Social hotspots mapping: a participatory approach for identifying cultural ecosystem services of forests and semi-natural areas

Carmelina Prete[1], Mario Cozzi[1], Mauro Viccaro[1], Frans Sijtsma[2] and Severino Romano[1]

[1] Scuola di Scienze Agrarie, Forestali, Alimentari ed Ambientali, Università degli Studi della Basilicata, Potenza, Italia
[2] Faculty of Spatial Sciences, University of Groningen, Landleven 1, 9747 AD Groningen, Netherlands

carmelina.prete@unibas.it

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Summary

The paper presents a methodology to identify and map Cultural Ecosystem Services (CES) of forests and semi-natural areas. The quantification of CES represents a complicated task in the framework of ecosystem service evaluation. Compared to traditional investigations on the topic, we support the idea that the enhancement of CES knowledge is closely linked to the involvement of society on the role of recreational, spiritual and symbolic services of the natural resources. The mapping CES could therefore be functional for a planning and management activity accompanied by an increase in local communities' awareness of the resources present in the territory. Thus, we proposed a participatory webGIS approach at the national level (Italy) to obtain people's preferences on the favourite natural places, spatializing the results by the use of weighted Kernel density.
Regarding people's preferences for outdoor recreational activities and ecotourism in forests and semi-natural areas, the most valued activities are observation of nature, walking or running, journey by car and picnic/BBQ, which tends, by widening the radius of choice, to diversify in favour of various types of sports/activities related to the sea or the mountain. Our results show that on average 45% of CES areas fall back outside Nature 2000 network, suggesting a deeper understanding in the use and appreciation of different types of natural areas for different needs and moods. Indeed, among the outputs, social hotspot of CES areas are stressed, quantifying not only the recreational component, but also the other components that make up CES.
This research carries major implications for policy at different levels of governance, as it makes possible to target policy instruments so that cultural dimensions are adequately considered.

Keywords: forests and semi-natural areas; participatory webGIS; weighted kernel density; ecosystem cultural services

JEL Classification codes: Q57

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[2] Faculty of Spatial Sciences, University of Groningen , Landleven 1, 9747 AD Groningen, Netherlands

1. INTRODUTION

In Italy, the national forest areas have increased in the last decades (about 6% from 2005 to 2015) (MIPAAF, 2017a), mainly due to spontaneous colonization of marginal agricultural areas, following the abandonment of cultivation. However, it is found also an increasing interest of society for forest, both in demand for tourist and recreational activities in forest (MIPAAF, 2017b), and to a greater awareness of role played by natural ecosystems (and forest) for territory conservation (Marchetti and Santopuoli, 2012).

With respect to these dynamics, sustainable forest management is a fundamental tool to guarantee a wide range of Ecosystem Services (ES). As recalled by the Report on the state of the European environment (EEA, 2015), the areas most endowed with ecosystem services are able to maintain a better environmental quality; at the same time, territory and human communities which reside there are more resilient and less vulnerable. Therefore, sustainable territorial development should integrate these aspects and explore ways to evaluate the benefits offered to the human community by natural capital, primarily through the identification of the ecosystems and the services they produce. In this context, the development of indicators, useful to represent the situation at national level, is an indispensable step in order to consider these ecosystem services in their effective dimension and use them effectively in territorial policies.

In particular, within ES, identified by the Millennium Ecosystem Assessment (2005), Cultural Ecosystem Services (CES) include non-material and non-consumable benefits, which favour physical and mental health of people. According to CICES classification of ESs (Haines-Young and Potschin, 2012), cultural function includes not only recreational services (collection of non-wood products, hunting, naturalistic tourism, sport activities), but also symbolic ones (historical, ethical, religious and spiritual values). The identification of these services has the aim to explicit their value (in monetary or non-monetary terms) in order to safeguard and enhance them, encouraging an ecosystem planning approach.

From a methodological point of view, compared to the other categories of ES, the quantification of economic value of CESs is a delicate issue. This is mainly due to the lack of tangibility and the influence of subjective questions in the assessment (Sijtsma et al., 2017; Rabe et al., 2018). There is a difficulty in the spatialization of monetary values with correct details (resolution) (Carvalho-Ribeiro et al., 2016; Daams et al., 2016), and the risk to underestimate the cultural value of recreational services, since monetary assessment studies (e.g. travel cost method) usually include them in tourism services. To face these challenges, a series of alternative methods, compared to those used in the economic analysis, have been applied to quantify CES (Nahuelhual et al., 2013; Brown and Fagerholm, 2015; Pastorella et al., 2017; Dunford et al., 2018). The simplest methods are based on the adoption of physical, biological or management factors (e.g. proximity to main roads, land cover, attractiveness to water, naturalness degree, surface of

protected areas), as a proxy of recreational and tourist services of natural areas (Paracchini et al., 2014). Some authors specifically support the use of methods that reflect the relationship between a specific cultural service and its user, including personal experience, imagination, expectation and preference (for example, Martín-López et al., 2009; Gee and Burkhard, 2010), thus obtaining an explicit psycho-cultural perspective (Kumar and Kumar, 2008). When this is done in a spatial explicit way, it is the field of Participatory GIS (Brown and Kyttä, 2014). PGIS provides an increasingly popular alternative to CES evaluation (Raymond et al., 2009; Sherrouse et al., 2011; Plieninger et al., 2013) or photo methods (Bernetti et al., 2019).

Assessing intangible benefits linked to nature is often problematic because nature is a public good, for which it is difficult to obtain a collective opinion, especially on a large scale. To this end, the use of internet, and specifically of webGIS, has certainly made possible new ways to gather collective information. Indeed, the survey by an internet-based online system was chosen in reason of the following advantages (Weible and Wallace, 1998; Reips, 2002): a non-local sampling with a wide distribution of demographic characteristics; absence of time constraints, organizational problems and costs; highly voluntary participation and ease of access for participants; reduction of experimenter effects and demand characteristics; and great openness of the research process and public control of ethical standards.

This paper will build on the online possibilities of surveying and use PGIS to evaluate the social side of the appreciation of forests and semi-natural areas.

2. MATERIALS AND METHODS

In this study, the online tool "greenmapper" (www.greenmapper.com) was used, a survey tool recently developed in the Netherlands (De Vries et al., 2013) with the general objective of determining the natural areas that people find most "attractive". Already tested in different countries, such as Netherlands (Sijtsma et al., 2012; De Vries et al., 2013; Davis et al., 2016; Scholte et al., 2018), Germany, Denmark, Switzerland (Bijker and Sijtsma, 2017; Sijtsma et al., in press), greenmapper was used to map CESs of forests and semi-natural areas of Italy. The main advantage is to make the collection of preferences quick and easy, using a (potentially) standardized, systematic and precise method in space.

To this purpose we conducted a survey to collect data on a national scale (Section 2.1). Subsequently, based on the preferences expressed by interviewees and the information contained in the survey, it was possible to map CESs linked to forest and semi-natural areas (Section 2.2), thus arriving at their categorization (Section 2.3).

2.1. Data collection: the greenmapper tool

The mapping of CESs through greenmapper is based on a spatially explicit multi-scale procedure, in which the interviewees mark the natural places they consider most attractive, on a digital map using an XY point position indicator.

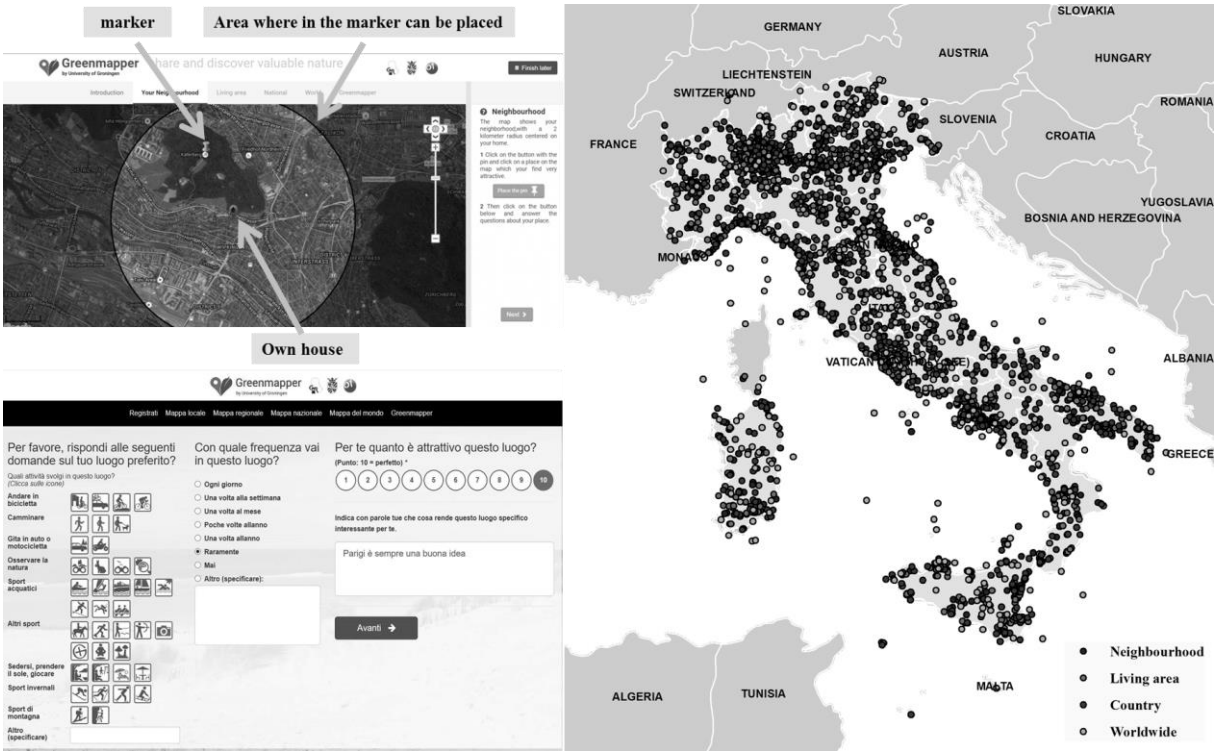
More in detail, the starting point is the house or street where the user lives, marked by a red flag. Users are completely free to mark their favourite natural places by dragging the marker on the map, based on four spatial levels:

- Level I – *"Neighbourhood"*: a circle with a radius of 2 kilometres from home;
- level II – *"Living environment"*: a circle with a radius of 20 kilometres from home;
- level III – *"Country"*: the entire nation;
- Level IV – *"World"*: global scale.

The first level is a distance linked to small daily recreational behaviours near own home. The second level represents the "living environment" of people: often commuters, who go to school or work, engage in recreational activities within this zone. The third and fourth levels are oriented towards politics and culture. Each place marked on the map is associated with qualitative information including the visit frequency, the preference rate expressed on a scale from 1 to 10 (1 as not very attractive and 10 as perfect). The activities to which they dedicate themselves in the places chosen among 39 activities indicated by icons. People can have preferences, for example, for places which are considered more attractive for the quiet, but also for other, such as cycling or walking with the dog, etc. The preferences can be significant in place-based decisions, so it is crucial grasping these aspects. Finally, more information is collected through an open section asking why the place is considered interesting. The formulation of a free answer question has the main disadvantage in the information coding phase. However, it allows to acquire information not known in advance and to give the user the possibility to respond in detail, adding all the clarifications he deems appropriate. The open section offers a qualitative reading on incidence of some factors affecting choices: accessibility, environmental attributes, such as species richness, as well as to other attributes, such as infrastructure and cultural attractions, built features, etc. Furthermore, it is possible to know the contribute of natural areas to the sense of place, social connection, physical well-being, learning, and other intangibles.

The dataset was collected in January 2018 among the members of an online panel (Demetra opinions - www.opinioni.net) and contains about 1,632 interviews and 3,731 markers belonging to the national territory, distributed among the four levels (see Figure 1). The sample was identified to be representative of the Italian population, taking into account the distribution of the population on the national territory and the social profile (age, sex, educational qualification) (see Table 1).

Figure 1: Greenmapper platform (on the right), markers of Italian survey for level I, II, III, IV (on the left)



Source: own elaboration

Table 1: Demographic profile of survey participants (N.= 1,632)

Gender

	North West	Nord Est	Centre	South	Islands	Total
M	178	174	164	188	86	842
F	230	146	205	165	96	790
Total	408	320	369	353	182	1632
Age						
	North West	Nord Est	Centre	South	Islands	Total
16-20	5	4	7	6	2	24
21-25	37	31	20	31	15	134
26-30	41	29	46	50	29	195
31-35	30	21	36	50	26	163
36-40	46	33	42	42	19	181
41-45	62	48	56	34	31	231
46-50	50	52	43	25	13	183
51-55	64	28	44	52	17	205
56-60	45	45	48	32	22	192
61-65	27	30	27	31	8	124
Total	408	320	369	353	182	1,632
Educational Qualifications						
	North West	Nord Est	Centre	South	Islands	Total
Primary education	18	21	12	9	17	77
Secondary education	177	130	125	135	55	622
A few years of university without a degree	63	46	66	48	37	260
Bachelor degree	52	40	50	52	31	225
Master degree	88	76	92	91	28	375
PhD	10	7	24	18	14	73
Total	408	320	369	353	182	1,632

Source: own elaboration

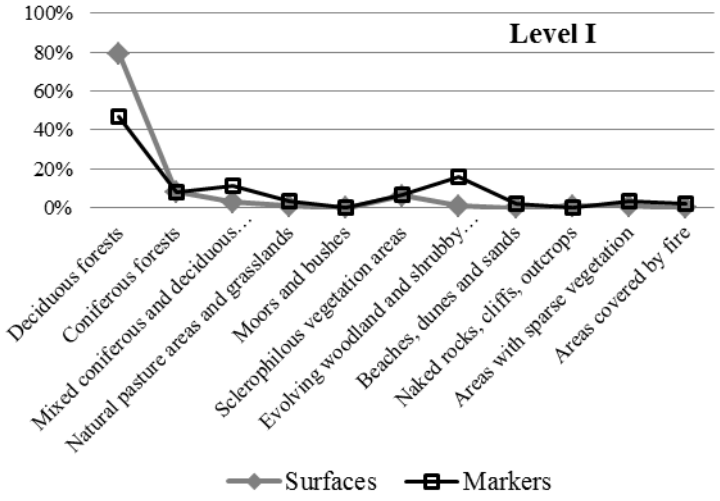
Thus, we extrapolated from dataset forests and semi-natural areas' markers according to Corine Land Cover 2018 database classification (scale 1:25,000) (EEA, 2018) . CLC 2018 database was chosen because, the last national forest inventory is still not available[1].

In particular, we focus on natural (forests) and semi-natural areas category as they have been included in recent international and community environmental policies, i.e. Green Infrastructure (GI[2]) planning - a successfully tested tool to provide environmental, economic and social benefits through natural solutions (EEA, 2017). Moreover, analyzing level I, despite a clear prevalence of surfaces falling back into deciduous forests (around 80%), only 47% of markers fall into this category, while for mixed deciduous and coniferous forests, as detected by Bernetti et al. (2019), and evolving woodland and shrubby areas, despite the smaller surfaces (respectively 3% and 1%), we found a higher percentage of markers (respectively 11% and 16%) (Figure 2). This confirm the need to include in the CES evaluation also the areas in evolution deriving from processes of abandonment of agricultural lands, which result to have a high social value. Indeed, within GI planning also reforestation and rewilding (letting or assisting the area return to a wilderness state) are options to exploit abandoned areas for carbon sequestration, soil and nutrient protection, water regulation and recreation. At the same time, this helps decrease fragmentation, providing habitats for large carnivores and contribute to Natura 2000 objectives.

Figure 2: Percentage of markers within forests and semi-natural areas compared to the percentage of their surfaces (level I)

[1] During 2017 the ground survey activities of the third Italian national forest inventory - INFC2015 were launched, which are expected to be completed by the end of 2019.

[2] "*Networks of natural and semi-natural areas (green infrastructures), planned at a strategic level with other environmental elements, designed and managed to provide a broad spectrum of ecosystem services"* (European Commission, 2013).



Source: own elaboration

2.2. Mapping cultural ecosystem services

The identification of CES areas, starting from community preferences points, has implanted using spatial statistics techniques. The advantages of this in-depth analysis are many: first of all because statistical indicators of distribution are achieved, overcoming the arbitrariness of visual analysis. In addition, through the interpolation on a continuous surface of points, density areas for each portion of territory are identified and quantified.

These areas can be calculated using point density mapping methods (Brown, 2004), such as Kernel Density Estimation (KDE) (Silverman, 1986), widely used to evaluate the concentration of phenomena in territorial analyses (O'Sullivan and Unwin, 2003; Borruso and Porceddu, 2009), or spatial interpolation methods (Siniscalchi et al., 2006), such as the Inverse Distance Weighting (IDW).

However, the use of density functions is more appropriate for analysing the value attributed to landscapes (Alessa et al., 2008; Sherrouse et al., 2011). For this reason, the KDE method was used in our study, applying a search radius of 5,000 m, as proposed by Alessa et al. (2008). The cell size parameter was set to 250 m (Daams and Veneri, 2017). The kernel density was weighted to take into account the score assigned on the scale 1-10; in other words, greater weight was attributed to markers with higher scores than those with lower scores, thus influencing density values.

2.3. Identification of cultural services categories

The analysis of the open section made it possible to identify CES categories linked to the most attractive forests and semi-natural areas. For this purpose, we started from the categories proposed in the Millennium Ecosystem Assessment (2005), revised on the basis of the information contained in the open section. The categories integration hypothesis, proposed by MEA, stems from other studies (Plieninger et al., 2013); however, our approach has the advantage of not choosing a priori the categories to be proposed to users but deriving them from the analysis of user responses. Compared to MEA categories, the *"mental refreshment services"*, the *"connection with nature"* and the *"unpleasantness"* linked to situations of neglect or degradation of places, have been integrated. Table 2 shows the 9 components marked by an acronym, a description and the recurrent expressions.

Table 2: Categories of cultural ecosystem (dis) services of the forests and semi-natural areas

(Dis) services	Acronym	Description	Expressions
Mental and spiritual refreshment services*	RS	Sites of spirituality, religious or other relax forms	E.g. *"Makes me relax"*, *"relax"*, *"free oneself with the mind from the city chaos"*, *"tranquillity"*, *"peace"*, *"serenity"*, etc.
Knowledge and educational value	KE	Sites which favour knowledge of animal and plant species	E.g. *"I am pleased to discover different species of animals"*, *"the diversity and abundance of species that make them"*, *"A municipal park which still preserves rare trees such as the cedar of Lebanon"*, etc.
Connection with nature*	N	Sites that simply influence an emotional feeling with nature	E.g. *"nature"*, *"green"*, *"I like trees and flowers"*, etc.
Aesthetic value	A	Sites of particular beauty	E.g. *"Beautiful"*, *"beautiful landscape"*, *"panorama"*, *"breath-taking landscape"*, *"breath-taking panorama"*, etc.
Social relations	SR	Sites of meeting points with family, friends and social sphere	E.g. *"there are courses for my age"*, *"children can play"*, *"social life"*, *"sociability"*, *"company"*, etc.
Sense of place	SP	Sites which feed a sense of authentic attachment and identity	E.g. *"It makes me feel at home"*, *"I grew up"*, etc.
Cultural heritage	CH	Sites relevant to local history and culture	E.g. *"a journey in the art"*, *"place of historical interest"*, *"very representative of the area"*, etc.
Recreation and ecotourism	RE	Sites used for recreational activities (walks, walks with dogs, horseback riding, swimming, gathering wild food, sport fishing, hunting, etc.)	E.g. *"equipped to play sports"*, *"It is an ideal place to do outdoor activities, such as cycling, running or walking, being in contact with nature while remaining close to the town"*, *"green lung in the city"*, *"away from smog and noise"*, *"clean air"*, etc.
Unpleasantness*	U	Neglected or degraded sites	E.g. *"... abandoned to negligence, and some areas have been closed for works"*, *"a beautiful place but should be improved"*, *"a forest, even if composed of sick trees"*, etc.

* Cultural services not included in the Millennium Ecosystem Assessment (2005)

Source: own elaboration

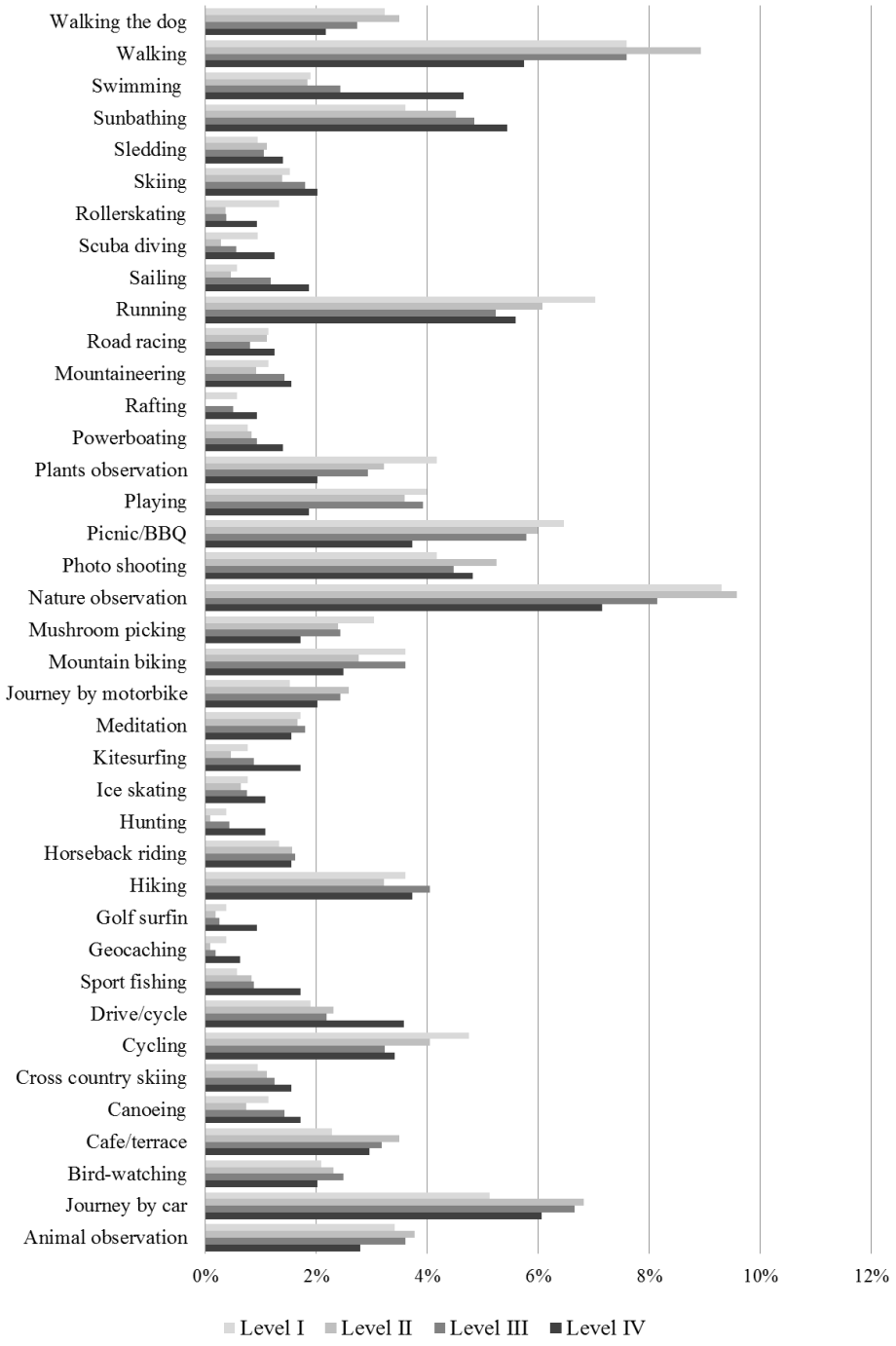
3. RESULTS AND DISCUSSION

Our results outline landscape and natural places which contribute to people well-being.

From relating the dataset with CLC 2018, we found about 21% of markers fall back into "forests and semi-natural areas" (code 3 of CLC), with an increasing trend from level I (about 8%) to level IV (about 33%). Regarding people's preferences for outdoor recreational activities and ecotourism in forests and semi-natural areas (Figure 3), the most valued activities are the observation of nature, walking or running, journey by car and picnic/BBQ. These results are in line with those reported in a review of European, United States and Canada studies (Bell et al., 2007), and with a study from America (Sexton et al., 2012), which confirm the great importance of walking within natural places. By widening the radius of choice at national and global level, the favourite activities related to the chosen places are diversified in favour of various types of sports related to the sea (power boating, kitesurfing, sailing, sunbathing or swimming) or the mountain (canoeing, cross country skiing, skiing); activities that are practiced less frequently and mainly related to holidays. Moreover, we found significant preference differences between males and females (>60% for all levels) about ski activities (skiing and cross country skiing), cycling, mountain biking, hunting and birds

watching, favourite by males, while females prefer relaxing activities such as mediation, sunbathing or walking the dog.

Figure 3: People's preferences for outdoor recreational activities and ecotourism in forests and semi-natural areas for each level (I, II, III, IV)



Source: own elaboration

Among factors of choice we detected the presence of water as an important element, through expressions like *"The feeling of being one with the sea"*, *"I adore the sea I am enchanted even to look at it"*, etc. (within the open section), as shown in other studies (Bijker and Sijtsma, 2017; Pastorella et al., 2017)

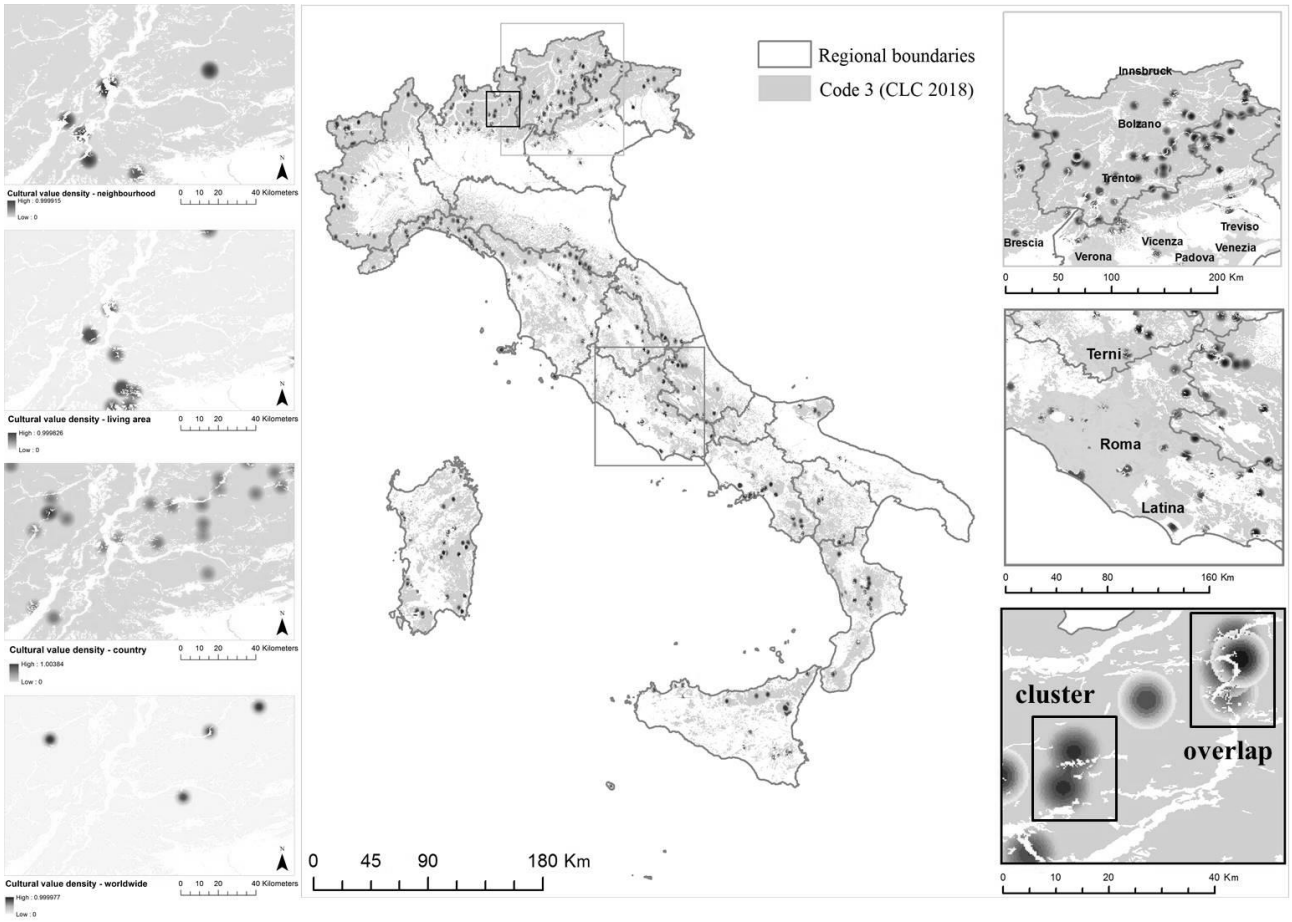
and confirmed by relating the dataset with CLC 2018 (an average of around 12% and a growing trend going from level I to level IV).

Also management factors, such as build features, can influence people's decisions about where to recreate (Adamowicz et al., 2011). We detected for example the presence of seating, fountains, area for dogs, playgrounds for children, outdoor sports fields, places for recreation, etc.

Moreover, our results suggest aspects to improve in the management of these areas, such as *"... abandoned to neglect, and some areas have long been closed for work", "a beautiful place but should be enhanced*", "... to keep better", "uniqueness, traditions, food, not good organization", *"a wood, even if composed of sick trees"*, etc. On the contrary, the good management forms are specified: *"Immersed in the tranquillity of nature, well cared for and maintained"*, *"Well maintained cycle path"*, *"It combines the nature present in a protected area to the sea that can be seen from the hills and it is very clean compared to the one closest to home"*, etc.

Applying the weighted KDE, we obtained variable maps in a range between 0 and 1 with increasing intensity within the four levels. In general, areas characterized by scattered and less numerous CES hotspots emerge, but also cases in which it is possible to find larger and irregular hotspots that form CES clusters (see Figure 4). The size, shape and number of these hotspots are partly the result of the used search radius; however, the relative difference between the values attributed to the various places is a consequence of the perceptions of the interviewees. The application of weighted KDE has also allowed us to estimate the surfaces of CES areas for each level. It is possible to distinguish an area equal to 206,033 ha for level I, 567,313 ha for level II, 1,013,605 ha for level III and finally an area of 416.928 ha for level IV. These hotspots only minimally overlap for all levels (around 11,930 ha, or less than 1%) (see Figure 4); greater overlaps occur between level II and III, and between III and IV (3.7% and 3.4% respectively). In general, most of CES areas are different depending on the level of choice.

Figure 4: CES density maps within the four levels (I, II, III, IV)

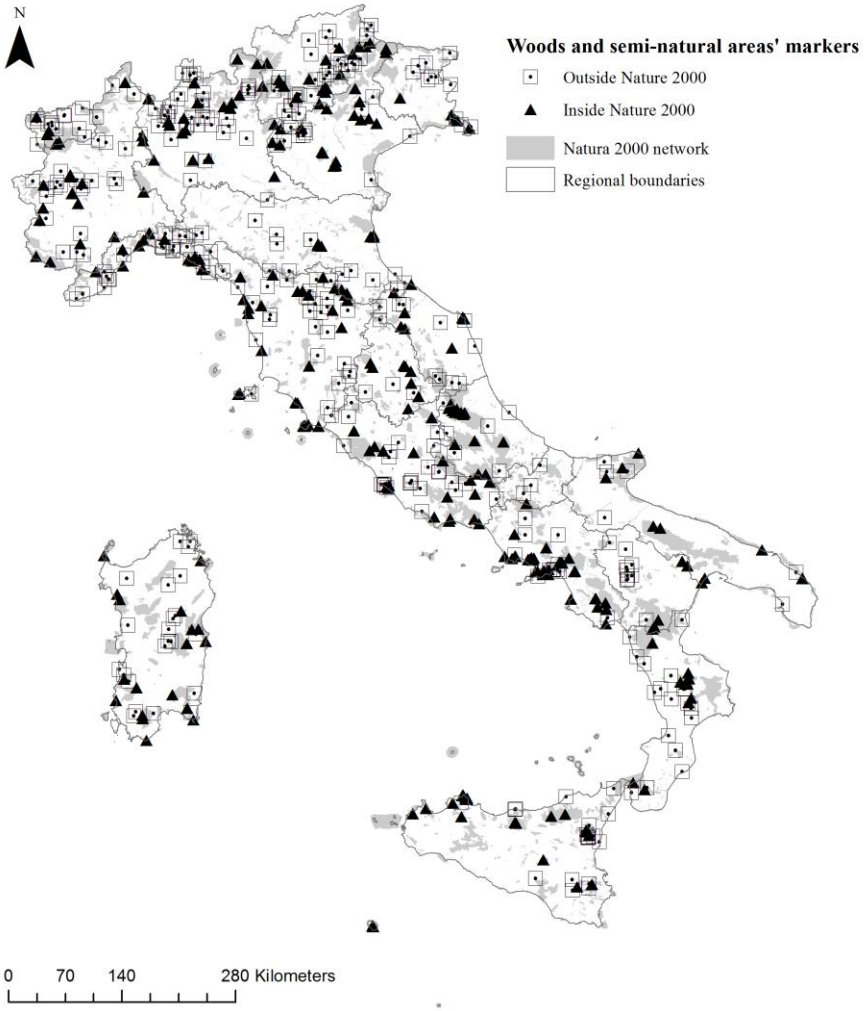


Source: our elaboration

In the field of ecosystems conservation there are certainly conventional protection tools such as Natura 2000 network. In this regard, it is possible to note, comparing expressed preferences with Natura 2000 areas, some support for the idea that ecologically sound nature is seen as attractive (Tveit et al., 2006). However, in line with Davis et al. (2016) our results shows on average about 40% of markers (257 markers - out of 648 or at a maximum distance of 10 m from the protected area[3]) are located outside Natura 2000 network (Figure 5). For the first level there is less convergence (116,041 ha outside Natura 2000 network - 56.3% of CES areas), while at level III there is greater convergence (363,745 ha outside Natura 2000 network - 35.9% of CES areas).

Figure 5: Markers of forests and semi-natural areas falling outside Natura 2000 network

[3] Tolerance margin linked to the accuracy in the position the marker on the map.



Source: own elaboration

Table 3: CES areas outside Nature 2000 network

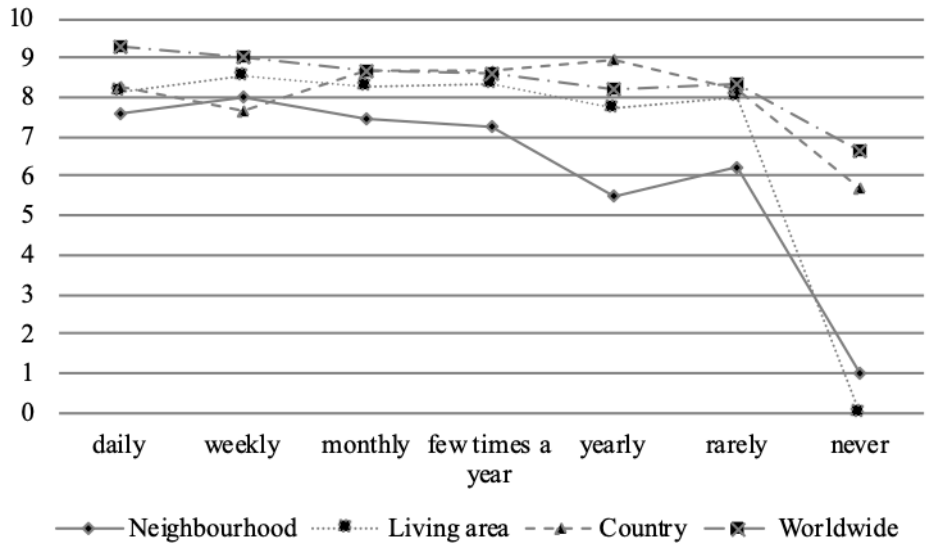
Level	CES Areas	Outside Nature 2000	
	ha	ha	%
Neighbourhood	206,033	116,041	56.3
Living area	567,313	254,437	44.8
Country	1,013,605	363,745	35.9
Worldwide	416,928	179,165	43.0

Source: own elaboration

This result suggests a deeper understanding in the use and appreciation of different types of natural areas. What Bijker and Sijtsma (2017) define a *"portfolio of places"* for different needs and moods. This aspect is of great importance in outlining areas, which may have different management values.

To confirm this, by linking the frequency of visits with the preference rate on the scale 1-10 (see Figure 5) it was possible to highlight that, while for the first two levels higher resource values are associated where there are both a fruition (therefore a value of use), for level III and IV the preference rate remains high even for unvisited places, generating "offsite services". The CES beneficiaries are thus external to the physical site where CES provision is generated. Then CES users also can derive some benefits that strictly speaking are non-use values (e.g. option or existence).

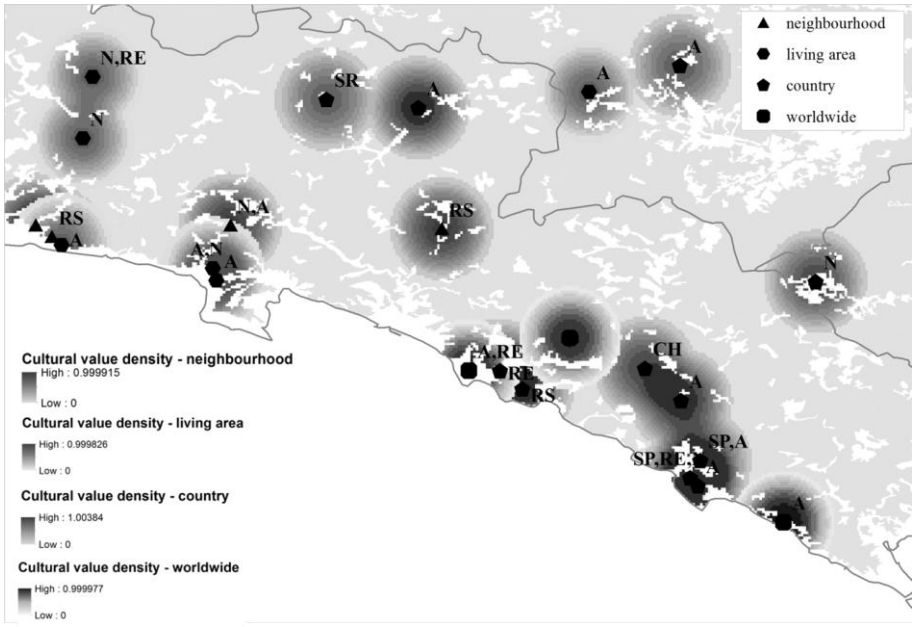
Figure 5: Relationship between visiting frequency and preference rate



Source: own elaboration

More in detail, people connect different cultural services to the chosen sites (see Figure 6). The analysis of the open section has, indeed, allowed us to extrapolate a "list" of cultural services that affect individual and collective well-being.

Figure 6: Mapping of CES categories for the four levels (I, II, III, IV). The acronyms contained in the map refer to table 2



Source: own elaboration

The need to escape from everyday life, brings more and more people to look for places with high aesthetic quality. In fact, this quality, most appreciated by the female gender, represents on average the most highlighted cultural function (about 25%), especially for level IV (about 34%), in the 36-40 age range (about 33%) and with a research doctorate (around 50%). Another category that involves a large portion of the sample interviewed is the connection with nature (about 22%), especially for level I (about 36%), where natural areas represent a way to have contact with nature and escape from city chaos; this service is most felt

as age increases, reaching around 37% in the 61-65 age group. Another important service always for level I (about 22%) is represented by the function of mental and spiritual refreshment, particularly felt in the 51-55 age group. While the sense of place is expressed through a sense of belonging growing from the micro-scale of domestic spaces (level I and II) to include the national dimension (level III) and global (level IV with around 30%). Recreation and ecotourism, with greater predilection on the part of men, constitute on average only 12% of the cultural services offered by the natural ecosystem; this percentage is distributed differently according to age, affecting above all young people, placed in the 21-25 age group (with around 40%) and in the 31-35 age group (with around 35%). On average, less than 1% of respondents mentioned any inefficiencies in the area; most do not refer to a disservice by the ecosystem itself as for a scarce exploitation of the resource.

Table 4 Percentages of CES categories within the four levels (I, II, III, IV) and average value

Acronym	Cultural (dis)services	Level I	Level II	Level III	Level IV	Average
		%	%	%	%	%
RS	Mental and spiritual refreshment services	21.84	15.69	17.69	9.18	16.10
KE	Knowledge and educational value	1.15	4.71	2.89	0.00	2.19
N	Connection with nature	35.63	20.00	25.63	5.10	21.59
A	Aesthetic value	20.69	27.45	17.69	33.67	24.88
SR	Social relations	0.00	1.96	1.44	2.04	1.36
SP	Sense of place	4.60	7.84	11.91	29.59	13.49
CH	Cultural heritage	9.20	6.27	5.78	8.16	7.35
RE	Recreation and ecotourism	5.75	15.29	15.88	12.24	12.29
U	Unpleasantness	1.15	0.78	1.08	0.00	0.75
		100.00	100.00	100.00	100.00	100.00

Source: own elaboration

Explicit quantification and mapping has been listed as one key element that is required in order to improve the recognition and implementation of ecosystem services into institutions and decision-making (Daily and Matson, 2008; Daily et al., 2009; Burkhard et al., 2012). Thus, CES mapping could represent a basis in regional forest planning and programming, which are closely linked to other territorial and sectoral planning tools (e.g. regional landscape plans, absent in 9 regions out of 20 - RRN, 2019), which still do not find full implementation between regional and provincial administrations.

Moreover, CESs, as many of the ES, even if they have a widely recognized economic value, do not have a price system and therefore a market able to create strong motivations for their protection and to increase their offer. For this reason, in the decision-making processes for the conservation and enhancement of forest ecosystems, attention has been focused on the activation of conventional tools (incentives and tax breaks) and above all on new tools such as Payments for Ecosystem Services (PES) aimed at increasing the supply of ES. In this direction the explicit quantification and mapping of CESs could be also a basis to develop Payments for Ecosystem Services aimed at increasing CES offer. The most widely used definition of PES internationally is that given by Wunder (2015), which defines the PES as contractual forms between at least one supplier (owner of the land or manager of that which, thanks upon payment, undertakes to support the offer of a well-defined CES) and at least one beneficiary user (generally private individuals, their associations or forms of representation, who would be unable to benefit from CES in the absence of PES). The relationship between the two subjects is on a voluntary basis and is regulated by an economic transaction. Since the PES essentially forms contractual agreements between at least two parties, these instruments can be separated from specific legislation. Examples of these PES are the maintenance of forest areas (cleaning, elimination of dangerous plants, creation of picnic areas, wildlife observation points,

equipped routes, etc.), carried out by forest area managers on payment by individual companies or associations interested in recreational, sporting, educational, cultural use of forests.

4. CONCLUSIONS

The mapping of cultural ecosystem services provides a tool to express social values in a way similar to monetary expressions of economic value (Brown, 2004). Maps of social value can help by identifying hotspots that require special attention from resource managers (Brown, 2004; Alessa et al., 2008) and to assess the consistency of management requirements for an area with values that society holds for the area (Reed and Brown, 2003). This study proposed an analytical approach to identify priority areas in the provision of cultural services. The methodology facilitates application from small- to large-scale analyses. This approach can be a very useful tool in the planning and management of natural and forest ecosystems. Unlike other approaches proposed on the subject, in which we ask to attribute a value to areas pre-identified by experts, our approach has the main advantage of reaching areas following a participatory process. More precisely, it is a doubly open approach: both in the choice of preferred places and in the motivations that lead to the choice and that therefore allow to delineate the categories of cultural services in a non-aprioristic way, but according to a bottom up approach.

The study allows us to draw some useful conclusions in improving knowledge on the subject. First of all, it was possible to highlight that the exclusive use of surface indicators, or those linked to biological criteria, is not always consistent and, therefore, proportional to the cultural value of the places. This implies in the planning of the territory (and forest resources in particular) the need to integrate the knowledge related to the structure and ecology of the landscape but also assessments and parameters from an aesthetic-perceptive point of view (or better, according to the landscape concept sensitive), as highlighted in the European Convention on the landscape (CE, 2000).

Furthermore, the analysis made it possible to explain the value linked to a direct use of the forest resource but also an option value and existence, widening the evaluation not only to the recreational and tourist component, but also to the other components that make up the largest category broad cultural services. Finally, our study documents that people find various cultural values in their daily environment and not only in landscapes of exceptional biodiversity, a key element to be taken into consideration also in urban or rural-urban planning.

Future developments will be oriented towards multivariate regression analysis with the aim of identifying the factors which influence population preferences (biophysical characteristics, geomorphological characteristics, land use, forest parameters, management aspects, level of environmental protection).

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