileshi GW, Kehlenbeck K, Masters E, McMullin S, Weber JC, Dawson IK (2013) Agroforestry, food and nutritional security. ICRAF Working Paper No. 170. Nairobi, World Agroforestry Centre. https://doi.org/10.5716/WP13054.PDF
Jaung W, Putzel L, Bull GQ, Kozak R, Markum A (2016) Certification of forest watershed services: a *Q* methodology analysis of opportunities and challenges in Lombok, Indonesia. Ecosyst Serv 22:51–59. https://doi.org/10.1016/j.ecoser.2016.09.010
Kelemen E, Gómez-Baggethun E (2008) Participatory methods for valuing ecosystem services. THEMES Summer School, Lisbon 26.05.-05.06.2008. https://www.researchgate.net/profile/Eszter_Kelemen/publication/247773660_Participatory_Methods_for_Valuing_Ecosystem_Services/links/02e7e51dd0cc9f0c6a000000/Participatory-Methods-for-Valuing-Ecosystem-Services.pdf. Accessed 21 July 2019
Kelemen E, García-Llorente M, Pataki G, Martín-López B, Gómez-Baggethun E (2016) Non-monetary techniques for the valuation of ecosystem service. In: Potschin M, Jax K (eds) OpenNESS Ecosystem Services Reference Book, EC FP7 Grant Agreement no. 308428. https://www.openness-project.eu/sites/default/files/SP-Non-monetary-valuation.pdf. Accessed 05 Dec 2019
Kennedy JJ, Thomas JW (1995) Managing natural resources as social value. In: Knight RL, Bates SF (eds) A new century for natural resources management, Island Press, Washington DC, pp 311–322. https://www.umass.edu/hd/resources/KennedyValues.pdf. Accessed 12 Dec 2019
Kenter JO, O'Brien L, Hockley N, Ravenscroft N, Fazey I, Irvine KN, Reed MS, Christie M, Brady E, Bryce R, Church A, Cooper N, Davies A, Evely A, Everard M, Fish R, Fisher JA, Jobstvogt N, Molloy C, Orchard-Webb J, Ranger S, Ryan M, Watson V, Williams S (2015) What are shared and social values of ecosystems? Ecol Econ 111:86–99. https://doi.org/10.1016/j.ecolecon.2015.01.006
Kenter JO (2016) Deliberative and non-monetary valuation. In: Haines-Young R, Potschin M, Fish R, Turner RK (eds) Routledge handbook of ecosystem services, part II. Routledge, Abingdon
Krueger RA, Casey MA (2001) Designing and conducting focus group interviews. In: Krueger AR, Casey MA, Donner J, Kirshe S, Maack JN (eds) Social analysis selected tools and techniques, Social Development Papers, Paper No: 36, June 2001. The World Bank, pp 4–23
Krueger RA, Casey MA, Donner J, Kirsch S, Maack JN (2001) Social analysis, selected tools and techniques. Social Development Paper, Number 36, Social Development Department, the World Bank. Washington
La Notte A, D'Amato D, Mäkinen H, Paracchini ML, Liquete C, Egoh B, Geneletti D, Crossman ND (2017) Ecosystem services classification: a systems ecology perspective of the cascade framework. Ecol Indic 74:392–402. https://doi.org/10.1016/j.ecolind.2016.11.030

Maes J, Teller A, Erhard M, Liquete C, Braat L, Berry P, Egoh B, Puydarrieux P, Fiorina C, Santos F, Paracchini ML, Keune H, Wittmer H, Hauck J, Fiala I, Verburg PH, Condé S, Schägner J.P, San Miguel J, Estreguil C, Ostermann O, Barredo JI, Pereira HM, Stott A, Laporte V, Meiner A, Olah B, RoyoGelabert E, Spyropoulou R, Petersen JE, Maguire C, Zal N, Achilleos E, Rubin A, Ledoux L, Brown C, Raes C, Jacobs S, Vandewalle M, Connor D, Bidoglio G (2013) Mapping and assessment of ecosystems and their services. An analytical framework for ecosystem assessments under action 5 of the EU biodiversity strategy to 2020. Publications Office of the European Union, Luxembourg. 10.2779/12398

Maes J, Barbosa A, Baranzelli C, Zulian G, e Silva FB, Vandecasteele I, Hiederer R, Liquete C, Paracchini ML, Mubareka S, Jacobs-Crisioni C, Castillo CP, Lavalle C (2015) More green infrastructure is required to maintain ecosystem services under current trends in land-use change in Europe. Landsc Ecol 30:517–534. https://doi.org/10.1007/s10980-014-0083-2