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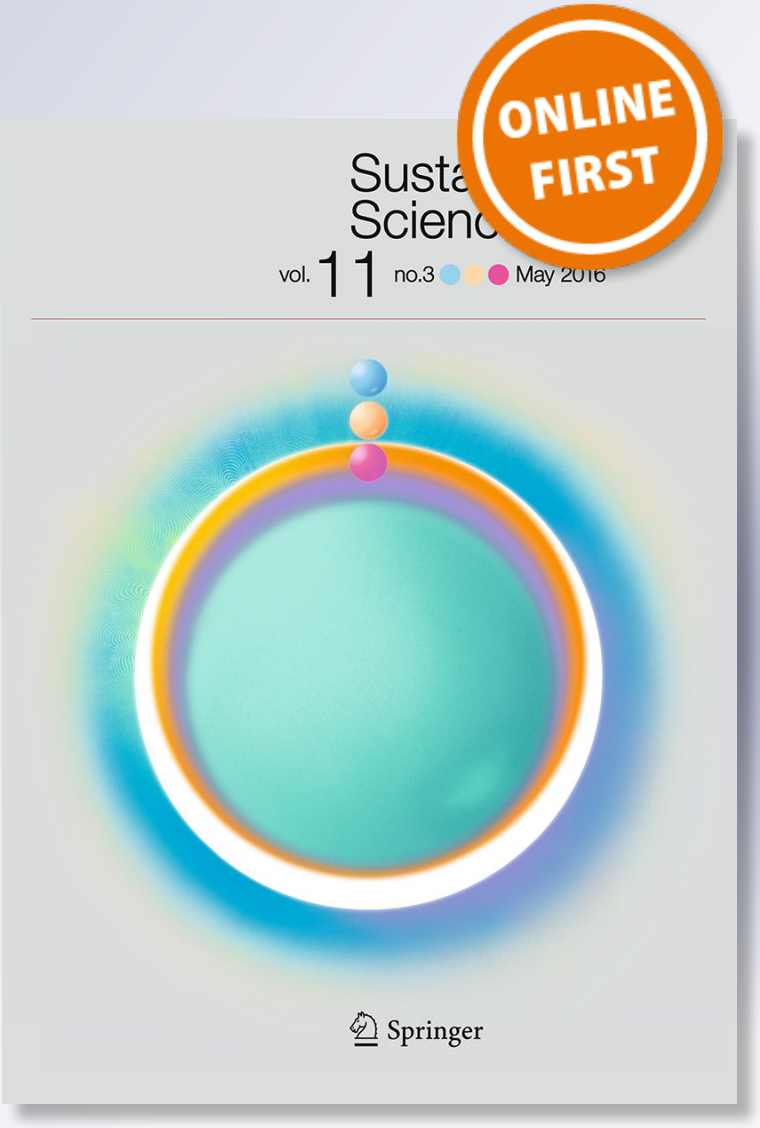

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ORIGINAL ARTICLE

Evaluating resilience for the management of social–ecological production landscapes and seascapes in Lefke Region of North Cyprus through adaptive comanagement

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Abstract
The purpose of this study is to evaluate resilience for the management of social–ecological production landscapes and seascapes (SEPLS) in Lefke Region of North Cyprus through adaptive comanagement (ACM). To this end, the following key attributes of ACM within the context of resilient landscape management were evaluated: diversity of social learning approaches, stakeholders and social networks, the role of traditional knowledge in management, effectiveness of the existing institutions for landscape conservation and management and potential policy responses for building and strengthening the landscape resilience. The method of the study comprised: development of an ACM evaluation framework for the SEPLS, exploration of the potential indicators for assessing the resilience, data collection with the semi-structured interviews and data evaluation. The collected data were evaluated based on a 1–5 Likert scale. The result of the evaluation revealed that the current governance of the SEPLS is far from being successful. The average relative value of the key attributes of the resilience for the management of the SEPLS seems to change from moderate to a very low degree. However, it is argued that the mechanism of ACM can be built particularly based on collaboration and power sharing, among the key stakeholders operating at different levels. Finally, a set of policy-oriented responses were recommended to contribute to the resilient landscape management in the region. It is expected that the results of this study can help policy makers, resource and landscape planners to establish and strengthen the resilient landscape management in Lefke Region and elsewhere.

Keywords Adaptive comanagement · Resilience · Socio–ecological production landscapes and seascapes · Landscape management · Landscape governance

Introduction

Throughout history, humanity has shaped the nature and nature has shaped the development of human society (Turner et al. 1990). This mutual dependency between humanity and the natural environment (Folke et al. 2003; Berkes and Folke 1998) has caused the formation of social–ecological systems[1] (Phuong 2005), such as social–ecological landscapes.

Social–ecological landscapes (SELs) are complex adaptive systems, which are characterized by their capacity to self-organize and to adapt uncertainties (Levin 1998; Pahl-Wostl 2007; Biggs et al. 2012). SELs are a linked system of people and nature, in which people depend on nature, and nature is influenced by people (Berkes et al. 2003). Such landscapes have been shaped over generations by sustainable use of natural resources. The health of SELs depends on the health of ecosystems and on the socio-cultural aspects of communities (UNU-IAS 2013). SELs include both ecological and social systems (Binder et al.

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[1] Social–ecological systems refer to an integrated, coupled system of people and environment (Armitage et al. 2009). Humans and ecosystems are intrinsically linked in social ecological systems (Ros-Tonen et al. 2014).

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2013). All components of ecological and social systems are functionally linked in the complex SELs (Pickett et al. 1997). A variety of different names is used for such landscapes across countries and languages (e.g. Satoyama in Japan and Dehesa in Spain). The term social–ecological production landscapes and seascapes (SEPLS) has been coined to refer them collectively (UNU-IAS et al. 2014). Therefore, the term SEPLS will be used instead of SELs after this. These landscapes develop continually depending on particularly their exposure to disturbances, their resilience and adaptive capacity on the long-term (Charette-Castonguay 2014). Resilience is a key property of SEPLS in the face of complexity and uncertainty (Folke et al. 2003; Phuong 2005).

The term 'resilience (resiliency)' refers to the capacity or ability of a system to deal with a disturbance or change (Plieninger and Bieling 2012; Ciftcioglu 2017a). The concept of resilience has emerged to understand changes and multiple cross-scale interactions in social–ecological systems (Gunderson and Holling 2002; Ciftcioglu 2017a). The resilience of SEPLS comprises both ecological and social resilience. The ecological resilience refers to the buffering capacity or the ability of a system to absorb perturbations or recover from a disturbance. Resilience is the key to biodiversity conservation, and diversity itself enhances resilience, stability and ecosystem functioning, and sustainability in the wider sense (Adger 2000). The key principles for evaluating the ecological resilience of SEPLS include biodiversity (Levin 1998; Folke et al. 2004; Martín-López et al. 2009), connectivity (Kindlmann and Burel 2008), and spatial heterogeneity (Pickett et al. 1997). The social resilience refers to the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental changes. The resilience of social systems is related in some ways to the resilience of ecological systems, on which social systems depend (Adger 2000). The key principles for assessing the social resilience of SEPLS include food security, economic development, knowledge and education, gender and demography, clear ownership and land management, cultural heritage and infrastructure (Ciftcioglu 2017a). Resilience of SEPLS is focused on how a society deals with changes. Resilient SEPLS provide essential ecosystem services (e.g. supply of food, energy and drinking water) to society (Berkes and Folke 1998; Unnasch et al. 2008). Within this context, adaptive comanagement (ACM)—a promising approach (Trimble et al. 2015; Armitage et al. 2009; Plummer et al. 2012)—can be a strategic instrument towards building and strengthening the resilient landscape management.

The term 'adaptive comanagement (ACM)' has emerged in the course of a project at the Center for International Forestry Research (CIFOR) in 1997 with the aim of managing complex social–ecological systems (Armitage et al. 2009). ACM is a process by which institutional arrangements and ecological knowledge are tested and revised in a dynamic, on-going and self-organized process of trial and error (Folke et al. 2002, p 8). According to Olsson et al. (2004a, p 75), ACM is a flexible, community-based system of resource management, in which rights and responsibilities are jointly shared across multiple organizational scales. Folke et al. (2005) pointed out that ACM is an approach to natural resource management that aims to integrate heterogeneous actors into a flexible community-based system of natural resource governance. Armitage et al. (2007) emphasized that ACM is an institutional and organizational response to complex adaptive systems and the challenge of resilient governance[2] and management.[3] Fundamentally, ACM is a self-organizing process that provides a framework within which different stakeholders across multiple scales are connected through networks from local users to international bodies in an on-going process of learning and responding to changes in social–ecological systems (Olsson et al. 2004a). ACM represents a potential innovation in natural resource governance under conditions of change, uncertainty, and complexity (Plummer and Armitage 2007). Therefore, it has received considerable attention for addressing the circumstances of complexity and uncertainty as well as enhancing the fit with ecosystem dynamics (Plummer et al. 2012).

ACM is one of the outcomes of adaptive management[4] and collaborative management[5] experiences, in which the

[2] Governance is the process of resolving trade-offs and providing a vision and direction for sustainability (Hahn et al. 2008). According to Tai (2015), governance refers to the structures and processes through which human societies share power; shape incentives, identity, and decision making; interact with each other; and influence outcomes. Governance involves stakeholders and actors (e.g. government, communities and business), different institutions (both formal and informal), various actions and decision-making processes (e.g. governmental and jurisdiction processes and public consultation (Armitage et al. 2009).

[3] Management is the operationalization of a vision, and monitoring provides feedback and synthesizes the observations to a narrative of how the situation has emerged and might unfold in the future (Hahn et al. 2008).

[4] Adaptive management focuses on learning-by-doing, takes place over the medium-to-long term through cycles of learning and adaptation, and concentrates on the relationships, requirements and capacity of managers (Plummer et al. 2012). It is often presented as a tool to frame the philosophical, methodological and practical challenges associated with the management of natural resources (Armitage et al. 2007).

[5] Collaborative management/comanagement/joint management refers to the sharing of power and responsibility between the government and local resource users (Berkes 2009, p 1691). Comanagement establishes institutional links (both horizontal and vertical) for sharing learning-by-doing between various actors, over a medium-to-long-term horizon. It is multi-scale in spatial scope and concerned with enhancing and including the capacity of all actors with a stake for sustainably managing the resource at hand (Plummer et al. 2012).

learning and linking functions (horizontally and vertically) of governance are emphasized (Armitage et al. 2008; Trimble et al. 2015). The aim of ACM is to solve resource problems through collaboration as well as to foster social–ecological resilience and ecologically sustainable livelihoods (Plummer and Armitage 2007; Berkes 2004; Carlsson and Berkes 2005; Folke et al. 2005; Trimble et al. 2015; Armitage et al. 2007; Plieninger and Bieling 2012). The objectives of ACM are learning, collaboration, and multilevel governance (McDowell 2012).

The key attributes of ACM comprise a focus on integrating different knowledge systems, learning-by-doing, collaboration and power sharing among community, regional, and national levels and management flexibility (Trimble et al. 2015; Olsson et al. 2004a; Armitage et al. 2007). These attributes foster a more effective approach of resource governance (Cox et al. 2009). The scholars in the field of ACM draw attentions to 12 variables (bridging organizations, incentives, shared responsibility, leadership, conflict, enabling conditions, trust, shared power, organizational interactions, networks, knowledge and learning) (Plummer et al. 2012) within the context of building and strengthening the resilient management of resources and landscapes. The key variables comprise learning, knowledge, networks, shared power and organizational interactions (Table 1).

Table 1 indicates that ACM is a process, which brings together collaborative and adaptive approaches in pursuit of sustainable resource use and social–ecological resilience. The overall outcomes of ACM are sustainability and social–ecological resilience of complex systems (Plummer et al. 2012). Within this context, SEPLS of Lefke Region located in North Cyprus can be a distinctive case study. Accordingly, the purpose of this study is to evaluate resilience for the management of the SEPLS in Lefke Region of North Cyprus through ACM. To this end, the following key attributes of ACM within the context of resilient landscape management were evaluated: diversity of social learning approaches, stakeholders and social networks, the role of traditional knowledge in management, effectiveness of the existing institutions for landscape conservation and management and potential policy responses for building and strengthening the landscape resilience. It is expected that the results of this study can help policy makers, resource and landscape planners to establish and strengthen the resilient landscape management in Lefke Region and elsewhere.

Materials and methods

Study area: Lefke Region

Cyprus Island is located in the Eastern Mediterranean Region with a typical Mediterranean climate; hot dry summers and mild winters (Delipetrou et al. 2008; Ciftcioglu 2015). The island is an element of the Eastern Mediterranean phytogeographic region, which is internationally recognized as one of the world's floristic hotspots due to its species richness and high ration endemics (Meídail and Queízel 1997; Ciftcioglu 2017a, b). The landscapes of Cyprus Island are a mosaic of natural and semi-natural habitats (Ciftcioglu 2016). Lefke Region has been selected as the case study area due to its characteristic landscape features (Fig. 1).

Lefke Region is located on the northwestern part of Cyprus Island. The integrative relationship between nature and culture has caused the generation of significant SEPLS in the region (Ciftcioglu 2016).The SEPLS consist of a

Table 1 The key attributes of ACM in comparison with adaptive and collaborative management

Type of management	Key attributes	References
Adaptive management	Learning-by-doing	Folke et al. (2003), Hahn et al. (2006), Plummer et al. (2012)
	Adaptation	
Collaborative (joint- or co- management)	Institutional linkages (both horizontal and vertical)	Berkes (2002), Hahn et al. (2006), Plummer et al. (2012), Plummer and Armitage (2007)
	Sharing power and responsibilities	
	Capacity development	
Adaptive comanagement (ACM)	Self-organized learning-by-doing	Plummer et al. (2012), Phuong (2005), Trimble et al. (2015), Folke et al. (2002, 2003, 2005), Olsson et al. (2004a, b), Armitage et al. (2007, 2009), McDowell (2012), Ros-Tonen et al. (2014), Carlsson and Berkes (2005)
	Institutional linkages (both horizontal and vertical)	
	Collaboration and power sharing between government agencies and local resource users	
	Synthesis of different knowledge systems	
	Flexible institutional arrangements and management	

Accessed on 01.11.2016

Fig. 1 Location of Lefke Region (Ciftcioglu 2017b)

mosaic of terrestrial (e.g. pine forest, maquis and agricultural lands), coastal (e.g. beaches) and marine ecosystems (Ciftcioglu 2017b). The terrestrial landscapes comprise rural landscape characteristics with a significant portion of the Mediterranean maquis vegetation (e.g. Calabrian pine forest, laurel, caper, carob, and mastic tree) (Ciftcioglu 2015). The maquis vegetation has shrunk due to the impacts of on-going urbanization process in the region (Ciftcioglu 2017a). The pine forest has been threatened by the disturbing factors of sac pine beetle, overgrazing, cutting, and erosion (Ciftcioglu 2015). Despite these problems, the local people continue to collect various terrestrial (49 wild plant and 5 mushroom species, flowers of citrus and pinecone) and marine (30 fish species, sea salt and seashells) products from the SEPLS for a variety of reasons (e.g. private use, socialization and nature experience) (Ciftcioglu 2016). In addition, suitable Mediterranean climate, spectacular landscapes, and many historical sites (e.g. Soli Ruins and Vouni Palace) are among the other valuable environmental and cultural resources of the region (Fig. 2).

There are 12 villages in Lefke Region. According to the statistical data of the State Planning Organization (2013), the total population of Lefke Region is 11,091 (KKTC Devlet Planlama Örgütü 2013; Ciftcioglu 2016). The local people are primarily engaged in agriculture sector (Ciftcioglu 2015).The younger population in the villages either work as officials in European University of Lefke located in the region or provide their livelihoods from the public and private sectors in Nicosia or Kyrenia Towns.

Agricultural ecosystems have been developed by the local communities to produce food and other ecosystem services. Most of the local people have relied on traditional agricultural practices over the centuries (Ciftcioglu 2017a). Citrus and olive are the dominating plantations in the region (Ciftcioglu 2015). However, agricultural lands (particularly citrus plantations) have increasingly abandoned and/or converted into other types of land uses (e.g. settlement) due to the lack of access to international markets. This situation has caused degradation of the harmonious relationship between agriculture and rural society, the SEPLS and associated ecosystem services (Ciftcioglu 2017a). On the other hand, the current spatial planning strategies and relevant institutions have largely ignored the conservation and management of landscapes in Northern Cyprus. This ignorance has caused degradation of the SEPLS as well. Despite all, the SEPLS in Lefke Region still provide essential ecosystem services for human well-being; therefore, the SEPLS should effectively be managed for the continuity of those benefits.

The conceptual framework and methods

This part of the study comprises three sub-sections: development of an ACM evaluation framework for the SEPLS of Lefke Region, exploration of the potential indicators for evaluating resilience for the management of the SEPLS, data collection and evaluation.

Development of an ACM evaluation framework for the SEPLS of Lefke Region

Design and implementation of a management mechanism are a priority to regulate the use of landscapes, associated natural resources and ecosystem services (Cetinkaya 2011). Within this context, an ACM evaluation framework for the SEPLS of Lefke Region was developed by reviewing the relevant literatures (Trimble et al. 2015; Tai 2015; Plummer and Armitage 2007; Plummer et al. 2012; Berkes et al. 2003; Cummings et al. 2005) and considering the local conditions (Fig. 3).

Figure 3 shows that the ACM evaluation framework for the SEPLS in Lefke Region comprises three parts: landscape resilience dimensions, the ACM process and the ACM outcomes.

The resilience dimensions of the SEPLS consist of three types of settings: ecological, social, and institutional. The ecological setting comprises the major ecosystems (e.g. pine forest, maquis formation, and agricultural lands), which provide a range of ecosystem services (e.g. edible

Fig. 2 Some views from the SEPLS of Lefke Region

plants, air quality, and recreation opportunities) for the local communities. The social setting includes local people, their economic activities, values, different types of knowledge (e.g. traditional/indigenous), and infrastructure. Human activities directly affect the dynamics of ecosystem structures and functions. Within this context, the ecological and social settings are mutually related. Both ecological and social settings are influenced by an institutional setting. The institutional setting means existing enabling legislations, their goals and balance between the resource users and institutional arrangement (Trimble et al. 2015). Institutions directly affect both ecological and social settings and their resilience (Adger 2000; Ciftcioglu 2017b). As institutions are created and implemented by humans, the social and institutional settings are mutually interrelated. Adger (2000) emphasized that institutional resilience is built on diversity principle (e.g. diversity of organizations) to ensure that all relevant sectors are adequately represented. The institutional setting directly affects the ecological setting; for example, the absence or weakness of relevant institutions can lead to overharvesting of natural resources in line with the market demands, which can result in habitat destruction and species decline. Cetinkaya (2011) highlighted that institutions can enforce local communities and other stakeholders with the requirement of the sustainable use of resources. Thus, the existence and effective implementation of international (e.g. the Convention on Biological Diversity) and national institutions (e.g. national landscape planning strategy) directly contribute to strengthening the ecological and social resilience, and thereby the resilient landscape management in Lefke Region. Unfortunately, the landscape resilience dimensions are adversely influenced by the impacts of international embargo and relevant restrictions against North Cyprus since 1974 and the absence of a national landscape management strategy.

The second part of the ACM evaluation framework is the ACM process, which consists of stakeholders, knowledge systems, and relevant institutions. Participation and collaboration are the key features of the ACM process. Both participation and collaboration create opportunities for learning-by-doing and stakeholder involvement in the

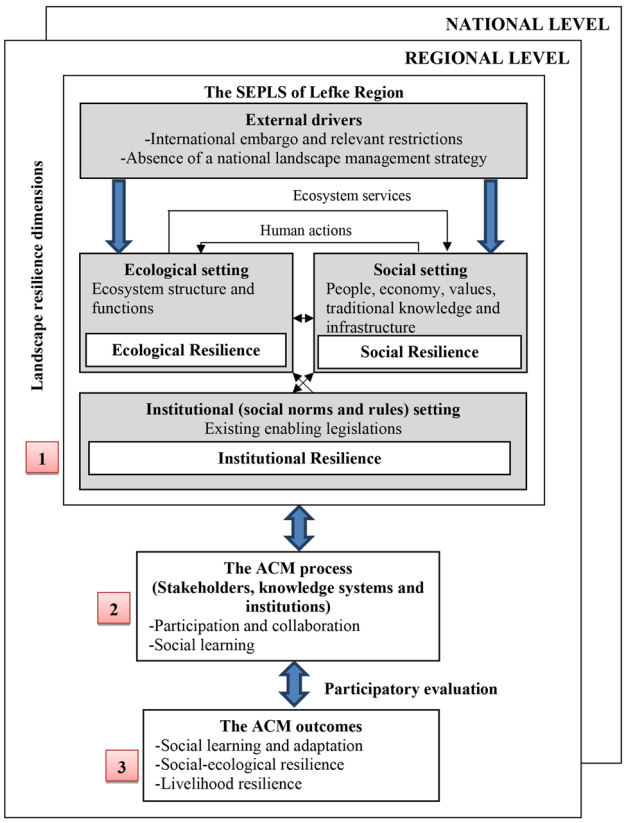

Fig. 3 The ACM evaluation framework for the SEPLS in Lefke Region (developed from Phuong 2005; Ciftcioglu 2017b)

process of model construction and encourage a sense of ownership for stakeholders (Maynard et al. 2011). Thus, participatory approaches can establish a common dialogue among all relevant stakeholders in terms of social learning, collaboration and sharing power, effective implementation of institutions and integration of traditional knowledge into landscape planning and improving the quality of decisions for the management of the SEPLS (Ciftcioglu 2016).

The major outcomes of a successful implementation of the ACM process are social–ecological resilience, resilient livelihoods and social learning and adaptation.

Potential indicators for evaluating the ACM process of the SEPLS in Lefke Region

Indicators are components which are used to assess the condition of the environment or to provide an early warning signal of changes in the environment (Kurtz et al. 2001; Müller and Burkhard 2012; Ciftcioglu 2017a; Dale and Beyeler 2001). Accordingly, a set of appropriate indicators for evaluating the ACM process of the SEPLS in Lefke Region were developed by reviewing the relevant literatures (Table 2).

Table 2 shows that evaluation of the ACM process for the SEPLS in Lefke Region comprises four main principles and relevant indicators.

Social learning is defined as a change in understanding that goes beyond the individual to become situated within wider social units or communities of practice through social interactions between actors (Reed et al. 2010, p 6). Social learning has emerged as a dominant theme in social–ecological systems. ACM takes learning as a necessary starting point and requires greater specificity with respect to the learning objectives. Systematic learning under conditions of complexity and uncertainty requires meaningful social interaction and a concerted effort to build trust. Local and traditional knowledge support learning through dialogue and deliberation. ACM needs to apply diverse learning strategies to understand social–ecological feedbacks. Social learning contributes to the accumulation of collective social memory, comprising historical experiences, knowledge, values, and institutions that could be drawn upon for future responses to change (Olsson et al. 2004a). As a result of reviewing the relevant literatures, diversity of different learning approaches (e.g. online, collaborative, practically oriented, and project-oriented learning) (Dlouhá et al. 2013) is proposed as an indicator within the context of this principle.

Integration of traditional knowledge: Traditional knowledge is a cumulative body of knowledge evolved by adaptive processes and handed down through generations (Berkes 1999). Knowledge systems and associated institutions represent a reservoir, a memory, of long-term social–ecological adaptations to dynamics and change (Berkes and Folke 2002). Management practices, associated institutions, and organizational structures seem to have developed through learning-by-doing, building knowledge and experience in the process (Olsson et al. 2004a). The management of complex adaptive systems may benefit from the combination of different knowledge systems, including scientific, indigenous, and local knowledge (Olsson et al. 2004a). Scientific knowledge can enhance the efforts to manage ecosystems and SEPLS. Integration of traditional knowledge with scientific knowledge can strengthen relevant management actions. In addition, integration of both knowledge systems can contribute to understanding ecosystem dynamics and developing collaboration with the communities (Berkes and Folke 2002). ACM opens up possibilities for linking traditional knowledge directly into the decision-making process (Berkes 2009). Three indicators were proposed within the context of this principle by analysing the relevant references.

Collaboration and power sharing: Collaboration is the process of two or more stakeholders working together to achieve a goal successfully. Power sharing refers to the collective sharing of obligations for a resource or

Table 2 The appropriate principles and relevant indicators for evaluating the ACM process of the SEPLS in Lefke Region

Principle	Relevant theme	Relevant indicator	References
Social learning	Learning	Diversity of learning approaches	Plummer et al. (2012), Olsson et al. (2004a, b)
			Dlouhá et al. (2013)
			Chapman et al. (2016)
Synthesis of different knowledge systems	Traditional knowledge	Degree of share and transmission of traditional knowledge	Plummer et al. (2012)
			Berkes (1999)
		Degree of documentation of traditional knowledge	Olsson et al. (2004a, b)
		Degree of integration of traditional knowledge with scientific knowledge	Trimble et al. (2015)
Collaboration and power sharing	Diversity of stakeholders	Diversity of stakeholders	Plummer et al. (2012)
			Phuong (2005)
	Social networks	Degree of local scale social networks	Plummer et al. (2012)
		Degree of cross-scale social networks	Olsson et al. (2004a, b), Trimble et al. (2015)
Institutions	Effectiveness of institutions	Degree of effective implementation of institutions	Trimble et al. (2015)

environmental consideration (Plummer et al. 2012). Both collaboration and power sharing are crucial for the success of complex systems (Blumenthal and Jannink 2000). ACM relies on the collaboration of a diverse set of stakeholders operating at different levels, often in networks, from local users, to provincial, regional, and national organizations and to international bodies (Olsson et al. 2004a). Diversity of stakeholders can be a crucial principle to achieve the successful management of the SEPLS in Lefke Region. Stakeholders are grouped as primary, secondary, and external stakeholders. Primary stakeholders are those that have low influence over the outcomes of decisions, but they directly depend on ecosystems. Secondary stakeholders can influence decisions being made since they are predominantly decision makers and those engaged in implementing decisions. External stakeholders are those individuals or groups, who can influence the decision process through lobbying the decision makers (Phuong 2005). Social networks are also an important principle to improve collaboration and power sharing among stakeholders. Social networks mean a strong horizontal (e.g. between village governing bodies) and vertical linkages (e.g. between a village governing body and political leader) among multiple stakeholders. Social networks can enhance self-organization and adaptive capacity, horizontal collaboration for legitimizing management of social–ecological systems and vertical collaboration for gaining financial and political support (Plummer et al. 2012; Olsson et al. 2004a; Hahn et al. 2008; Folke et al. 2005; Adger 2000). Within this context, three relevant indicators were proposed.

Institutions: these are habitualized behaviours, rules and norms that govern society (Adger 2000). Institutions encompass all formal and informal interactions among stakeholders and social structures that determine how decisions are taken and implemented, how power is exercised, and how responsibilities are distributed. Various collections of institutions come together to form governance systems at different scales from local to global (Diaz et al. 2015). Accordingly, a relevant indicator was proposed.

Considering arrangements in relation to ACM are most frequently studied at regional level (Plummer et al. 2012), this study was conducted at the regional level in Lefke Region of North Cyprus.

Data collection and evaluation

The data on the indicators, proposed in the previous section, were collected from the relevant stakeholders, which directly and/or indirectly influence the management of the SEPLS in Lefke Region. The relevant data were collected through face-to-face semi-structured interviews. A series of pre-interviews were conducted with the five local administrative employees (three employers from the Municipality, one employer from the Agricultural Office and one employer from the Environmental Office) to discuss the questions in relation to 'the role (duties and responsibilities) of administrative bodies in the landscape management' and 'their cooperation with the regional and national administrative bodies (the degree of and the key issues in cooperation). The interviews were carried out in a conversational atmosphere, which facilitated greater communication in terms of discussing the key questions. The questions were asked as open-ended questions. The

Table 3 Population profile of the interviewees

Component of population profile	Characteristics of the population profile	Number of respondents	Percentage of respondents
Gender	Female	10	35.7
	Male	18	64.3
Age	20–29	5	17.9
	30–39	8	28.6
	40–49	3	10.7
	50–59	4	14.3
	60 and > 60	8	28.6
Education	Primary school	5	17.9
	High school	6	21.4
	University	17	60.7
Occupation	Public sector	9	32.1
	NGOs	1	3.6
	Private sector (retired staff and those, who can lobby the decision makers)	14	50.0
	Academic staff	4	14.3

answers were in the form of sentences. As a result, the role of the key stakeholders in the management of the SEPLS and the vertical linkages among them was examined.

After the pre-interviews, a set of semi-structured interviews were carried out with 28 people (Table 3). A survey form was developed with this aim. The survey form consisted of five sections and 13 closed-ended questions. The sections comprised profile of the interviewees (e.g. age, education and gender), major social learning activities (e.g. type of social learning activities), traditional knowledge related to landscape management (e.g. degree of documentation and transmission of traditional knowledge), relevant stakeholders (e.g. the key stakeholders responsible for landscape conservation and management), and existing institutions in relation to the management of the SEPLS (e.g. degree of effectiveness of the existing institutions on landscape conservation and management). The administrative offices in Lefke Region have a limited number of staff; for example, the Agriculture and Environment Offices consist of one staff each. Therefore, the retired staff and local people, who can lobby the decision makers, were interviewed as well. The administrative interviewees are the members of the community. The interviewees were selected by their importance as stakeholders, or were chosen with the advice of interviewees. The semi-structured interviews were conducted with the participants at a specific time in the relevant office or the village coffee shop. The interviews generally lasted for about 30 min. The relevant data were collected between November 2016 and February 2017.

Table 3 shows that 64.3% of the interviewees are male. The age profile of the interviewees varies between 30 and over 60 years of age. 60.7% of the respondents have a university degree and employed in the public sector (32.1%) or retired from one of them (50%).

The quantitative data obtained from the semi-structured interviews were analysed on a five-point Likert scale with the following interpretations, where:

0: Ineffective.
1: Very low.
2: Low.
3: Moderate.
4: High.
5: Very high.

The relative average values of the questions were calculated by dividing the total score by the total number of the respondents. As a result, the resilience for the management of the SEPLS through ACM was evaluated.

Results and discussion

Evaluating resilience for the management of the SEPLS in Lefke Region through ACM

The resilience for the management of the SEPLS in Lefke Region was evaluated by adopting ACM and using relevant principles and indicators (Table 4).

Table 4 shows that the total average relative value of the resilience for the management of the SEPLS seems to be low with 2.37 points. The diversity of social learning approaches in Lefke region is very low with 1.86 points. Assessment of the semi-structured interviews revealed that the major awareness rising programmes organized until

Table 4 Evaluating resilience for the management of the SEPLS in Lefke Region through ACM

Principle	Relevant theme	Relevant indicator	Mean value (0–5-point Likert scale)
Social learning	Learning	Diversity of learning approaches	1.86
Synthesis of different knowledge systems	Traditional knowledge	Degree of documentation of traditional knowledge regarding wild plants, nature, landscape conservation and management	2.14
		Degree of share and transmission of traditional knowledge	1.79
		Degree of integration of traditional knowledge with scientific knowledge	2,00
	The average relative value of the integration of different knowledge systems		1.97
Collaboration and power sharing	Diversity of stakeholders	Diversity of stakeholders for landscape conservation and management	2.43
	Social networks	Degree of local scale social networks	3.25
		Degree of cross-scale social networks	2.96
	The average relative value of the collaboration and power sharing		2.88
Institutions	Effectiveness of existing institutions	Degree of effectiveness of the existing institutions for landscape conservation and management	2.57
The total average relative value of the resilient landscape management			2.37

present comprised: an education programme on the importance of raising environmental awareness for NGOs; a project related to compost preparation for farmers, which was implemented by the Environmental Association of Lefke and the Lefke Citta-Slow Project, which was organized by the Municipality of Lefke. The main reasons for the low level of social learning were determined as all kinds of limited resources of the local administrations (financial and human capitals in particular) and the lack of policies about landscape conservation, planning and management in North Cyprus. This situation shows that the social and institutional settings are mutually interrelated, i.e. changes in the resilience of one system directly affect the resilience of the other system. More diversified social learning activities are required to support self-organized learning process, which provide a forum for social interaction and building trust among the stakeholders in the region. This approach supports the arguments of Armitage et al. (2008), Olsson et al. (2004a), and Dlouhá et al. (2013).

The average relative value of the integration of traditional knowledge with scientific knowledge was estimated to be very low with 1.97 points. The documentation of traditional knowledge was only carried out by two studies (Ciftcioglu 2015, 2016), which focused on edible, medicinal and aromatic plants collected from the SEPLS. These data have not been integrated in any kind of policy until present. Traditional knowledge is one of the components of social setting. Therefore, the limited financial and human capitals of the local administrations and the lack of policies related to traditional knowledge are the major obstacles in terms of integration of traditional knowledge with scientific knowledge. Within this context, it can be argued that a strong or weak social setting directly affects the institutional setting. As Tai (2015) emphasized, the ignorance of traditional knowledge can cause the loss of traditional knowledge, institutions and cultural identity. Therefore, traditional knowledge should be integrated within the management of the SEPLS to contribute to building and strengthening the effective implementation of institutional framework, to supporting social networks and learning-by-doing activities and to developing collaboration among the stakeholders. This approach supports the findings of Olsson et al. (2004a) and Berkes and Folke (2002).

The SEPLS in Lefke Region are managed by a range of different stakeholders (Table 5). The diversity of stakeholders for the landscape conservation and management estimated to be low with 2.43 points.

Table 5 shows that there is not a fully responsible stakeholder for the entire landscape management system in the region. There are several organizations, which are directly and/or indirectly responsible for the management of the SEPLS. Lefke Forestry and Agricultural Offices are the responsible stakeholders for the management of forests and agricultural lands, respectively. Although Lefke Environmental Office seems to be the responsible stakeholder for conservation and management of all ecosystems in the region, it is inactive at present. The NGOs (e.g. Lefke Environment Association) and European University of Lefke (EUL) located in the region are not directly responsible stakeholders in the management of the SEPLS; however, these stakeholders indirectly contribute to the

Table 5 The key stakeholders for the management of the SEPLS in Lefke Region

Category of stakeholder	Name of stakeholder	Responsibility
Primary stakeholder	Local people	No responsibility in resource and landscape management
	Visitors/tourists	
Secondary stakeholder	Municipality of Lefke	Planning and implementation of the grey (e.g. sanitary services) and green (e.g. open green spaces) infrastructures, management of the Citta-Slow Project, and organization of the cultural activities (e.g. Lefke Pecan Festival)
	Lefke Environmental Office (inactive)	According to the Environmental Law (2012), responsibilities of the Environmental Office include solid waste management, waste water management, Environmental Impact Assessment, wildlife conservation, protection of flora, fauna, fragile habitats and wetlands, coastal and marine areas, implementation of environmental policies and legislations, and controlling hunting activities
	Lefke Forestry Office (in Gemikonağı)	Forest conservation and management such as reforestation, erosion control, protection of endemic species (e.g. orchids and monumental trees), silviculture, fighting with forest problems and diseases (e.g. fire, illegal logging, overgrazing and poaching)
	Lefke Agriculture Office	Helping and educating farmers particularly about pruning, agricultural disease and pest control
External stakeholder	Ministry of Interior and Labour	Municipality of Lefke is directly attached to the Ministry of Interior and Labour
	Ministry of Tourism and Environment	Lefke Environmental and Forestry Offices are directly attached to the Ministry of Tourism and Environment, respectively
	Ministry of Agriculture and Natural Resources	Lefke Agricultural Office is directly attached to the Ministry of Agriculture and Natural Resources
	Lefke Environment Association	It aims to contribute to conserving endangered endemic flora and fauna species, coastal and marine areas, and fragile habitats and combating with drivers of change (e.g. illegal logging, pest and disease control)
	Lefke Tourism Association	It contributes to conserving the historical and archaeological sites and organizing the persimmon festival in the region
	European University of Lefke	It contributes to the scientific and capacity development in the region

management of the SEPLS by cooperating with the relevant stakeholders. Evaluation of this indicator shows that there are enough local administrations in the region; however, the insufficient number of experienced human capital in the local administrations and the limited institutional linkages among the stakeholders operating at different scales are the major obstacles for the resilient landscape management. This situation shows that the social and institutional settings are interrelated. Within this context, Hahn et al. (2006, 2008) and Olsson et al. (2004a) emphasized that strong collaboration among the stakeholders operating at different scales can enhance the social capital, facilitate conflict resolution, build and share knowledge.

Assessment of the social network among the key stakeholders revealed that the SEPLS need to be managed by a multilevel social network (Fig. 4).

Figure 4 shows that the vertical linkages among the stakeholders in the management of the SEPLS operate on three levels: local, regional and national. Lefke Region has

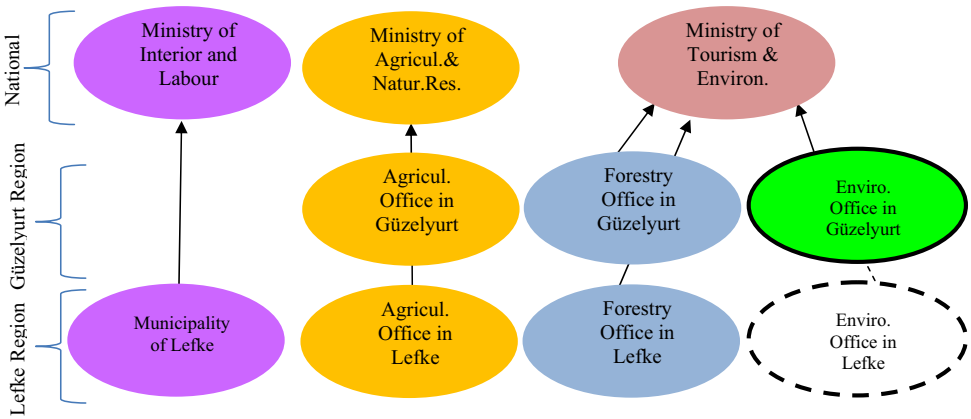

Fig. 4 The vertical linkage among the stakeholders responsible for the management of the SEPLS in Lefke Region

Table 6 Existing institutions related to the management of the SEPLS in Lefke Region

Date of issuance	Document	Responsible stakeholder	Responsibility of stakeholder
February 27, 2012	Environmental Law	Environmental Protection Agency	Especially waste management
July 12, 1989	Building Law	Municipality of Lefke	Sustainable spatial development

been declared as a district recently; therefore, the local responsible stakeholders in the management of the SEPLS would directly be linked to the national key stakeholders. Assessment of the social networks showed that the degree of local scale social networks is moderate with 3.25 points and the degree of cross-scale social networks is low with 2.96 points. The basic reason why the degree of local scale social networks is at a moderate level is that all employees of the local administrations are from the region and know each other. This situation shows that a strong horizontal scale social connection contributes to building a basis for collaboration and power sharing. However, both vertical and horizontal linkages among the stakeholders should be strengthened to contribute to increased flow of information, regulated responsibilities, and problem articulation in the region. This approach supports the arguments of Hahn et al. (2008) and Armitage et al. (2009).

Evaluation of the current institutions revealed that there are only two institutions which can be linked with the conservation of ecosystems and preservation of historical buildings in Lefke Region (Table 6).

Table 6 shows that there is not any institution on landscape management in North Cyprus. The degree of effectiveness of the existing institutions for the landscape conservation and management was found to be low with 2.57 points. Assessment of the institutional principle revealed that the existing institutions are out of date, which means they need to be revised by considering the current conditions. Considering the mutual relationship between the social and institutional settings, the lack of a strong institutional setting and qualified human capital was determined as the major problem for building and enhancing the resilient landscape management in Lefke Region. In addition, the existing institutional structure does not provide adequate opportunities for horizontal and vertical interactions among the key stakeholders. Therefore, regulatory interventions at the appropriate level are needed to strengthen the interactions among the stakeholders.

Potential responses for building and enhancing the resilient management of the SEPLS in Lefke Region

Evaluation of the resilience for the management of the SEPLS in Lefke Region through ACM revealed that the current trend in landscape management in Lefke Region as well as in North Cyprus is low due to several reasons (e.g. absence of the relevant institutions and weak linkages among the stakeholders). Within this context, the following responses are suggested to establish and enhance the resilient landscape management in the region.

- Development of a national landscape planning strategy: the SEPLS in Lefke Region comprise a mosaic of ecosystems (e.g. forest, agriculture, coast, settlements and maquis). Unfortunately, the lack of a national landscape planning strategy as well as a landscape plan for the SEPLS at regional level has caused degradation of the landscapes and associated ecosystem services. These valuable landscapes have been under the threats of intensive urbanization, land abandonment and land use change. A national landscape planning strategy is needed to contribute to the landscape conservation, planning and management at different scales. Within this context, the European Landscape Convention can be used as a strategic tool to develop the relevant strategy.
- Integration of landscape-scale management approaches: many socio–ecological problems (e.g. population growth, land use change, intensive urbanization and food production) have caused the degradation of biodiversity at large spatial scales, such as landscape scale. Therefore, landscape-scale approaches to biodiversity conservation are required in North Cyprus (Ciftcioglu 2016).
- Support for participatory approaches: participation of the stakeholders, particularly primary stakeholders in the process of landscape management, should be supported to strengthen the social links as well as to provide opportunities for the integration of traditional knowledge with scientific knowledge. This approach supports the findings of Tai (2015).
- Development of social networks: the governance of the SEPLS in Lefke Region comprises two jurisdictional levels: national government and local-level institutions. Unfortunately, this two-tier structure, which has a low level of social networks, is ineffective in the management of the SEPLS. Therefore, the social networks between the target institutions should be enhanced to influence the governance and management processes in the region.
- Integration of traditional knowledge with scientific knowledge: opportunities for integration of both knowledge systems should be created and supported.

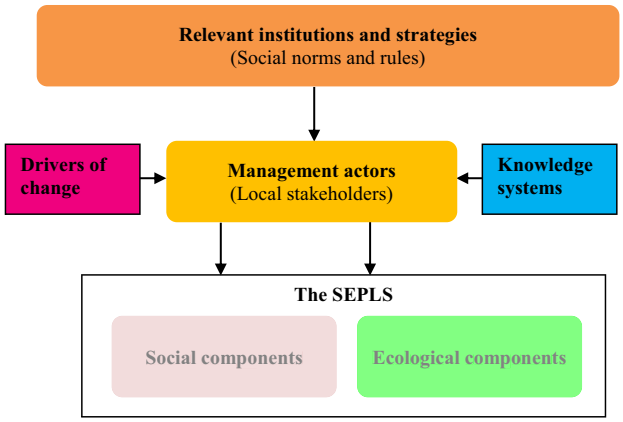

Fig. 5 The proposed management approach for the SEPLS in Lefke Region (modified from Phuong 2005 and Hahn et al. 2008)

- Development of a landscape management plan: a landscape management plan for the SEPLS is needed with the aim of supporting biodiversity conservation, agricultural production and sustainable rural livelihoods in Lefke Region. The management plan should comprise both ecological and social systems (Fig. 5).

Figure 5 shows that the management of the SEPLS requires relevant resilient institutions (e.g. National Landscape Planning Strategy), management actors (local stakeholders) and the SEPLS (both ecological and social systems and their components).

Conclusion

This study has tried to evaluate the resilience for the management of the SEPLS located in Lefke Region of North Cyprus through ACM. The results of the evaluation revealed that the resilience for the management of the SEPLS is far from being satisfactory today. Thus, the current governance of the SEPLS is unsuccessful due to the absence of relevant institutions, weak collaboration among the stakeholders, the lack of social learning activities and integration of traditional knowledge with scientific knowledge. The existing institutions are old fashioned and do not meet the needs of the current situation. As a result, the SEPLS in Lefke Region face vulnerability and uncertainty at present. Within this context, ACM can be a promising mechanism to solve the current problems and to build a base for the resilient management of the SEPLS in the region. ACM can also create opportunities for better understanding the complex SEPLS, involvement of diverse stakeholders in the planning and management process and building the capacity for institutional change across scales. This argument supports the findings of Akamani (2014) and Phuong (2005). The other relevant contributions are given below.

- The current spatial planning, relevant management strategies and institutions have largely ignored the conservation and management of landscapes in North Cyprus. Unfortunately, such ignorance has caused degradation of the valuable landscapes such as the SEPLS in Lefke Region. Within this context, ACM might be a promising mechanism for building and strengthening the resilient management of the SEPLS in the face of uncertainty and complexity.
- ACM can be a strategic instrument to build and promote integrated landscape management for long-term ecosystems, agro-ecosystems, social and economic resilience. Therefore, ACM should be integrated into landscape planning strategies to achieve biodiversity conservation, agricultural production and sustainable livelihood development—the three fundamental goals of landscape planning.

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