

RECREATIONAL VALUE OF REGIONAL FORESTS: THE CASE OF BELGIUM'S WALLOON REGION

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Abstract

The Walloon forestⁱ, which is geographically close to densely populated areas of Atlantic Europe, fulfils an important recreational function. Various surveys were set up, among which a large-scale statistical survey in 40 woodlands, distributed throughout the Walloon forest and resulting in over 4,000 questionnaires collected. These give information about the recreational activities carried out in the forest, which in turn helps determine the unit value of visits. The regional value is calculated on the basis of the estimated number of visits annually for the total woodlands in the region. Contingent Valuation is used to estimate recreational values for this specific data set comprising the whole regional level with heterogeneous visits and comparisons with other methods and other hypotheses are undertaken. Although the valuation varies depending on the method and the application modalities selected, it is very large and confirms the importance of this non-benefit service and the weight it could carry in terms of regional forest policy.

Keywords: forest, recreational value, survey, willingness to pay, Wallonia

1. Introduction

Estimating the economic value of forest recreation has become in recent decades a useful exercise for evaluating official decisions to develop a touristic site or a highly visited forest (e.g. Ward and Beal, 2000). Today this trend is even reinforced by the context of sustainable forest management and multi-functionality including the growing importance of leisure in many countries. Hence, quantitative data are more and more often required to assess the recreational value of a particular forest.

Wallonia belongs to those regions in western Europe that are affected by unrelenting urbanization, and thus forests and natural areas are under pressure. As a result, assessing the recreational value of the Walloon forest globally constitutes an important tool for regional environmental and planning policies. Notwithstanding this fact, no economic valuation study of recreational services has been carried out in Wallonia until now, although studies are available in neighboring countries and regions, including Flanders (e.g. Moons et al., 2000 and Lambrechts, 2005).

The travel cost and contingent valuation methods are often used to assess the recreational value of a site (e.g. Elsasser et al., 2008), although they have been revisited and adapted repeatedly since their creation. This valuation study is specific for two reasons. First, it concerns the whole regional level (all woodlands of the Region, that is some 540,000 hectares) and second, it quantifies visits that are particularly heterogeneous (local visitors, one-day visitors, vacationers, opening or closure of sites to the public, ...). These two distinctions contribute to the originality of this study and differentiate it from very specific economic studies applied to woodlands whose detailed data are known and to one particular forest cover. For that reason, it is impossible to get

appropriate data for each and every woodland and hence, to apply classical travel cost methodologies. Rather, other valuation methods, based on average numbers and annual number of visits globally are therefore used.

The implementation of valuation methods nevertheless requires a large number of data. Hence, this study starts with the build up and the compilation of various surveys with specific objectives for the whole Walloon territory in order to know as precisely as possible the geographic context, the public demand, and the recreational offer.

The contributions of the paper are thus threefold: i) creation of the first very large data set for Wallonia concerning recreation activities in the global forest cover, ii) first application of a valuation study of recreational activities in the Walloon territory and iii) specific valuation analysis based on a whole region and on heterogeneous visits.

The remainder of the paper is organized as follows. Section 2 describes the various surveys determining the number of forest visits in Wallonia, Sections 3 and 4 describe the methodology and valuation analysis while Section 5 discusses the results, adding refinements and comparisons. The last section (Section 6) concludes and presents the caveats.

2. Surveys of forest visits in Wallonia

The Walloon forest covers 540,000 hectares, or one third of the regional territory. However it is very scattered and the forestation gradient increases gradually from the northwest towards the southeast. The population density in Wallonia reaches on average 198 inhabitants per km² and its gradient is inverse to the forestation one: the highest population density is observed in the northwest of the region. Wallonia is located between the heavily urbanized, mildly

wooded areas in northwest Europe (northeast France, Flanders, the Netherlands, northwest Germany) and more rural regions in central Europe. As such, the Walloon forest can be called a rural forest in a peri-urban environment.

Three surveys were set up as part of a study related to woodland visiting for recreational purposes in the Walloon forest (Colson, 2009 and Colson et al., 2010) and aimed at characterizing the visits to the Walloon forest and gathering the necessary data to assess the economic value of this non-benefit service. Two of these three surveys were useful for our purpose and are detailed here.

The first survey was a phone survey, where a sample of 1,005 persons was polled. It found out that 45% of the Walloon and Brussels population visit the forest for recreational purposes. A variance analysis however pointed out significant variations of this proportion depending on the forestation rate of the residing municipality. In Wallonia this proportion seems to vary between 39% for regions where the forestation rate is below 20% and 75% for regions where the forestation rate exceeds 60%.

A second survey was carried out on 40 woodlands during 6 time periodsⁱⁱ distributed over the year so as not to bias the analysis by focusing on one particular time period. A total of 4,046 interviews were performed and helped characterize the type of public and activities. The duration of face-to-face interviews was around 15 minutes. The context and scope of analysis was detailed for some 5 minutes and 10 minutes were needed to answer the questions. Based on the answers, it was estimated that, regionally, 30% of the sample were vacationers (persons staying at least one night in the area), the others being considered as proximity visitors (that is local population and one-day visitors). The questionnaire consisted in 25 main questions and on general socio-economic information (age, employment, education level, ...). Questions were generally not open questions and were partitioned in six sections, among which, the frequency of

forest visits, the types of activities undertaken and their valuation. The part of the questionnaire that is interesting for this paper is replicated in Appendix.

Based on the two different surveys, it is possible to quantify and cross-check the annual number of visits in all Walloon forests. First, concerning proximity visits, the two surveys enable to determine the proportion of visitors going into the forest (telephone survey) and the frequency of their visits (face-to-face interviews in forest), so that an annual number of visits from each population centerⁱⁱⁱ (cities in Wallonia and in neighboring regions and countries provided they are located within a distance of 50 kilometers) can be established. Then, a distribution of this number of visits relative to local population and one-day visitors was estimated from each place of residence towards the woodlands so as to form the proximity visits data. Second, visits by vacationers were determined for each of the 4752 forest entrances^{iv}, based on data for the local visitors in the survey of 4046 individuals. The results of these computations, detailed in Colson (2009) for the Walloon Region as a whole, gives a total number of annual visits of 113 million, with local and one-day visitors representing 92,686,629 visits on the one hand, and vacationers 20,288,149 visits on the other hand^v.

The various survey results, as well as the estimated annual number of visits, underscore how important forest recreation in the Walloon forest is. To translate this into financial terms, contingent valuation has been adapted to the Walloon forest context and to the fact that the study considers all forests in the Region, and it measures the so-called informal visits to the forest (Benson and Willis, 1992), in other words visits that are not organized or supervised and thus do not generate any direct cost to the public (entrance fee).

3. Valuing recreation in the context of the global Walloon forest cover

The objective consists in determining the economic value of each of the 113 million visits to the Walloon forest. The classical valuation methods are the Travel Cost and the Contingent Valuation. The specific context of this study may not validate both measures, which is why the context is first re-explained and the valuation method is then inferred from it.

The economic valuation of the forest recreation in Wallonia must take into account the main local characteristics of the forests and their respective visitation levels. In other words what is considered here is a regional forest cover that is rather large but very *heterogeneous*, in terms of scattering – various forests differing in size, attractiveness, stands types, species composition, relief, ownership, inroads opened or closed to the public, ... Moreover, that forest cover is visited by *different sorts of people*: locals and one-day tourists or vacationers originating from seven distinct regions or countries.

Concerning the latter characteristic, the visits by local and one-day visitors can be characterized at the same time by their geographic origin (area and thus region and country) and by their travel distance between their residence and the visited forest. The visits by vacationers on the other hand cannot be described as precisely as they are not within the population centers considered in the data set; hence data precision and availability are different for locals and vacationers. Concerning the former specificity, data are not available for each Walloon forest and disaggregated recreational data (visits per forest, inroads open to the public or not, available amenities, other attractiveness factors, ...) cannot be inferred. These elements obviously complicate the choice or prevent the applicability of some valuation methods.

The travel cost method is based on the principle that the value given to an activity is at least equal to the total expense of traveling to the forest. This method was initially designed by

Hotelling in 1947 to value the recreational function of national parks in the United States (Ward and Bean, 2000), which are sites with a definite location and clear limits and are visited by tourists. But in this study, even though the database is very large, as mentioned before, data are not available for every single forest and every type of visitor (i.e. proximity visitors and vacationers), and the total number of annual visits, only, can be inferred. Hence, it is not possible to determine consumer surpluses (difference between an individual's Willingness-To-Pay – hereinafter referred to as WTP – and the actual recreation expenditure incurred in using each particular forest's amenities for recreation purposes). What can be estimated however is the average cost associated with traveling for a visit to Wallonia's forests. This will be done later (Section 5.2) for purposes of comparison with the valuation method chosen.

Contingent valuation is another method that was first applied to value recreational activities in the forests of Maine in 1963 (Desaigues and Point, 1993). It is generally used to estimate the WTP to benefit from a service or rather from a modified use of a good (Tyrvaainen, 2001). The surveyed persons are thus asked to state their preferences on a hypothetical market. This is the method that is used here. This regional study targets the recreational value of the Walloon forest as it is rather than its possible increased or decreased value resulting from modified services to the public (for example modified WTP to access a site with new infrastructure). The WTP analysis for recreational services offered to the public in the Walloon forest aims at estimating the maximal WTP for a current recreational activity. An open-end question was asked to the 4,046 respondents to the visitation survey. The question was as follows: "If you had had to give a contribution in order to continue practicing your current activity, what is the maximal amount that you would have agreed to pay (in euro per activity and per person)?" ; this is question 25 in the Appendix^{vi}.

4. Contingent valuation analysis

The willingness to pay estimation is based on the answer to the open-end question for which it is not possible to distinguish non-answers corresponding to zero values and non-answers corresponding to the difficulty to quantify the WTP. According to Desaignes and Point (1993), most economists tend to agree to consider that the persons who do not answer survey questions are the least interested and thus would have added near-zero values to the natural asset. In this study, all non-answers are also assimilated to zero values. Out of the 4046 questionnaires completed during the survey, 3986 can be exploited and 2206, or 55 %, of them contain a non-zero value so that the sample is large enough to pursue the analysis. The average amount indicated by those respondents is 8.08 € per activity while the general mean for all respondents, including those with a zero-value, amounts to 4.43 Euro.

Note that both the proportion of non-zero values and the estimated WTP amount are superior to the results obtained in the phone survey (first survey mentioned before) aimed at assessing the average contribution per year that forest visitors would accept to pay. Indeed, in the phone survey, 23% of forest visitors would agree to pay an annual contribution of 24.04 €/year, which corresponds to a WTP of 4.38 € per visit, based on the average number of visits per year. Such a difference was also brought up by Tyrvaïnen and Vaanaen (1998) and we cannot overlook the possibility that respondents are willing to pay a larger financial contribution when they are interviewed in the forest (on-site face-to-face survey) than when interviewed at home (over the phone).

Figure 1 shows the distribution of the 4046 interviews in WTP brackets. The first bar represents the zero value assigned by 45% of the sample. Among those who have assigned a

positive value, we can see that the proportion in each WTP bracket decreases exponentially as the marginal WTP increases: more than two thirds of this sub-sample have a WTP ranging from a positive number to less than 10 Euros and less than 1% of the sub-sample would be willing to pay more than 50 Euros for a visit.

Figure 1 : Sample distribution in maximal WTP brackets per activity

As mentioned earlier, it may then be interesting to verify the WTP difference between vacationers and locals. Considering the whole sample – average WTP of 4.43 Euros – their respective WTP amounts to 5.9 and 3.8 Euros per visit. This could be due to vacationers budgeting their stay and thus being more willing to accept paying for activities.

Based on this distinction and on the annual number of visits, the recreational value of the Walloon forest is estimated at 472 million € per year. If this value is expressed per hectare of forest, we obtain 852 Euro/ha/year when the total surface of the Walloon forest is taken into consideration and 1768 Euro/ha/year if we distribute the visits only on the public forest. For comparison purposes, the recreational value of the German forest was found to vary regionally between 25 and 25,000 Euro/ha/year^{vii} (Elsasser, 2004).

5. Discussion and comparison

Two matters should now be discussed to go one step further. First, since data are based on average values, it is important to have additional information about the various values that are

computed in order to get the numbers given in the previous section *and* to undertake a sensitivity analysis based on the various computed values for determining a range in the estimations.

Second, even though the travel cost method cannot be used in this context for the reasons explained above, some comparison with average costs associated with travel may further help validate the recreational values proposed in the previous section.

5.1. REFINEMENTS AND ESTIMATION RANGES

Many questions in the survey concern the type of activity undertaken, its duration, the fact that an activity may either be organized by an agency or not, the distance traveled, the interview timing and the education level of the respondents. To estimate the impact of these variables on the WTP, simple linear regressions are explored and summarized in Table 1. The Table shows that the WTP varies a lot with the type of activity done in forest: respondents are much more in favor to paying for an activity such as horseback riding (7.77 Euros on average for the whole sample) than for other activities such as cross-country running or leisure walks, which have the lowest average WTP. Similarly, organized activities have a higher WTP than activities carried out by oneself (nearly twice as much: 7.42 Euros versus 4.09). Also, WTP increases with activity duration, which is expected. Finally, the interview period is also statistically significant in its impact on WTP as people prefer to use forest amenities in the Spring (WTP of 5.68) and the Winter is the least favoured period for climatic reasons (WTP of 3.63). However, as in Tyrvainen and Vaanaen (1998) and in Reynisdottir et al. (2008), the education level does not seem to explain the observed WTP variability, which conflicts with the general opinion as this variable is viewed as an income indicator^{viii}.

Table 1: Statistically significant WTP variations (95% confidence interval) for the activity practiced at the time of the survey

Each of these explanatory variables is explored more precisely and more data can thus be inferred from what is summarized here. For clarity of exposition, the WTP breakdown per type of activity is the only one detailed here (Table 2).

Table 2: WTP breakdown per type of activities

Table 2 indeed shows that the average WTP is 4.43 Euros – 5.9 for vacationers and 3.8 for locals – but it very much depends on the type of activity. To go from one extreme to the other, vacationers are ready to pay 21.5 Euros for horseback riding^{ix} while locals would not accept to pay more than 2.71 Euros for a leisure walk.

Data coming from Tables 1 and 2, along with data coming from the complementary phone survey, could be used to try to determine a lower and upper bound for the recreational value of forests in the Walloon region.

Let us first hypothesize three methods for placing a lower bound on the recreational value: i) taking locals into account only, ii) considering the activity undertaken by the majority of the people as a surrogate for recreational value and iii) considering the worst climatic period of the year (winter) as a precautionary approach for forest attendance. Valuing forests by locals only would give a total WTP of 352 Million Euros instead of 472 Million. Considering in Table 2 that the recreational value is given by the activity undertaken by most people, that is leisure walk, the total value would then amount to 349 Million Euros. And finally, if the winter period value is

considered for the whole year, the estimation goes down to 410 Million^x. The lowest bound of the recreational value would then be set at 349 Million Euros.

As far as the upper bound goes, it has been explained before that most computations are conservative and can go well beyond the findings based on average values. Indeed, the mean value could be undervalued because of unidentified false zeros and it might therefore be interesting to analyze the sensitivity of this result by replacing the mean with a higher value. The 9th decile of the maximal WTP for the activity has been retained as it is the first one that features a value superior to the mean (considering the inverse J-shaped distribution of the sample depending on the WTP). These unit values are 10 Euro and 15 Euro for non-vacationers and vacationers respectively. The total value amounts to 1231 Million Euros a year (927 and 304 millions respectively for locals and vacationers) and can be considered as the upper bound.

Using some of the data provided in Tables 1 and 2 does not go above that upper bound value. Three hypotheses can be posed for estimating an upper bound: i) vacationers' WTP are the reference average WTP, ii) organized activities are those that determine the WTP of people visiting the forests, and iii) the most favorable climate season is used for computing the WTP. Contrary to the previous estimation, this does not account for non zero values and therefore brings about a lower total WTP, but within the scope of these data, the total WTP are respectively valued at 666, 838 and 641 Million Euros^{xi}.

5.2. AVERAGE COSTS ASSOCIATED WITH TRAVEL

As explained before, the travel cost method cannot be fully explored but some information on average costs associated with traveling can nevertheless be deducted and compared with the Contingent Valuation analysis. These include the cost of traveling to the forest, the opportunity cost of the activity and the accommodation cost for vacationers.

Concerning the cost of traveling to the forest, the price of fuel, including the normal wear and tear of the vehicle - tires and small maintenance – (Bateman et al., 2003) is used here. Based on statistics about the average age of the automobile fleet, fuel type, engine capacity and car make, the mean value is estimated at 0.16 Euro/km^{xii}. And since the survey data revealed that the average group visiting a forest is estimated at 2.13, the mean cost to go to a forest per person and per kilometer amounts to 0.08 Euro. The mean travel distance for vacationers reaches 372 km round-trip, which values a recreational activity per vacationer at 4.25 Euros while distance cost varies per individual for locals as it is based on the distance between each population center and each point of entry in the forest.

Whether the hourly cost of the activity should be considered has been hotly debated (Ward and Beal, 2000). This opportunity cost offers the advantage that the time spent in forest receives a value. Consequently it can solve the problem of proximity visits (peri-urban forest) being given a zero value because there is no car travel. Each hour spent in the forest was given a value of 1 Euro, which represents the average cost of guided hikes in the Walloon forest in 2008, since no other data could be collected concerning other leisure costs. As time spent in forest is asked in the survey (average of 2h24 for locals and 3h52 for vacationers), the estimated opportunity cost of the activity is set at 2.4 and 3.52 Euros respectively.

On top of this, vacationers bear accommodation costs if they want to pursue their activity in forest, which would not have been spent if they had not left their residence (Ward and Beal, 2000). The data collected during the forest survey (description of accommodation type, length of stay and cost) indicated that the average cost per night is 32.22 Euro (value weighted on the basis of vacationers' distribution in different types of accommodation). Since determining how much the activity in forest represented in the total stay was impossible^{xiii}, by hypothesis, a total cost of one night was allocated to it.

Aggregating all of this into an average cost figure shows that, under the hypotheses used in this study, locals' costs depend on travel distances, and hence vary per person, while vacationers' costs are simple addition of the averages mentioned above and hence amount to 39.99 Euros.

Finally, computing individual values of each of the 113 million visits by locals and vacationers results in a total recreational value of 1728 million Euros. Expressing this number per hectare of forest gives an amount of 3119 Euro/ha/year if the total surface of the Walloon forest is taken into account, and 6021 €/ha/year when only the public forest is concerned. These values are within the same range as those calculated by Moons et al. (2000) in a Flemish forest^{xiv} (annual recreational value varying between 825 and 9,548 €/ha depending mostly on the approach to assess the number of visits) but somewhat higher than the Contingent Valuation study. This is partly due to the fact that, by hypothesis, one night accommodation is computed for vacationers, even though they may have decided to stay overnight independently of their forest activity, and that an opportunity cost is computed for locals, therefore canceling out zero-values existing in the other method.

In other words, this value goes beyond the estimated upper bound of the contingent evaluation study (1.7 versus 1.2 Billion) but stays in the range of other researchers' work. Even though that number does not come from a travel cost analysis, it reinforces the fact that the 1.2 Billion Euros upper bound estimated with the contingent valuation analysis may be a credible estimate.

6. Conclusion and caveats

The economic valuation presented in this paper shows how difficult estimating the recreational value of the forest at regional scale can be. Besides the intrinsic complexity - for example other recreational activities are not exclusively practiced in forest – valuation methods turned out to be particularly arduous, because the heterogeneity of the forest cover in Wallonia and the fact that the global forest surface, comprising many different small forests and entry points (in opposition to National Parks in the USA with large surface and few entry points), has to be considered here; and also because of the variety of visitors: locals and one-day visitors as well as vacationers.

The variability between the results highlights how careful one must be when interpreting absolute values. This observation holds for our analysis but also for other similar or related studies (Moons et al., 2000; Lambrechts, 2005; Bellu and Cistulli, 1997).

The results of the contingent valuation analysis vary roughly between the lower bound of 349 Millions to the upper bound of 1.2 Billion, with a value of 472 Million Euros per year for all the recreational visits to the Walloon forest. There is a factor of 3.5 between the lower and the upper bounds. This may seem rather large – and it indeed is – but it should be compared with other studies where uncertainties, sample size and forest heterogeneities are such that a factor of 10 to 1000 can sometimes be found (e.g. Moons et al., 2000 and Elsasser, 2004). Moreover, the estimation of 472 Million is based on an on-site survey without adjusting for different visit probabilities of the respondents; hence, this is likely to bias results downwards (Kish, 1992).

Another caveat concerns the total recreation values obtained, as it is directly dependent on the number of annual visits and on forest visitation data collected in various studies.

Nevertheless, dividing the visitation numbers by 2 or multiplying them by 2, which is unlikely to happen in reality, largely keeps the resulting values within the boundary ranges.

We would also like to point out that concerning the geographic distribution of this regional value, analyzing and interpreting the resulting values in relative terms (this sub-region has a higher recreational value than that one) is more relevant than to do so in absolute terms (the recreational value of this spot is x million Euro). When we take a closer look at the mapped distribution of these regional values by forest entrance sites, we notice how clearly identifiable some areas are: They correspond to peri-urban forests in the north of the region and to touristic spots in the Ardennes.

Although the originality of this study consists in considering the economic importance of the forest recreational value at regional scale (540,000 hectares), a classic valuation method could not be applied without formulating a certain number of working hypotheses, which were at times simplified. Because of the combination of local and non-local visitors, the heterogeneous study field, the size of visitation surveys, and the difficulty in obtaining precise data, some results had to be aggregated. In spite of those perfectible aspects (which however would entail that permanent surveys be set up), we believe that this study may contribute to the refinement of the regional forest policy in that it supplies monetary values and quantifications, which were never before made available because of lacking field studies or appropriate valuation methods.

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Figure and Table

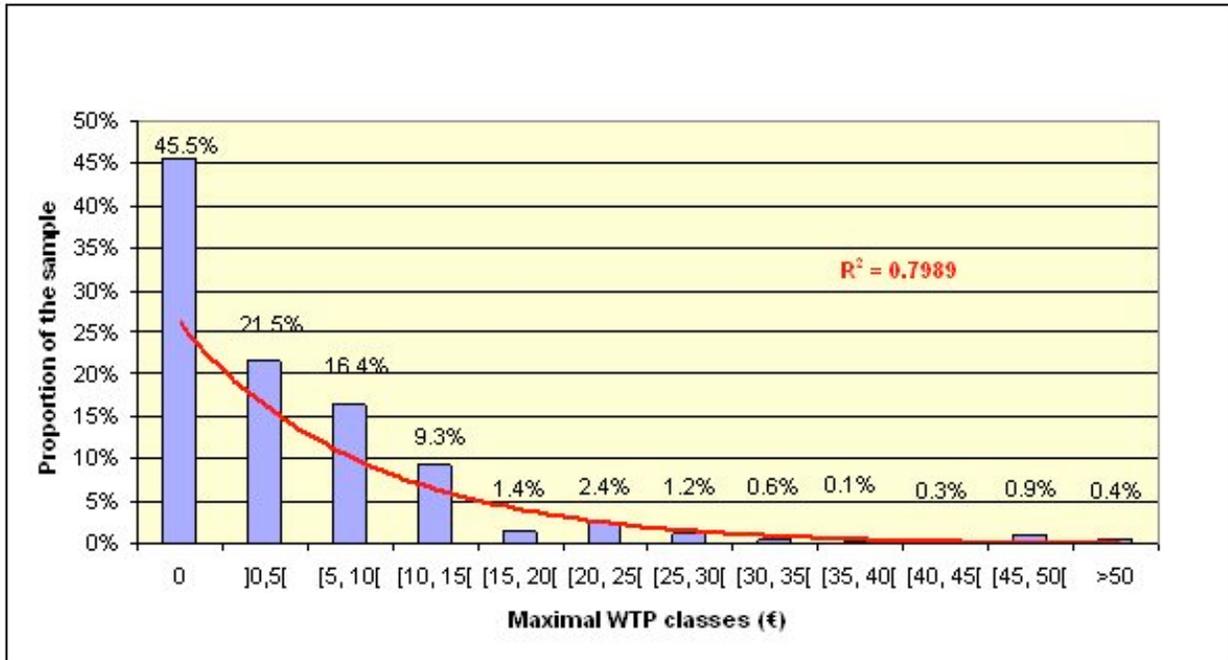


Figure 1 : Sample distribution in maximal WTP brackets per activity

Variable	WTP significant variations	Remarks
Activity type	Yes	3.44€ (leisure walking) => 7.77€ (horseback riding)
Activity duration	Yes	WTP increases with duration
Organization of the activity	Yes	7.42€ if organized, 4.09€ if non-organized
Residence-forest travel	Yes	Increase until 200 km then decrease
Interview timing (period)	Yes	Higher values in Spring (5.68) and lowest in winter (3.63)
Education level	No	No significant difference identified

Table 1: Statistically significant WTP variations (95% confidence interval) for the activity practiced at the time of the survey

Activities	locals		vacationers		total	
	WTP	<i>sample</i>	WTP	<i>sample</i>	WTP	<i>sample</i>
Fauna and flora observation	6,97	131	7,64	39	7,13	170
Others	6,68	61	7,64	18	6,90	79
Horseback riding	6,60	117	21,50	10	7,77	127
Orientation sport	5,68	14	3,67	6	5,08	20
Guided walk	4,66	341	5,96	210	5,16	551
Freetime and rest	4,56	93	6,59	45	5,22	138
Organized games (scouts, ...)	4,44	25	5,57	21	4,96	46
Picnic, BBQ, ...	4,35	65	6,42	19	4,82	84
Ski and snow sports	4,23	39	6,45	21	5,01	60
Biking	4,10	376	10,60	96	5,42	472
Jogging	3,44	223	6,32	14	3,61	237
Leisure walk	2,71	1306	4,81	696	3,44	2002
Total	3,80	2791	5,90	1195	4,43	3986

Table 2: WTP breakdown per type of activities

Appendix

Note: this Appendix does not include the complete questionnaire, simply the parts of the questionnaire that are relevant for this paper. Those sections are *not* included: the type of circuit in forest (3 questions), the activities enjoyment (5 questions), and the type of forest visited (1 question with many sub-questions).

FREQUENCY OF YOUR FORESTS' VISITS

- 1) how many times did you go to the forest for recreational purposes within the past 12 months ?
- Less than 5 times a year ?* *Once to twice a week ?*
 Between 5 and 1 times a year ? *More than twice a week ?*
 Once to 3 times a month ?

THE ACTIVITY DONE TODAY :

10) What activity are you doing today (1 answer only)?

- Leisure walk* *Games (scouts, ...)*
 Guided walk *Ski and other snow sports*
 Jogging *Flora and fauna observation*
 Biking *Resting*
 Horseback riding *Picnic, BBQ*
 Orientation sport *Others :*

11) Purpose of your activity :

- sport* *rest* *leisure/excursion*

12) Is today's activity done alone or not ? (one answer only)

- Alone* *Couple* *Family (number:...)* *Friends, group (number :....)*

13) How long does your activity last today? hours(s) min

14) What distance have you done today? km

15) How many times have you done that activity over the past 2 months? times.

16) Is today's activity organized by a club or an association ? *Yes* *No*

17) Did you pay a fee for today's activity?

- Yes* *No* *If yes, how much ? :euros/person*

18) Why did you come here (more than 1 answer is possible)

- I know the place*

- At random*
- Proximity to the place I stay*
- Walking card, directions, tourist information*
- Infrastructure for the activity*
- Others :*

19) How did you come here (more than 1 answer is possible)

- walking* *biking* *Moto* *Horse*
- Car* *Bus* *Train* *Other.....*

VALUE GIVEN TO TODAY’S ACTIVITY

21) Are you on holidays in the region? *Yes* *No*

If yes, what is the duration of your stay in days:

If yes, what type of lodging do you have?

- B&B* *Hotel* *Camping* *Holiday rental* *Holiday home* *Other*

22) What expenses have you incurred for the activity undertaken today?

- *in transport (if paid transport) :euros for persons*
- *in lodging (if in holidays in the region) :euros/day for ...persons*
- *in food :euros/ day pourpersons*
- *in documentation : book road-book maps topographical maps others :*

23) Is there a specific equipment that you only use for this activity?

- O yes O No if yes, which one ?.....*

24) If you had the choice between today’s activity and another leisure activity, which one would you have chosen?

- 24.1) *O your activity* **OR** *O newspaper, magazine, ice cream, drink, DVD rental, ...*
- 24.2) *O your activity* **OR** *O movie theater, tennis lesson, ...*
- 24.3) *O your activity* **OR** *O casual dinner, expo visit, football game, ...*
- 24.4) *O your activity* **OR** *O formal dinner, concert ticket, ...*

25) If you were asked to pay a fee for today’s activity, what is the maximal amount you would agree to give?

.....euros per activity per person

GENERAL INFORMATION

Age : ... Sex : M O F O Occupation :

*Last diploma : elementary school O first degree high school O second degree high school O
2 or 3 year college O university O*

Number of persons in the family: ... adults ... children

Address

ⁱ The analysis is carried out for the Walloon Region but the Brussels Region has been taken into account in the telephone survey considering that most of the visitors coming from this Region go to Walloon woodlands for their recreational activities in forests

ⁱⁱ The time periods are chosen based on school and official holidays and are respectively: october-november, december-january, february-march, april, may and july-august.

ⁱⁱⁱ A population center is the centroid of statistical sectors defined for various ranges of inhabitants and enabling to geo-reference data on population density.

^{iv} Forest entrances are based on forest cover and road access and the computation methodology is described in Colson (2009).

^v In other words, this 113 Million number is derived from data extrapolation about the frequency of forest visits for locals and from the proportion of vacationers computed at each entry point in all forests of the Walloon region.

^{vi} This value was then compared with answers provided in Question 24 to verify for potential abnormal numbers proposed as answers to Question 25. For example, if a value of 100 Euros is given in Question 25, but if forest recreation is compared to a movie theater ticket, the value is not taken into account.

^{vii} The numbers should be interpreted with caution as they come from various studies with different hypotheses

^{viii} If the education variable is a proxy for income, since locals are present in the sample, they may not be as sensitive to costs as others.

^{ix} Although the sample is small and caution should be exercised in interpreting this number

^x Computations are as follows for the 3 cases. i) $3.8 * 92,686,629 = 352,209,190$; ii) $(2.71 * 92,686,629) + (4.81 * 20,288,149) = 348,766,762$; iii) $3.63 * 112,924,778 = 409,916,944$.

^{xi} Computations respectively multiply 5.9, 7.42 and 5.68 by 112,924,778.

^{xii} Computation details are available from the authors upon request.

^{xiii} Even though an expert opinion (forest manager) has considered that vacationers often come to a forest once or twice during their stay, provided it is not longer than a week; which makes this one night hypothesis seem credible

^{xiv} Even though caution should be exercised when comparing numbers as Flanders has a higher population density and may have a different WTP