Economic Valuation of Forest Recreation in an Alpine Valley

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Abstract

Recreation in forests is an essential service provided by the environment that allows generating considerable incomes for the local population. To make appropriate management strategies, recreational values of forests have to be considered in order to prevent further losses of the landscape and other factors of tourists' attraction. Forest recreational values due to the lack of a market can be estimated using environmental evaluation techniques such as Contingent Valuation (CV), Choice Experiment (CE) or Travel Cost Method (TCM). The first part of the paper offers a meta-analysis of the recreational values of mountain forests in Europe in order to compare the values of similar sites for altitude (above and below 1,000 m a.s.l.), tree species composition (mixed and pure conifer/broadleaved forests) and tourists target. In the second part of the paper, a Benefit Transfer (BT) application is presented by applying the results of the meta-analysis (average value transfer). The "policy" site chosen is an Alpine valley located in the north-east of Italy (Valle di Non, Province of Trento). The results of meta-analysis highlight that the recreation value of the mixed forests is higher than that of pure forests (conifer or broadleaved forests), while the applied economic techniques (CV or TCM) has low influence on the recreational value per visit. Finally, the results of the application show that the total recreational value of the Valle di Non forests is around 2,5 million € per year and it has a considerable weight in the Total Economic Value (TEV) of the valley's forests.

Key words: mountain forests, tourism and recreation, economic evaluation, Benefit Transfer method.

Introduction

Recreation and tourism in forests is a growing phenomenon, especially in the industrialised countries, which are experiencing an increase in demand for nature-based vacations (Gössling 1999, Ars Stubelj and Bohanec 2010). The opportunity to enjoy natural environments and picturesque landscapes, to find peace and tranquillity and to change from routine are some of the main reasons why many tourists visit forest areas. Recreation in forests is a relevant issue of the later decades and underlines the fact that the economic value of forests is not only related to timber production (Lazdinis et al. 2009). Forests provide non-market goods and services such as biodiversity conservation, soil and water protection, air cleaning (carbon storage), cultural-educational and health-hygienic forest services (Boyd and Banzhaf 2007, Šišak 2013). In this last category of ecosystem services for human well-being, recreation is one of the most important social and economic activities. Benefits from tourism and recreation in forests are connected with income generation, local development and improvement of quality of human life (Gössling and Hickler 2006).

Clean environments, biodiversity richness and picturesque landscapes are greatly powerful attractions for tourists who intend to be in contact with nature. Within this context, natural resources conservation sustains ecosystem functionalities and generates revenues. According to Hearne and Salinas (2002, p. 154) "nature conservation contributes to tourism industry and tourism contributes to the national economy".

To fully achieve the conservation objectives, it is important to develop nature-based form of tourism, particularly eco-tourism, respectful of the natural environment and the local traditions. Eco-tourism is an ideal strategy to combine conservation and local development (Bookbinder et al. 1998). Forest management strategies play a key role in forest multifunctionality valorization with special emphasis in preserving habitat and species richness (Hörnfeldt and Ingemarson 2006).

Forest recreation is one of the ecosystem services that can be included in the public goods sphere, because it is non-rival and non-excludable (Kaul and Mendoza 2003). Because of above-mentioned characteristics, there is no market in which a price for recreation is established. Without a market price, the related economic value of forest recreation is not clearly visible and, therefore, the conservation costs (i.e. non-use of forests for production purposes) may often appear higher than the advantages. Although the lack of a price, the economic value of the recreation service can be very remarkable and its inclusion in management decisions can create differences when considering non-productive functions of forest and the related value (Zandersen and Tol 2009).

Several environmental evaluation techniques have been developed in order to assess the economic value of the ecosystem goods and services. The main economic techniques can be subdivided in two groups (Rosenberger and Loomis 2001) as follows: revealed preference techniques (indirect methods for estimating consumer surplus) and stated preference techniques (direct methods for estimating consumer surplus). More precisely, considering the recreational value assessment, the most useful methods are the Travel Cost Method (TCM) in the group of the revealed preferences, and Contingent Valuation (CV) and Choice Experiment (CE) among the stated preferences methods.

TCM is a technique in which the cost supported by tourists for the travel to forests is used as a proxy for the individual value, associated with forest recreation (Willis and Garrod 1991). TCM approaches include the zonal and individual methods. Zonal TCM is undertaken by subdividing the tourists' places of origin into concentric zones, having the same per capita visit cost, and calculating the number of visits per population per zone per year. Individual TCM, otherwise, considers the number of trips per year per individual user and calculates the cost supported by each tourist.

CV is a method in which respondents are asked to express their Willingness to Pay (WTP) for the environmental good evaluated (Hanemann 1994, Arrow et al. 1993, Mitchell and Carson 1989).

Lastly, CE technique evaluates the environmental goods in terms of their relevant attributes. Respondents are asked to indicate their choice and their WTP among a series of available scenarios. Alternative scenarios are defined by the combination of attributes and their levels (Hanley et al. 1998; Batsell and Louviere 1991, Alpizar et al. 2001).

Benefit transfer (BT), or more generally Value Transfer, is another environmental goods evaluation technique. BT consists in examining the results of surveys undertaken in specific contexts and transferring them to similar unstudied situations of interest for policy making (Wilson and Hoehn 2006). The site with available data is typically called the "study" site, while the site to which data are transferred is called the "policy" site (Bergstrom and De Civita 1999). BT is a well-developed method to value an environmental good or service in cases in which the resources needed to obtain primary data are missing. Field surveys are not always feasible and BT is a cost-effective approach in case of budget constraints, time limitations and/or because the resource impacts are expected to be low (Rosenberger and Loomis 2001). For reason of this utility, BT is well developed in the United States and in Canada by the government agencies for benefit-cost analysis (Bergstrom and De Civita 1999). The typical spheres of application are health benefits, water quality and recreational values.

Being aware of an importance of forest recreational value, the aim of the present paper is to estimate the economic value of the recreational function in European mountain forests using a meta-analysis (TCM, CV and CE researches). This kind of research is relevant from the political and technical point of view because it provides useful and credible information to decision makers, in order to define management strategies finalized to preserve against development a fragile ecosystem such as mountain forests.

Moreover, since the Alps provide major ecosystem services and the value of ecosystem services is often not included into the planning process, these evaluations are important because changes in ecosystem services may negatively affect the economy.

The choice to consider European mountain forests is motivated by the necessity to compare values related to sites with similar altitude, forest tree composition and touristic target. The meta-analysis allowed estimating the recreational value of several mountain forests using different evaluation techniques. In particular, the differences between evaluation methods, tree species composition, location (protected and non-protected areas) and altitude were tested from the statistical point of view. In this way, the mean recreational value can be applied to comparable forest areas (Bartczak et al. 2008). In the last part of the paper, using BT (average value transfer) the results of the meta-analysis are transferred to a "policy site" located in the north-western Italian Alps (Valle di Non, Province of Trento). Finally, the meta-analysis data and the local statistics on the tourist presences are used to estimate the economic value of recreation in the Valle di Non, in order to support policy makers in the evaluation of forest management strategies.

Materials and Methods

Meta-analysis of forest recreation values

An intensive search of suitable studies has been conducted based on peer-reviewed and grey literature. Finally, we collected 32 studies of which 26 belong to peer-review international literature, while five are collected in Italian, German and French national literature, and one is a Ph.D. Thesis (Table 1). From a temporal point of view, these surveys were published in the period between 1977 and 2013, and almost all surveys from 1989 to present time. The recreational values considered refer to the following activities: walking/hiking, picnicking, jogging and landscape viewing while other activities like hunting, fishing, mushroom and berry picking, have not been considered. This restriction was made in order to catch only the indirect use value of the forest. Activities like hunting and picking, which related to the consumption of forest resources, and hence, represent a direct use value, are unrelated to the research objective.

The main evaluation techniques used to estimate the recreation forest function were CV and TCM. In some cases, both these techniques were used in order to compare the differences. Globally, our database includes 18 CV values, 19 TCM, and one CE, for a total of 38 measures of the value of forest recreation.

In the present research, we also analysed the typology of the TCM values of the primary site. We considered transport costs and, if present, forests entrance fees. Consequently, the individual WTP was modified every time primary data contained further elements for the valuation. Other expenses such as accommodation, bike rental or food expenses were not considered. All the monetary valuations were presented in their current values (2012 is the year taken as a reference), actualized with three different social discount rates (0.5%, 1% and 2%). The social discount rate is the discount rate stipulated for use in public decision-making (i.e. environmental protection or health-related projects).

We use the descriptive statistics (mean, median and standard deviation) for the recreational value of European mountain forests resulting from the meta analysis.

Statistical analysis was performed using STATISTICA for Windows, version 7.1 to investigate differences between locations (forests on protected areas, not forests on protected areas), evaluation techniques (CV and TCM), forest types (conifer pure forests, broadleaved pure forests and mixed forests) and altitudes (above and below 1,000 m a.s.l.). To test if the collected data were normally distributed, the Shapiro Wilk normality test was performed. As data distribution was not normal (p-values < 0.05), data were analyzed using Kruskal-Wallis non-parametric test and Mann-Whitney U test. All statistical tests were assessed at $\alpha = 0.05$ level. The Kruskal-Wallis non-parametric test was used to assess statistical differences

Table 1. List of the study sites considered in the meta-analysis

Authors (year)	Study area	Country	Surface (ha)	Method
Baumgart (2005)	Oberland Bernese (Bern Canton)	Switzerland	-	CE[1]
Bellu and Cistulli (1997)	Liguria Region	Italy	126,000	TCM[2]
Bettinazzi (1995)	Lessinia (Veneto Region)	Italy	10,500	TCM
Boatto et al. (1984)	Tarvisio (Friuli-Venezia Giulia Region)	Italy	23,000	TCM
Bravi and Curto (1996)	La Mandria (Piedmont Region)	Italy	1,350	TCM
Bravi and Curto (1996)	Sarco Monte Varallo Sesia (Piedmont Region)	Italy	30	TCM
Bravi and Scarpa (1999)	Parco Nazionale Gran Paradis (Piemont Region)	Italy	70,000	CV[3]
Cesaro (1991)	Novella river (Trentino-Alto Adige Region)	Italy	-	CV, TCM
Garrido et al. (1994)	Regional Park of Cuenca de Manzanares	Spain	52,800	TCM
Getzner (2010)	Tatra mountains	Poland	21,164	TCM
Gios et al. (2006)	Campogrosso municipality (Trentino-Alto Adige Region)	Italy	500	CV
Glück and Kuen (1977)	Ahornboden (Karawendel Mountains)	Austria	240	TCM
Goio and Gios (2011)	Sinello valley (Trentino-Alto Adige Region)	Italy	550	CV
Goio et al. (2008)	Trentino Province (Trentino-Alto Adige Region)	Italy	345,180	CV
Grêt-Regamey et al. (2008)	Landschaft davos (Graubünden Canton)	Switzerland	25,500	CV
Hackl and Pruckner (1995)	Kalkalpen National Park (Oberösterreich)	Austria	21,500	CV
Häyhä et al. (2014)	Fiemme and Fassa valleys (Trentino-Alto Adige Region)	Italy	40,000	CV
Löwənstein (1994)	Sued Harz (Mansfeld-Südharz Region)	Germany	-	TCM
Marangon and Gottardo (2001)	Fusine forest (Friuli-Venezia Giulia Region)	Italy	15,670	CV
Marinelli and Romano (1987)	Umbra forest (Apulia Region)	Italy	399	TCM
Merlo (1992)	Val Rosandra (Veneto Region)	Italy	210	TCM
Montagné et al. (2005)	Rhône-Alpes and Provence-Alpes-Côte d'Azur	France	-	TCM
NIER S.c.r.l. (1991)	Paneveggio forest (Trentino-Alto Adige Region)	Italy	4,350	CV, TCM
Notaro et al. (2009)	Lavazè (Trentino-Alto Adige Region)	Italy	100	CV
Romano and Carbone (1993)	Vico lake area (Lazio Region)	Italy	4,500	TCM
Scolozzi et al. (2012)	Adamello-Brenta Park (Trentino-Alto Adige Region)	Italy	19,900	CV
Tempesta (1995)	Mis valley (Veneto Region)	Italy	11,746	CV, TCM
Tempesta and Thiene (2000a)	Dolomiti Bellunesi (Veneto Region)	Italy	32000	CV
Tempesta and Thiene (2000b)	Dolomiti Ampezzane (Veneto Region)	Italy	11,200	CV
Tosi (1989)	Calamento valley (Trentino-Alto Adige Region)	Italy	4,000	CV, TCM
Tosi (1989)	Cimoliana valley (Friuli-Venezia Giulia Region)	Italy	6,800	CV, TCM
Tosi (1989)	Cansiglio forest (Veneto and Friuli-Venezia Giulia Region)	Italy	4,230	CV, TCM

[1] CE= Choice Experiment, [2] TCM=Travel Cost Method,
[3] CV= Contingent Valuation

in recreational value among forest types (conifer pure forests, broadleaved pure forests and mixed forests). The Mann-Whitney non-parametric test was used making comparisons between the values of recreation of two independent random samples such as CV-TCM, protected – non-protected forests, and high altitude – low altitude forests.

Study Area

The study area is the Valle di Non (46°21'43'' N, 11°2'27'' E), located in the North-West of the Province of Trento in the Italian Alps (Figure 1). The land area of the Valley is 59,674 ha with a population of 39,134 inhabitants (density 65.6 inh./ha) corresponding to 14,393 families (average number of components: 2.72 persons/family). The Valle di Non is divided into 38 administrative municipalities. Valle di Non is a rural district characterized by an important role of the primary sector, which employs near 20% of the local workforce. The cultivation of the apple tree (6.828 ha and 4,000 firms) represents a priority from the socio-economic point of view.

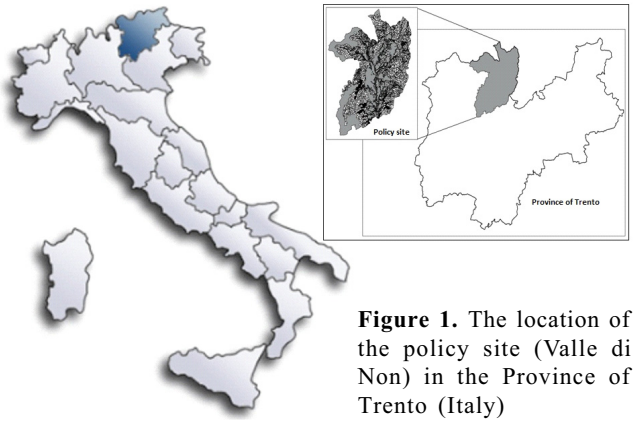

Figure 1. The location of the policy site (Valle di Non) in the Province of Trento (Italy)

The altitude of the Valley is between 400 m and 2,500 m above sea level, the climate is cool, temperate and mild continental. The pasture area covers 6,651 ha (11% of land area), while the forest area covers 38,597 ha (65%) of which 80% are public and common forests and 20% are private forests. More than 80% of forest area is under forest management plans and is managed for two main purposes such as productive use (24,693 ha) and natural hazards protection (3,149 ha). The standing volume in the productive forests is around 5 million m^3 with the annual increment of 83,000 m^3/yr. The main forest types of the Valley are conifer high forests (mainly Norway spruce forests pure and mixed to the silver fir, European larch, Scots and black pine forests) (90%) and the remaining 10% are European beech forests (Table 2).

Table 2. Distribution of the Valle di Non forests by altitude and tree species composition (in hectares).

Tree species composition/Altitude	Below 1,000 m a.s.l.	Above 1,000 m a.s.l.
Conifer forests	12,473	23,819
Broadleaved forests	1,289	1,016
Total	13,762	24,835

Benefit Transfer (BT) Method

The economic value of recreation in the Valle di Non forests was estimated using the BT method and considering three key variables: environmental evaluation techniques (CV and TCM), altitude (above and below 1,000 m a.s.l.) and forest composition (mixed and pure forests) of the "policy" site.

The economic value estimated can be transferred to the policy site either as monetary units (value transfers) or as a function (function transfers) that define the attributes of an ecological and economic choice setting (Loomis 2005). Among the four different benefit transfer methods (Rosenberger and Loomis 2001), we particularly used the average value transfer method considering the previous studies related to the economic estimation of recreation in mountain forests in Europe. The average value transfer method includes a measure of central tendency of all subsets of relevant studies as the transfer measure for the policy site issue. The accuracy of the BT estimates depends on the errors contained in the original studies, part of which could be transferred when the BT method is applied. Bergstrom and De Civita (1999) have found five sources of error that can bias the final estimates: (1) commodity measurements error, (2) population characteristic measurement, (3) welfare change measurement error, (4) physio-economic linkage measurement and (5) estimation procedure and judgment error.

The value transfer can be implemented using a meta-analysis that combines several valuation studies. A meta-analysis offers some advantages in terms of accuracy in the estimates (Rosenberger and Stanley 2001) because a large number of estimates allows providing more precise measures of central tendency.

In the present study, we decided to include in the meta-analysis only European mountain forests study sites, in order to have comparable situations in which to undertake a reliable BT. We believe that measurement errors could be reduced if the study sites are similar, as shown by Leon-Gonzales and Scarpa (2008).

Results

Meta-analysis study sites

The results of the meta-analysis show a mean recreational value equal to 10.57 € per visit (current

value obtained using a social discount rate of 1%) and a median of 5.30 € per visit (Table 3). Considering the large divergences between mean and median the distribution of the estimates is skewed. The mean recreational forest values are included in a wide range from 0.89 € per visit in an Austrian protect area (Ahornboden) (Glück and Kuen 1977) to 98.6 € per visit in the Regional Park of Cuenca de Manzanares in Spain (Garrido et al. 1994). Comparing this BT application to others, we notice that Zandersen (2008) evidences, through a meta-analysis on forest recreation valuation studies in Europe (25 studies), that the values range from 0.66 € to 112 € per visit, with a median of 4.52 € per visit. The database was composed by forests of the northern Europe – overall Danish, British and northern German forests – that are not located in mountain but in flat areas. Another similar application of the BT method in Spain (Province of Segovia), with a flat forests database, show an average value of 6.90 € per visit (Gonzales et al. 2010).

Table 3. Recreational value of forests using different social discount rates

	Value per visit (€)		
	0.5%	1%	2%
Mean	9.96	10.57	11.78
St.dev.	16.62	17.57	19.47
Median	5.15	5.30	5.60
Min	0.78	0.89	1.12
Max	93.32	98.60	109.17

Observing the recreational values in protected areas (national and regional parks and natural reserves), we found that for the nine observations the mean recreational value is 17.02 € per visit (social discount rate of 1%) and the median 5.52 € per visit (Table 4). Diversely, for the forests located in not protected areas – using the same social discount rate (1%) – the mean recreational value is 7.68 € per visit and the median 4.53 € per visit (Table 4). The higher value observed in the protected areas is probably due to the site characteristics in terms of quality of the environment, landscape and biodiversity richness that are associated to a higher WTP of the visitors. Another explanation of the higher tourists' WTP could be represented by the protected areas location. In fact, protected areas are usually located far from the cities, so the WTP calculated with TCM gives a higher result for protected areas. However, the Mann-Whitney test shows no statistically significant differences between the recreational values of protected and not protected forests using a social discount rate of 1% (U = 154.5, Attended value = 145.0, p-values = 0.772). This is probably due to the low numbers of studies in the two subgroups (respectively 9 and 23) and to the large standard error of the mean observed in protected areas.

The data collected with different methods (CV and TCM) are compared to evidence the influence of the methods on the value estimation (Table 5). The 18 studies that use the TCM show a mean value equal to 14.13 € per visit (median 5.72 € per visit), while the 19 studies that applied the CV method display a mean value of 6.85 € per visit (median 3.13 € per visit). Also in Tempesta (1995) and Tosi (1989) are evidenced higher recreational values when the TCM was used.

This result may be explained by the different construction of TCM and CV models. The first one, considering the cost supported by the tourists, reports a real monetary flow, so a reliable proxy for the wish to visit the forest. CV applications, otherwise, create a hypothetical scenario in which people are asked to express their WTP, usually, for an entrance fee to be applied to the forest. While answering, respondents concentrate on stating a reasonable ticket cost, without considering the whole economic value they attribute to the forest, which remains undervalued. Maybe, to have more effective CV assessment, the scenario should be created in a more exhaustive way, including not only the entrance fee issue, but also other characteristics of the total value.

Despite the aforementioned difference, the non-parametric test of Mann-Whitney – using a 95% confidence interval – shows no statistically significant differences between the values calculated for the two methods (U = 202, Attended value = 171, p-values = 0.358). These results confirm that – from the practical point of view – the use of one or the other evaluation technique does not lead to substantial differences in the value estimation. The choice of the economic evaluation technique is related to the objectives of the study and to the intrinsic characteristics of the site. Generally, the CV technique is advised when the aim of the research is to investigate both use and non-use values of the forest.

The results of the meta-analysis referred to the forest tree composition (conifer, broadleaved and

Table 4. Recreational value of forests in protected and not protected areas using different social discount rates

Method	Mean ± SE per visit (€)			Median value per visit (€)		
	0.5%	1%	2%	0.5%	1%	2%
Forests in protected areas (n = 9)	16.16 ± 1.41	17.02 ± 1.49	18.73 ± 1.65	5.34	5.52	5.87
Forests not in protected areas (n = 23)	7.12 ± 0.17	7.68 ± 0.18	8.81 ± 0.21	4.17	4.53	5.26
Mann-Whitney test (α = 0.05)	p-values = 0.937	p-values = 0.772	p-values = 0.898			

Table 5. Recreational value of forests per method using different social discount rates

Method	Mean ± SE per visit (€)			Median value per visit (€)		
	0.5%	1%	2%	0.5%	1%	2%
TCM (n = 18)	13.20 ± 0.60	14.13 ± 0.64	15.99 ± 0.70	5.18	5.72	6.79
CV (n = 19)	6.55 ± 0.53	6.85 ± 0.55	7.45 ± 0.60	3.02	3.13	3.56
Mann-Whitney test (α= 0.05)	*p*-values = 0.408	*p*-values = 0.358	*p*-values = 0.327			

mixed forests) show interesting differences (Table 6). The mixed forests have the highest mean value per visit (17.01 € per visit) followed by the conifer forests (7.79 € per visit). These results confirm the considerations of another research on the community perception of forest composition, carried out in a mountain area (Paletto et al. 2013). The authors evidenced that the majority of respondents expressed a preference for mixed forests (65.6% of total respondents) and secondarily for conifer forests (28.2%). The strictly relationship between WTP and forest composition in the recreation context is evidenced also by Matthews et al. (2007). The authors affirm that the WTP is mainly related to three forest aspects: site quality, forest size and percentage of forest area covered by broadleaved trees. However, the non-parametric test of Kruskal-Wallis – using a 95% confidence interval – shows no statistically significant differences among the forest composition types (K observed value = 1.584, K critical value = 5.991, *p*-values = 0.453). The low number of observations for each forest tree composition (n = 16; n = 6; n = 14) may be responsible for the absence of statistical differences among the forest types.

Table 6. Recreational values per forest tree composition using different social discount rates

Forest tree composition	Mean ± SE per visit (€)			Median value per visit (€)		
	0.5%	1%	2%	0.5%	1%	2%
s (n = 16)	7.37 ± 0.20	7.79 ± 0.21	8.62 ± 0.23	4.49	4.96	5.88
Broadleaf forests (n = 6)	4.03 ± 0.26	4.36 ± 0.28	5.02 ± 0.31	4.02	4.32	4.94
Mixed forests (n = 14)	16.02 ± 0.94	17.01 ± 0.99	18.98 ± 1.10	5.41	5.66	6.15
Kruskal-Wallis test (α= 0.05)	*p*-values = 0.479	*p*-values = 0.453	*p*-values = 0.453			

Finally, the data analysis considering the altitude of the study site shows limited differences in the recreational values per visit between high altitude forests (above 1,000 m a.s.l.) and low altitude forests (below 1,000 m a.s.l.) (Table 7). The forests above 1,000 m a.s.l. have a higher value (11.75 € per visit) compared to the low altitude forests (10.42 € per visit). Probably, this difference is due to the characteristics (in terms of landscape view, presence of areas and paths for recreational activities) of the high altitude forests that are greatly appreciated by the tourists. The non-parametric test of Mann-Whitney - using a 95% confidence interval - shows no statistically significant differences (U = 136.0, Attended value = 136.0, *p*-values = 0.986). Also in this case, one explanation of the non-significant results is the low number of observations for the two subgroups.

In consideration of the test's results and of the small differences between high and low altitude forests in the application of the BT method, the average value can be used for both types of forests.

Recreational value of the policy site

The recreational value of the Valle di Non forests was estimated taking into account the average value of the study sites, considering the altitude and forest tree composition (conifer and broadleaved forests). According to the provincial statistics, the annual number of tourist presences in Valle di Non is 321,059. Taking into account the characteristics of the valley (low availability of sport infrastructures, high levels of forest land use) we decided to include all the tourist presences and not only a part (i.e. summer tourist presences). Consequently, the total recreational value of the Valle di Non forests is around 2,5 million € per year (Figure 2); the conifer forests above 1,000 m a.s.l. weight for the 64% of total value, while the contribution of the broadleaved forests is quite limited (3.4% of total value).

Conclusions

Summarizing the main findings, the present research shows that coherence toward mountain forests

Table 7. Recreational values per site altitude using different social discount rates

Altitude	Mean ± SE per visit (€)			Median value per visit (€)		
	0.5%	1%	2%	0.5%	1%	2%
Below 1,000 m (n = 16)	9.72 ± 0.42	10.42 ± 0.44	11.82 ± 0.49	4.04	4.37	5.12
Above 1,000 m (n = 17)	11.19 ± 0.64	11.75 ± 0.68	12.87 ± 0.75	4.12	4.45	5.09
Mann-Whitney test (α= 0.05)	*p*-values=0.986	*p*-values = 0.986	*p*-values = 0.491			

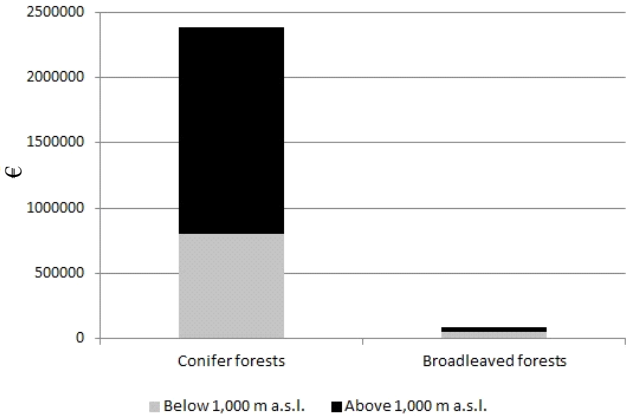

Figure 2. Distribution of total recreational value in the Valle di Non forests subdivided per altitude and tree species composition

preferences can be found. Although no significant differences were found using the non-parametric tests, we evidenced higher values for mixed forests than for pure deciduous or conifer forests, preferences for forests located at higher altitude. These findings demonstrate that mountain forests have a big attractiveness for tourism purposes and that the recreational value of these forests is a relevant element in multi-objective forest management strategies. Although statistically significant differences were not found, results showed that recreational values were higher when the TCM was used instead of CV technique. In the present research we formulated some hypothesis to explain these differences, but further future improvements of the work can be comparing the application of the methods in other case studies. Even if no significant differences were noted, for future application we suggest to take into account the tree species composition and the location (in protected areas or not in protected areas) applying the relative recreational values.

Results reveal that meta-analyses can provide a useful approach to estimate the general magnitude of recreational value provided by forests. Authors would like to remark the relevance of these kinds of investigations – concerning the non-market benefits of forest – as tools to support multi objective forest management strategies. The estimate of the economic value of recreation in mountain forests is particularly important in supporting decision makers in the conservation and valorisation of these fragile ecosystems. Accounting for the value of the recreational service adds a new important facet to the information available to planners and decision makers.

So far as the method is concerned, the application of the average value transfer method revealed itself well-suited to the policy site, chosen in the Valle di Non. In the presented case, we can affirm that the economic value of the recreation and tourism is high enough to deserve a primary role both in forest planning and local political strategies development.

Moreover, the application of the BT technique provides some indications useful to estimate the value of the forest recreation services of other mountain areas in Europe. When using a BT technique, the meta-analysis approach allows more accurate estimates than other approaches, but primary attention must be given to the differences among study sites and policy site, in order not to commit errors of evaluation.

With regard to the application of these results, as they are derived from a limited amount of data, attention must be paid to apply them to a wider context of BT. Undoubtedly, the BT exercises applied to forest contexts have still gaps and uncertainties, thus the findings with respect to the total recreational value presented herein should be interpreted with caution.

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