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Social Perceptions and Forest Management Strategies in an Italian Alpine Community

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Individuals' perceptions are becoming increasingly relevant as a central component of social and environmental sustainability. As a result, the social dimension has become a fundamental element of sustainable forest management. To investigate people's perceptions of forest management, it is necessary to analyze values and norms in the social and cultural context and, at the same time, to consider individual preferences for forest management strategies. Trento municipality in northeast Italy was chosen as a study area because of its location in the European Alpine region and because of the links that exist between individuals and forest resources. A structured questionnaire was sent to 1000 randomly selected household heads. Responses were analyzed, taking into consideration the relationship between perceptions and respondents' gender, age, education, and geographical location; this allowed highlighting of statistical differences between groups. Results confirmed the importance of gender, age, and location in influencing individuals' preferences. Results also showed that people generally prefer open forests with mixed tree species and different sizes, which is in line with the goals of the local public forest service's management strategies.

Keywords: *Perceptions; forest management; forest values; Trento municipality; European Alps; Italy.*

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Introduction

The sustainable forest management (SFM) paradigm aims to balance the social, economic, ecological, and cultural needs of present and future generations (Wyder 2001; Tabbush 2004) and to maintain resources based on the multiple use of forests (Garcìa-Fernàndez et al 2008). Direct integration of people's values in the decision-making process is an important aspect of SFM, because it can increase the social acceptance of the decisions and reduce conflict among users (Xu and Bengston 1997; O'Brien 2004; Cantiani 2012). By incorporating the preferences and perceptions of various actors in the decision-making process, the paradigm has gradually transformed forest management into "management by inclusion" (Kant and Lee 2004). Forest values can be defined as enduring concepts of what is good and desirable, or conversely, bad and undesirable, about forests (Bengston 1994). These values vary from culture to culture and over time (Manning et al 1999); consequently, knowledge of forest values is important in determining people's attitudes (Duinker 2008), and the criteria used to evaluate management practices from a social point of view should be based on the values assigned by people to forests (Gamborg and Rune 2004).

Forest values can be divided into two categories: material (economic and life supporting) and nonmaterial (sociocultural, ethical, spiritual, and aesthetic). They can also be classified as either intrinsic or instrumental (Buijs 2009). Intrinsic values relate to the contribution of action to maintaining the health and integrity of a forest ecosystem (holistic nonanthropocentric values) or the conservation of a single species (individualistic nonanthropocentric values), while instrumental values involve satisfying human needs or wants (anthropocentric values). Anthropocentric values also include some noninstrumental values, such as aesthetic, cultural, and spiritual values, whose importance has grown in recent decades (Patel et al 1999).

An analysis of people's perceptions is fundamental to participatory forest planning and management, because individuals' knowledge has the potential to effectively support decision-makers in the management and preservation of forest resources (Vining and Tyler 1999; Jensen 2000; Lewis and Sheppard 2005; Hickey et al 2007). Moreover, being aware of people's perceptions and

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preferences regarding the forest and its landscapes is important for designing and implementing management policies (Schmithüsen et al 1997; Jensen and Koch 1998; Lee 2001; Cantiani et al 2002; Heer et al 2003; Edwards et al 2012a). This aspect is particularly significant in mountain areas in general and the European Alpine region in particular. The Alpine region is characterized by a strong link between local communities and forests (Notaro and Paletto 2011) and by particular attention to forest multifunctionality (Grêt-Regamey et al 2008).

This study investigated people's perceptions of forest management practices by considering individual preferences. The method was tested in the Municipality of Trento, located in northeastern Italy in the Province of Trento, one of the country's most important forest regions, in which 345,180 ha, or 55.6% of total land surface, is covered by forests. This area was chosen on the grounds of its Alpine location and the links that exist between individuals and forest resources. The current situation in the forestry sector in this area may be considered emblematic: Faced with the crisis in the traditional timber sector, forest administrators and owners need to look for new opportunities in timber production (eg supplying wood biomass for energy provision) and to take into account new demands made of the forests by the communities, demands that increasingly diverge from those traditionally made by mountain populations. The traditional "close to nature" silviculture that has shaped the forests in the Province of Trento over the last 50 years (Wolynski 2001) might be forced to evolve in line with new management strategies.

Current forest legislation in the Trentino

For the preceding reasons, the Province of Trento has undergone radical changes in forest legislation and planning in the last few years. A 2007 forest law revised the forest planning structure, introducing a regional-level plan covering all mountain ecosystems within a catchment or subcatchment, irrespective of the land ownership patterns within it. The regional plan has two tasks: (1) to take into account general and long-term interests, and on the basis of this provide its subordinate levels with useful information, and (2) by means of a single, coherent planning drive, to address the various problems related to the conservation of nature and the landscape, the physical protection of the territory, and the forest–timber or forest–timber–energy chain.

The legislature clearly intended to encourage the various services in charge of safeguarding and managing the territory to cooperate to address forest problems. This responds to a precise need, highlighted at the European level (Andersson et al 2000; Farcy and Devillez 2005), to consider the biological, physical, and socioeconomic systems from a networking perspective.

The success of the efforts undertaken in this direction depends on the extent to which those responsible for the planning and management of the natural resources recognize and interpret the entire spectrum of values, including those of a noninstrumental nature, that bind humans to the forest.

Material and methods

Trento municipality (46°4′0″N; 11°7′0″E) is located in the Province of Trento in the Italian Alps. The population numbers 114,236 with a density of 723 people/km^2. It is subdivided into 12 districts: 6 on the valley floor and 6 on the adjacent mountain slopes.

Sampling

A self-reporting questionnaire was sent to a random sample of 1000 household heads living in Trento municipality. The sample was stratified according to the 12 administrative districts, and the sample size was proportional to the size of the population in each district. The survey focused on household heads because its main objective was to investigate the preferences of individuals belonging to the same community and living in the area; tourists were therefore not considered in this study.

Respondents were asked to return the completed questionnaire within 6 weeks and were given 3 options—return by mail, hand deliver to a prearranged collection center, or have collected (by appointment) by survey staff—to maximize the number of completed questionnaires.

Questionnaire

The questionnaire was composed of 56 mainly closed-ended questions grouped into 4 thematic sections: personal information, forest perceptions, forest and society, and personal knowledge about the forest. This article focuses on the questions on forest perceptions, in particular 6 questions on strategies adopted by the provincial forest service. The questions investigated people's perceptions indirectly. Based on the assumption that ordinary citizens were unlikely to be conversant with highly technical matters or specialized terminology, they focused on the consequences of the management strategies rather than the strategies themselves. On the questionnaire, 4 single-choice questions asked for opinions about different forest models that can be achieved with different silvicultural treatments, and 2 asked respondents to rate the importance of recreational resources in forests and of the goods and services they look for in forests on a 10-point Likert scale (Table 1).

Analysis

The survey responses were analyzed statistically with respect to respondents' gender, age, level of education, and location. The χ^2 test was used to test the differences

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TABLE 1 Survey questions.

Question	Analytical categories[a)]	Type of question[b)]
1. What kind of tree species do you prefer in a forest?	Broadleaf (less than 20% evergreen)	Single choice
	Evergreen (less than 20% broadleaf)	
	Mixed	
2. Which kind of forest structure do you prefer?	Regular distribution; trees with similar diameters	Single choice
	Random distribution; trees with similar diameters	
	Random distribution; trees with a variety of diameters	
3. Do you prefer open or closed forest?	Open forest (10–40% canopy cover)	Single choice
	Closed forest (more than 40% canopy cover)	
4. Which kind of undergrowth do you prefer in a forest?	Litter with leaves and needles	Single choice
	Grass	
	Dense shrub layer	
	Sparse shrub layer	
	Moss layer	
5. In your opinion, what kind of recreational resources do you find important in a forest?	Paths	10-point Likert scale (1 = very low importance, 10 = very high importance)
	Picnic benches and tables and barbecues	
	Fitness trails and sports equipment	
	Panoramic views	
	Food vendors	
	Unspoiled nature	
	Parking areas	
	Places of historical and religious interest	
6. What goods and services do you look for in a forest?[c)]	Hiking	10-point Likert scale (1 = very low importance, 10 = very high importance)
	Hunting	
	Sporting activities	
	Cultural heritage	
	Relaxation	
	Landscape contemplation	
	Naturalness	
	Firewood harvesting	
	Harvesting of nonwood forest products	

[a)]Analytical categories were based on FAO (2001), Pommerening (2002), Tahvanainen et al (2001), and UNEP/FAO (1994).

[b)]All questions were closed ended.

[c)]Timber production was not included because respondents were primarily urban and not directly concerned with it; firewood harvesting was included because people have the right to gather firewood in areas designated as common forests.

among the groups. For question 6, because normal distribution in the various groups could not be guaranteed, the nonparametric Kruskal–Wallis test was used for statistical analysis with respect to age and education. Grouped by gender and geographical location, data from question 6 were compared by means of the Mann–Whitney *U*-test. All statistical analyses were carried out using XLStat 2012.

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TABLE 2 Preferred forest types.

Variable and category	Percent
Forest tree composition	
Broadleaf forest	6.2
Evergreen forest	28.2
Mixed forest	**65.6**
Forest structure	
Regular distribution of trees with similar diameters	13.4
Random distribution of trees with similar diameters	28.0
Random distribution of trees with varying diameters	**58.6**
Crown cover density	
Open	**82.4**
Closed	17.6
Undergrowth	
None (litter only)	**48.8**
Grass	18.6
Dense shrubs	4.2
Sparse shrubs	14.1
Moss	14.3

Percentages are derived from answers to questions 1–4. The highest value for each group is indicated in bold.

Results and discussion

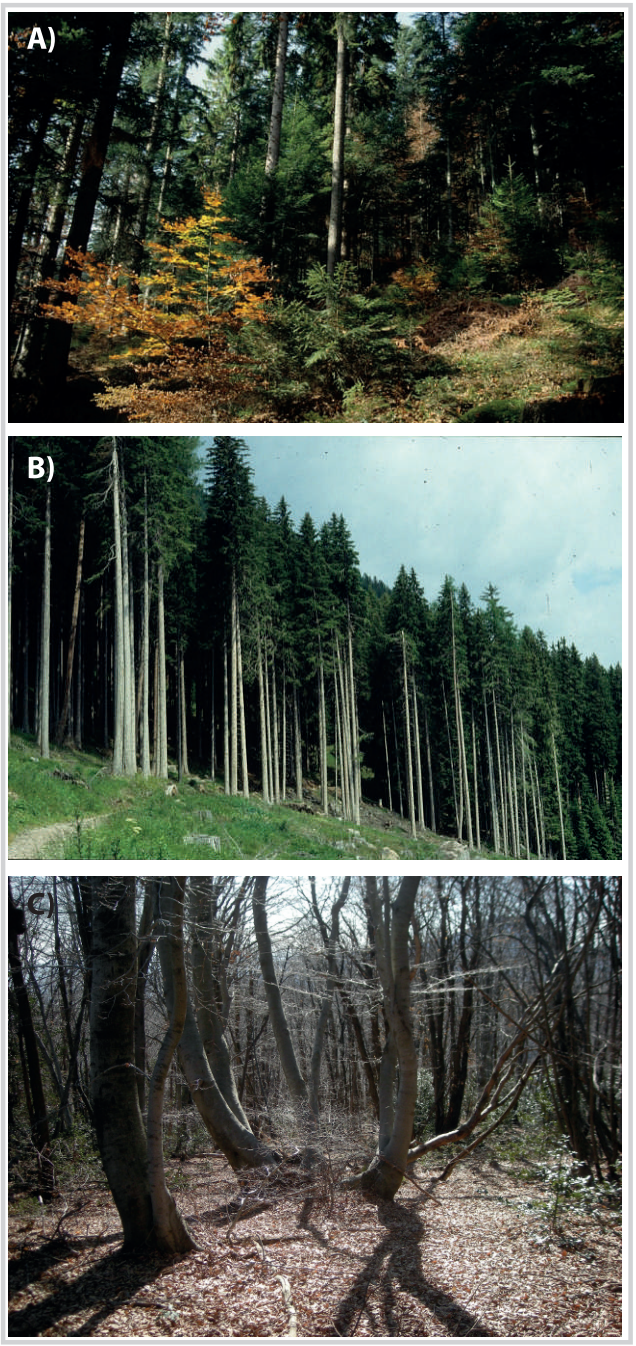
The response rate was 34.6% (346 questionnaires); other research carried out in Italy has reported a response rate between 20% and 30% (Montini 2001). Regarding location, 244 questionnaires were returned by household heads living in the urban area, home to the majority of the population, and 74 were returned by household heads living in the mountainous and hilly area; 28 household heads did not indicate their location. Of the respondents, 67% were men (232) and 33% were women (114). In the Italian Alps, household heads are generally male.

The majority of respondents expressed a preference for mixed forests (Table 2). The low preference for broadleaf forests is probably because in the Province of Trento, lower-altitude broadleaf forests are coppices of low aesthetic value, some still in use and others left to return to their natural state, whereas the broadleaf forests of the middle altitudes are young, high beech forests derived from the conversion, since the 1960s, of beech coppices. Both types of forest are characterized by trees of modest development and, particularly insofar as coppices are concerned, by trees with poor form far removed from the majestic bearing typical of high broadleaf forests. Women showed a greater preference for mixed forests (71.6%) than did men (62.7%). The χ^2 test showed no significant statistical differences (χ^2 test: observed value = 2.981, critical value = 5.991, $P = 0.225$, $\alpha = 0.05$). Young people (18–35 years old) showed a greater preference for broadleaf forests (14.6%) than did other age groups (5.9% for ages 36–55, 3.4% for ages 56–75, and 5.4% for ages over 75), while elderly people preferred evergreen forests (43.2%). The latter statistic is most likely related to the important role played in the economy of mountain communities, until a few decades ago, by evergreen (mainly spruce) forests. There was a significant difference among the age groups (χ^2 test: observed value = 19.934, critical value = 12.592, $P = 0.003$, $\alpha = 0.05$).

The majority of respondents expressed a preference for a random distribution of trees with diverse sizes (diameters). Most people do not like forests with a low degree of naturalness—for example, plantations and reforestation projects with regularly spaced trees—and prefer uneven-aged forests. A large number of people surveyed appreciate forests left to evolve naturally, such

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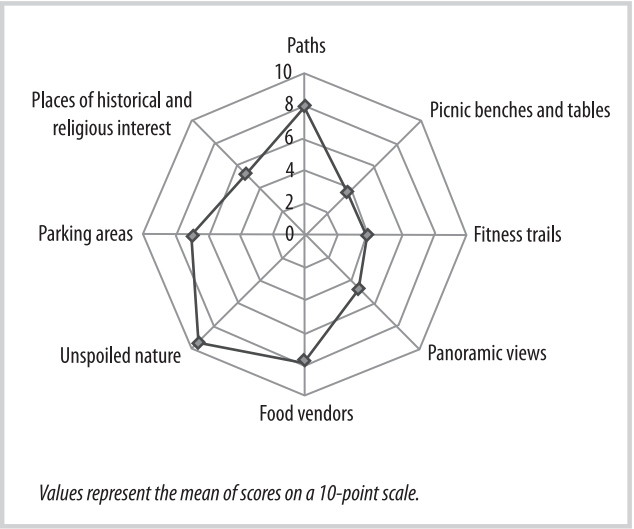
FIGURE 1 (A) Mixed, uneven-aged stand, with high diametric differentiation of trees, and presence of undergrowth. (B) Pure, even-aged Norway spruce stand, with regular distribution and low diametric differentiation of trees. (C) Lower-altitude broadleaf stand: mixed coppice left to natural evolution, typical of a limestone area. (Photos by Maria Giulia Cantiani)



as those at higher altitudes and in protected areas. A significant difference between men and women was observed, with women showing a stronger preference for uneven-aged forests (χ^2 test: observed value = 6.219, critical value = 5.991, $P = 0.045$, $\alpha = 0.05$).

A substantial majority of respondents expressed a preference for forests with limited canopy cover (open forests), with women showing an even higher preference

FIGURE 2 Perceived importance of recreational resources in forests.



for open forests than men (χ^2 test: value observed = 3.909, critical value = 3.841, $P = 0.048$, $\alpha = 0.05$). The χ^2 test showed no significant relationship between canopy cover preference and age or geographical location.

With regard to the presence of undergrowth (Figure 1), of the five possible options, almost half of respondents preferred no undergrowth (needles or leaf litter only); no significant statistical differences were found among the groups. The χ^2 test showed no significant differences between urban and rural dwellers for the first 4 questions.

Respondents ranked on the 10-point Likert scale the unspoiled nature (9.34), paths (7.84), and food vendors (7.85) as the most important recreational resources in forests (Figure 2). This is a fair reflection of the attitude of the average inhabitant of the Province of Trento, who has a certain familiarity with forests, both their economic benefits (eg, firewood gathering) and their leisure benefits (primarily for physical activities such as hiking). There are no notable differences among the groups; the only difference of interest is that the elderly assign a higher value to almost all recreational resources.

Regarding the goods and services provided by the forest to society (Table 3), respondents ranked as most important naturalness, landscape contemplation, hiking, and relaxation. Economic benefits (firewood and nonwood forest products) were rated second, which is consistent with other surveys conducted in the Alpine region (Schmithüsen et al 1997). Women assigned higher values than men to aesthetic and spiritual services, while men assigned higher values to nonwood products, firewood, sports, and hunting. An explanation for this could be that these goods and services are typically related to male activities, while women favor contemplative activities (including relaxing and landscape appreciation). A number of studies carried out in North

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TABLE 3 Most highly valued forest goods and services.[a] (Table continued on next page.)

Characteristics of respondents (*n*)[b]	Top 3 preferences
Gender	
Male (229)	Naturalness (8.79)
	Relaxation (8.73)
	Landscape (8.66)
Female (115)	Hiking (9.29)
	Naturalness (9.29)
	Relaxation (9.07)
Age	
18–35 (48)	Landscape (8.96)
	Naturalness (8.83)
	Relaxation (8.75)
36–55 (140)	Naturalness (8.81)
	Landscape (8.76)
	Relaxation (8.74)
56–75 (119)	Naturalness (9.19)
	Relaxation (9.10)
	Hiking (9.05)
>75 (38)	Naturalness (8.97)
	Hiking (8.73)
	Landscape (8.67)
Education	
None (4)	Landscape (9.00)
	Nonwood forest products (8.25)
	Naturalness (8.00)
Elementary school (109)	Naturalness (9.04)
	Hiking (8.87)
	Landscape (8.82)
High school (158)	Naturalness (9.09)
	Relaxation (9.00)
	Hiking (8.92)
University degree (70)	Hiking (8.71)
	Relaxation (8.64)
	Naturalness (8.56)

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TABLE 3 Continued. (First part of Table 3 on previous page.)

Characteristics of respondents (*n*)[b]	Top 3 preferences
Geographical location	
Urban area (244)	Hiking (8.94)
	Naturalness (8.94)
	Relaxation (8.81)
Mountain/hill area (74)	Landscape (8.93)
	Naturalness (8.92)
	Relaxation (8.85)
All respondents (346)	Naturalness (8.96)
	Hiking (8.84)
	Relaxation (8.84)

[a]Scores are derived from answers to question 6, which were ranked on a 10-point Likert scale.

[b]The *n* values in each subcategory add up to a different total. This is because some respondents did not fill in values for some questions.

America confirm that women value the spiritual, aesthetic, and environmental aspects of forests, while men attribute a higher importance to economic and recreational values (Brown and Reed 2000; Tarrant and Cordell 2002; Kumar and Kant 2007).

While other age groups assign prime position to naturalness, the young (18–35 years old) consider the landscape the most important aspect of the forest. Interest in the landscape may be associated with the importance attributed to the forest's recreational function. With regards to age, a recent European survey found that young people value recreation more than other forest functions (Rametsteiner et al 2009).

In contrast to people living on the valley floor, those living in the mountainous districts assigned a higher score to all aspects except hiking and naturalness. The difference between urban and nonurban areas is higher for economic services and hunting. The nonparametric Kruskal–Wallis test was applied to determine the statistical significance of differences based on age and education. It found no significant difference regarding age but a significant difference was found taking education into account with regard to naturalness (K observed value = 11.523, K critical value = 11.345, $P = 0.009$, $\alpha = 0.01$) and nonwood forest products (K observed value = 15.973, K critical value = 11.345, $P = 0.001$, $\alpha = 0.01$). Unlike those with a tertiary education, people with lower levels of education assigned a higher value to all services. These findings are consistent with the work of Kumar and Kant (2007), who found that irrespective of context, less educated people are the most attached to forests and forest-related goods and services.

The significance of differences between gender and geographical location was assessed by the nonparametric Mann–Whitney test. When taking gender into account, a significant difference was observed with regard to hiking ($U = 9953.5$, attended value = 12,208.0, variance = 536,205.8, $P = 0.002$, $\alpha = 0.01$) and hunting ($U = 14{,}174.0$, attended value = 12,376.5, variance = 238,662.5, $P = 0.000$, $\alpha = 0.01$). Women expressed a preference for walking and hiking; men expressed one for hunting. In terms of geographical location, a significant difference was found with regard to firewood production ($U = 4465.0$, attended value = 8073.0, variance = 335,008.1, $P < 0.0001$, $\alpha = 0.01$). Contrasts between urban and rural populations are consistent with previous studies' findings that urban and rural inhabitants have different needs, generally related to the direct use that respondents make of the forest (Roovers et al 2002). In this case, the difference is strictly linked to common property rights, the right to harvest firewood from common forests exclusively afforded to those living in mountainous districts.

The questionnaire-based survey using closed questions was useful for the present study, because the preferences expressed by individuals were explicit and therefore assessable. Quantitative surveys have been described as excellent tools for measuring preferences and attitudes in a population (Babbie 2010). Nevertheless, closed questions have some disadvantages, such as the impossibility of individual interpretation and in-depth response (May 1997), which limits the analysis.

The approach followed in this study also revealed itself to be well suited to the reality of the territory surveyed. The possibility of extending the use of this approach to other areas was recently discussed in an Italian publication aimed at local public agencies (Betta et al 2009). This kind of survey has the potential to identify ongoing trends that need to be monitored over time, and it could prove highly effective if administered at regular intervals.

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Conclusions and the way forward

Survey results indicate that the forest is important to people because it is a representation of nature undisturbed by human activity. These findings are consistent with other studies on perceptions of forests that focus on people living in urban areas (Schmithüsen and Wild-Eck 2000).

The majority of respondents appeared to prefer mixed and open forests with a high degree of natural diversity and a well-articulated structure. This fits quite well into the type of ecosystem that the Forest Service of the Province of Trento has been trying to design over the last 50 years, ecological conditions permitting. Such an ecosystem is made up of trees of mixed sizes and ages, ensuring the best possible protection for the soil in mountainous areas and a good maintenance of fertility and conservation of biodiversity. This model of forest, however, is generally characterized by well-developed undergrowth formed by natural regeneration and a shrub layer. People's preference is mostly for a forest without undergrowth, with the soil covered just by litter, which is typical of an even-aged, fairly closed forest. This is because, in addition to their concern for nature and landscape (questions 5 and 6), people show a strong interest in hiking (question 6) and prefer a good network of paths (question 5); forest cleared of undergrowth is therefore the most favored. This contradictory attitude must be carefully considered, particularly when managing forests with a high recreational use. These forests are important not only for the population of Trento and the other urban areas in the province but also for people from all over the country. Tourism is an important element in the economy of the Province of Trento.

Another possible source of conflict may be old-growth stands that are left to natural forest succession, as is being done in the Province of Trento for biological, scientific, and educational purposes (Wolynski 2010), because the majority of respondents indicated a preference for forests without undergrowth. To prevent such conflict from arising, it is advisable that appropriate and timely information regarding the aim of this option be furnished, though it is foreseeable, as stressed by Hunziker (2000), that in the near future the new generation will show an increasing sensibility toward these forms of nature conservation.

This survey confirmed the importance of social characteristics and situational context in research into forest preferences, which has been underlined by other studies (Gobster et al 2007; Carvalho-Ribeiro and Lovett 2011). Results regarding the relationship between social aspects and preferences given to forest attributes on the one hand and goods and services on the other confirm that these interactions are complex. While the relationship between gender and nature (in the specific forests) has undoubtedly changed with the shift from traditional to modern society, women still tend to have a more intense relationship with nature and to attribute higher values to the contemplative and environmental values of forests (Buckingham-Hatfield 2000).

Individuals' preferences for certain forest landscape characteristics are influenced by a combination of factors associated with people and place (including cultural, social, and human values; attitudes; and biophysical differences in forest types) and deeply rooted in the local context. Therefore, surveys offer useful insights for a potential systematic and comparative program of research whose conclusions and recommendations would be generalizable for European policy (Edwards et al 2012b).

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