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Summary

This paper offers an economic value assessment of a nature protection programme in the Veluwe. This programme involves two defragmentation scenarios: the first scenario connects the central part of the Veluwe with the IJssel river forelands in a north-eastern direction, while the second scenario is focused on defragmentation in a south-western direction, where the Rhine river forelands are located. The valuation is based on a questionnaire that was administered during face-to-face interviews in the Veluwe area and through the Internet. We employ a contingent valuation approach to assess the respondents' willingness to pay for the realisation of the defragmentation scenarios. It appears that the mean willingness to pay for the two defragmentation scenarios are € 59.7 and € 162.2 per respondent. These two willingness-to-pay estimates, which refer to a lump sum payment (or 'once-and-for-all payment'), are based on a lognormal and Weibull distribution respectively. In addition to the willingness to pay, we also estimate recreation benefits of the Veluwe. To that end, we use the travel cost technique, the purpose of which is to arrive at an estimate of the site's consumer surplus. According to this technique, the yearly recreational benefits are estimated between € 0.06 and € 0.45 per visitor. Whereas the former estimate is based on the fuel costs only, the latter covers also insurance and maintenance costs, and capital depreciation. Finally, we performed an aggregation of individual WTP estimates over Dutch households. With the resulting aggregate estimates we are able to compare the total costs and benefits of the two scenarios for habitat fragmentation in the Veluwe. The result of such a simple comparison turns out to critically depend on whether the mean or median estimate is used for aggregation. If aggregation of individual WTP estimates is based on mean values, then the benefits far exceed the estimated costs of defragmentation. In other words, based on an integrated economic-ecological analysis it makes sense to execute the defragmentation measures described in the scenarios. However, aggregate estimates obtained by using median values result in higher costs than aggregate estimates that are based on mean values. Even stronger, median-based estimates show that the costs of implementing scenario 2 are higher than the total benefits of this scenario.

Keywords: Economic value, Nature protection, Defragmentation policy, Veluwe

JEL Classification: Q50, Q57, Q58

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1 Introduction

This paper performs an economic valuation of a nature protection programme targeted at the alleviation of the negative impacts of habitat fragmentation in an area in the Netherlands, namely the Veluwe-region. Fragmentation denotes "… the splitting up of suitable habitat in a landscape from a single coherent unit into smaller, isolated patches of habitat in a surrounding inhospitable landscape, resulting from habitat loss and degradation." (Foppen, 2001, p. 21). It thus consists of two components: (i) loss of total habitat area and (ii) distribution of remaining habitat into smaller, more discontinuous patches.

The objective of this paper is to determine the willingness to pay for two nature protection scenarios, which are aimed at the unobstructed dispersal of animals in the Veluwe-region. Since most of the benefits from such protection scenarios are non-market goods, a survey was constructed as a measure instrument for assessing the individual's valuation of these two defragmentation scenarios. The central part of the survey instrument focused on the scenario descriptions and on eliciting the respondent's willingness to pay. Other questions in the survey asked for the respondent's familiarity with the Veluwe, her attitudes and opinions regarding nature policy in the Netherlands, her motivation structure, and her socio-economic characteristics.

The organisation of this paper is as follows. Section 2 provides a short background to the study area, including a description of its present situation, its historical development, and the problem it faces. Section 3 describes the questionnaire used, with special attention given to the questionnaire design and survey administration. The survey revolves around two defragmentation scenarios, which are also presented in this section. Section 4 presents the descriptive statistics of the survey responses, such as number of respondents and response patterns on various questions. Valuation results are derived using both a travel cost model and a contingent valuation method. The former is capable of estimating use values, while the latter captures mainly non-use values (see, for example, Carson *et al.*, 2001). In section 5 travel cost results are estimated and total recreation benefits are computed. Next, section 6 discusses and analyses the valuation results derived from the use of the contingent valuation method. Finally, section 7 presents the conclusions.

2 Study area

The Veluwe is the largest forested and natural area in the lowlands of north-western Europe. It is located in the province of Gelderland, in the eastern part of the Netherlands. The central part of the Veluwe is a ridge of hills (the so-called lateral moraines) pushed up by extending ice caps during the third glacial period, the Saalien (300,000 – 130,000 years ago). It forms a part of the sand region, in which the fine periglacial sands deposited during the last ice age (the Weichselien, 100,000 – 10,000 years ago) play a predominant role (Vos and Zonneveld, 1993). At present, the ice-pushed ridge shows elevations up to approximately 110 meter above sea level and serves as a

groundwater infiltration area. Infiltrated water partly flows to nearby lowland areas, and is partly withdrawn by drinking water wells. Groundwater tables are relatively deep, up to 35 meter below the land surface.

For centuries, the Veluwe was a wild and desolated area with only red deer, wild boars, roe deer and wolves. People did not live in the Veluwe but entered the area every now and then. When agriculture began on the slopes of the hills, they gradually caused an ecological disaster. Primeval forests were cut down in order to obtain areas of open grassland for farm animals – especially sheep – to graze on, but also to gain charcoal for the extraction of iron. The widespread clearance of the land ultimately resulted in an overexploitation of the area, with large-scale sand-drifts on soils vulnerable to erosion. Thus, due to human activity, the vegetation cover was damaged to such an extent, that wind erosion and dune formation could take place. It was already in the 11th century that villages were threatened by large amounts of sand. While landscapes consisting of sand-drifts used to be found all over north-west Europe, they all have disappeared nowadays with the notably exception of the sand-drifts in the Dutch province of Northern-Brabant and the Veluwe. In addtion, during the last 100 years, most European heathlands have been converted into woodland and land suitable for farming and building. Remaining heathlands, the largest in size on the European continent, are still to be found in the Veluwe. They are considered valuable natural ecosystems.

On the northern side, the Veluwe is bordered by the so-called 'Randmeerkust', on the eastern side by the outer marches of the IJssel river, on the southern side by outer marches of the Rhine river, and on the western side by a valley called 'de Gelderse Vallei'. Table 2.1 shows some characteristics of the various municipalities that are located in the Veluwe. From an ecological point of view the area is extremely important because of its size, equalling approximately 1,000 square kilometres, and of its ecological quality. The area is characterised by a unique variety of forest (almost 75%), heath and sand-drift (20%), and country seats and cultivated landscapes (5%).[1] This wide variety of scenery and wildlife is further increased by the transition zone, with its complexity of abiotic conditions, between the elevated central part of the Veluwe and the plain areas of the outer marches. The sandy, central part of the area is dry and low in nutrients, whereas the soil of the border areas – consisting of brooks and areas with high ground water levels – typically contains large amounts of nutrients. Most of these border areas, however, are in agricultural use and therefore, ecological values remain underdeveloped.

Because of its nature, its landscape and its cultural history, the Veluwe-region is attractive to many people as a place to live and work. Together with the beaches along the North Sea, it is one of the most popular tourist sites within the Netherlands. Each year, approximately 28 million day-trippers and 1.7 million holiday-makers visit the area. The total turnover due to recreation and tourism is estimated at 1 billion euro per year. The tourist sector offers

[1] Due to government intervention, aimed at curbing the sand-drifts, most of the current forest was planted at the end of the 19th century on sand blown areas. By and large, the stands consist of Scots pine and are generally homogeneous. There are some deciduous stands as well, which consist mainly of oak and beech.

employment to more than 22,000 people, which is about 5% of the professional population in the Veluwe. Because the Veluwe offers a combination of quietness, space and nature, the province of Gelderland has turned out to be an attractive location for the establishment of several industries.

Table 2.1 Some characteristics of municipalities in the Veluwe at a glance

Municipality[a]	Number of inhabitants (Oct. 2002)	Land use in ha. (1996)			
		Forest, heath and sand-drift	Built-up area	Other[b]	Total area
Apeldoorn	155,616	18,944	3,598	11,571	34,113
Arnhem	141,357	3,424	2,602	4,127	10,153
Brummen	21,608	1,460	557	6,493	8,510
Ede	104,544	16,444	2,221	13,383	32,048
Elburg	21,684	2,507	509	3,579	6,595
Epe	33,238	6,976	778	7,971	15,725
Ermelo	26,820	5,050	756	2,932	8,738
Harderwijk	40,482	1,437	944	2,446	4,827
Hattem	11,672	458	303	1,659	2,420
Heerde	18,174	3,006	362	4,671	8,039
Nunspeet	26,460	8,425	597	3,927	12,949
Oldebroek	22,880	3,064	451	6,370	9,885
Putten	23,187	2,728	387	5,630	8,745
Renkum	32,218	1,670	861	2,181	4,712
Rheden	44,989	4,090	1,021	3,328	8,439
Rozendaal	1,519	2,604	52	139	2,795

Sources:: Provincie Gelderland (2000, p. 109, Map 1); CBS StatLine (available via the Internet; URL: http://www.cbs.nl).

Notes: [a] Some municipalities are located in the border region; they are partially within and partially outside the Veluwe. With regard to these municipalities, it was considered too difficult to give reliable estimates of the size of the area and the number of inhabitants that are within the borders of the Veluwe. Therefore, data of these municipalities are fully taken into account, leading to an overestimation of area size and number of inhabitants.

[b] Other land use includes, amongst others, agricultural land, infrastructure, public gardens, parks, allotments, land devoted to recreation, cemeteries, dumping sites, and water.

An undisturbed and continuous Veluwe is a reminiscence from a time long past. The Veluwe nowadays consists of a patchwork of habitat fragments. Game averting fences, infrastructure, economic activities (such as agriculture), camping sites and bungalows, and military sites have fragmented the area.[2] These barriers and different land uses are the consequence of the assignment of property rights in the past (see Table 2.2). As a result, formerly continuous wildlife habitats are now often divided into pieces, leaving small habitat patches scattered throughout the area. Habitat fragmentation threatens the persistence of species in two ways (see

[2] Across the Veluwe, there are 1,200 kilometres of so-called provincial roads, 107 kilometres of national motorways and 60 kilometres of railways.

Foppen 2001; van der Grift *et al.*, 2002). First, populations in small and isolated habitat patches have a higher risk of extinction due to random variations in population size (demographic stochasticity) and unpredictable changes in environmental factors (environmental stochasticity) (see Barbault and Sastrapradja, 1995). Second, the potential for dispersal and colonisation is often reduced due to an increase in both distance between (sub)populations and the number of barriers (Primack, 1998). These problems may be overcome if habitat connectivity is restored and barriers to the normal processes of dispersal, colonisation, and foraging are removed.

Table 2.2 Assignment of property rights in the Veluwe

Landowner	Area (in ha.)
National Forest Service ('Staatsbosbeheer')	17,000 ha.
Society for the Preservation of Nature ('Natuurmonumenten')	12,000 ha.
Provincial nature conservation organisation 'Geldersch Landschap'	6,000 ha.
Crown Property ('Kroondomein')	10,000 ha.
National Park 'De Hoge Veluwe'	5,000 ha.
Municipalities	15,000 ha.
State / Ministry of Defence	13,000 ha.
Private owners > 5 ha	16,000 ha.
Private owners < 5 ha	5,000 ha.
Other	1,000 ha.
Total	100,000 ha.

Source: Provincie Gelderland (2000, p. 49, Box 5).

Over the last two decades much effort has been devoted to curbing fragmentation in the Veluwe. This has included, amongst others, the design of wildlife overpasses, such as wild viaducts, and underpasses. These facilitate the movement of wildlife at several locations throughout the area. Moreover, various neighbouring landowners and managers have signed a 'declaration of intent' to improve the ecological quality of the Veluwe. They have indicated to be willing to co-operate in order to realise a Veluwe without any barriers to the free movement of species (Provincie Gelderland, 2000).

3 The survey

3.1 Questionnaire design

The questionnaire consisted of two major parts. The first part collected respondents' travel and expenditure data, while the second part included the contingent valuation exercise. Furthermore, the questionnaire was conducted in two different ways: through the Internet, and by face-to-face interviews in the Veluwe area. Respondents to the Internet questionnaire belong to a survey panel of individuals who are paid for filling out questionnaires. Although some of these respondents are likely (recreational) users of the area, it is expected that the majority of them are (completely) ignorant of the Veluwe and have no relationship or bond at all with the area.

Because these respondents were not interviewed in the area itself, they were not (could not be) asked about their travelling behaviour either. In other words, Internet respondents were excluded from the first part of the questionnaire. Face-to-face interviews, by contrast, were executed within the Veluwe-region, and therefore, respondents could be identified as users of the area; they were, more or less, familiar with the area. The interviewers presented them a sequence of questions so as to elicit the respondent's travel behaviour to the site, as well as to reveal the set of expenditures that she incurred during her visit. Appendix a presents the original face-to-face survey instrument, while Appendix b provides further information on the structure and contents of the Internet questionnaire.

An accurate, balanced and plausible scenario description is crucial for the development of the survey instrument. For this valuation survey, two scenarios were designed in close co-operation with the Ministry of Agriculture, Nature Management and Fisheries – policy department East. These two scenarios deal with the free dispersal of animals by removing barriers so that wild species can safely reach the river forelands. If not hampered by any hindrance, grazing red deer, for example, will migrate seasonally across the Veluwe region in search of the best vegetation.

The aim of the first habitat defragmentation scenario was to develop an ecological corridor between the central part of the Veluwe and the IJssel river forelands, which are located to the north-east of the area. This scenario deals with the removal of game-averting fences and the construction of a wildlife viaduct across the A50 motorway, south of the town of Hattem. The aim of the second scenario was to connect the central part with the Rhine river forelands in the south-west. It consisted of breaking down fences, establishing a wildlife viaduct across the A12 – east of the town of Ede –, relocating industry from the Renkum's Brook valley to outside the region, and elevating a 500 meter stretch of the provincial road N225 between the towns of Renkum and Wageningen. The two scenarios are summarised in Table 3.1. In addition to these two scenarios, various other habitat defragmentation scenarios were thought of. However, in this study we focus only on the two scenarios, which are considered most important.

Table 3.1 Description of the two scenarios

Scenario 1	Scenario 2
Aim: connecting the Veluwe with the IJssel river forelands by • removing game-averting fences; and • constructing a wildlife viaduct across the A50 motorway, south of the town of Hattem.	*Aim:* connecting the Veluwe with the Rhine river forelands by • removing game-averting fences; • constructing a wildlife viaduct across the A12 motorway, east of the town of Ede; • relocating industry from the Renkum's Brook valley to outside the Veluwe; and • elevating a 500 meter stretch of the provincial road N225 between the towns of Renkum and Wageningen.

In order to guarantee the validity of the valuation exercise, the two scenarios were presented as clearly as possible to the respondents. This involved not only a careful description and explanation, but also a visualisation by means of graphical material, such as maps and pictures. Subsequently, respondents were asked whether they had any preference for one of the two described scenarios. If so, they were asked which one, and for what reasons. The questionnaire then continued with various valuation questions. It is important to emphasise that these questions focussed on only one of the two scenarios. Whether this was the first or the second scenario, was randomly defined and thus independent of the respondent's preference for one of the two scenarios. That is, the distribution of the two scenarios was random, because visitors of the Veluwe were randomly approached and asked whether or not they were willing to cooperate with the interview.

In addition to an accurate description of the different scenarios, we also needed to make choices about the welfare measure, the elicitation method and the payment method. Both with respect to the welfare measure and the elicitation method, we followed closely the National Oceanic and Atmospheric Administration guidelines (NOAA, 1993). This means that, as far as the welfare measure is concerned, we adopted the willingness to pay (WTP) for two nature protection scenarios instead of the willingness to accept compensation (WTA) for a further defragmentation of the Veluwe region. The WTP is characterised by being a conservative choice, which increases the reliability of the estimated values by eliminating extreme responses. With respect to topics as clean air and public parks, several surveys have been conducted where the researchers asked questions both about the willingness to pay and the willingness to accept. Most studies found that the WTA responses exceeded the WTP answers (Hanemann, 1991; Kahneman *et al.*, 1991). Moreover, according to Hanley and Spash (1993) empirical work also showed that WTA formats gave a proportionately high number of protest bids, such as "I want an extremely large or infinite amount of compensation for agreeing to this", and have frequently experienced refusals to answer the question. A high number of refusals is probably due to the fact that people feel conscience stricken about accepting monetary compensation for the loss of

a natural asset. Alternatively, individuals who have qualms about compensation for a natural asset foregone can state a ridiculously large WTA amount.

With respect to the elicitation method we applied a closed-ended referendum format, or, more specifically, a dichotomous choice elicitation format.[3] This means that the respondents have to answer "yes" or "no" to the question of whether they hypothetically want to pay a specified amount of money for the introduction of a defragmentation scenario. Respondents therefore do not have to answer the difficult valuation question directly by answering an open question. In the present study, the dichotomous choice format was extended to a double-bounded (or repeated) dichotomous choice format. Respondents are faced with a specific cost and if they accept this payment, they are subsequently asked whether they would pay a higher amount. If respondents reject the initial payment, they are asked to give a yes-or-no response to a second, lower, bid amount. Thus, the level of the second bid is contingent upon the response to the first bid. Hanemann *et al.* (1991) show that adding a follow-up bid to a single-bound dichotomous choice format improved the statistical information provided by the data.[4] Respondents who say "yes" to both the initial and second bid amount were confronted with an open-ended question about the maximum amount that they are willing to pay. Also respondents who answered negatively to both bids amounts were directed to an open-ended question to reveal their willingness to pay. If they did not want to pay anything at all, they were asked to give the most important reason for this choice.

The use of the double-bounded dichotomous choice question requires the design of a range of bids. This means not only a specification of the initial and second bid, but we also had to decide how many different bids to use, how the bids should be spaced and what proportion of respondents should be offered each bid. For our final decisions we relied on the experiences gained during a previous valuation survey (Nunes and van den Bergh, 2004). Table 3.2 presents the full range of euro amounts used in the present survey instrument. For the two scenarios, the same bid card design was used.

Table 3.2 Bid amounts used in the survey

Bid Cards	Initial Bid	Increased Bid	Decreased Bid
Card 1	€ 6.-	€ 20.-	€ 2.-
Card 2	€ 14.-	€ 34.-	€ 7.-
Card 3	€ 20.-	€ 52.-	€ 11.-
Card 4	€ 40.-	€ 120.-	€ 16.-

In addition to the welfare measurement and the elicitation method, we also needed to choose the payment method or vehicle. Unfamiliarity with the payment vehicle, and the question

[3] Bateman *et al.* (2002) provide a useful and detailed description of different types of elicitation formats, ranging from an open-ended direct elicitation format to double-bounded dichotomous choice formats.

[4] For a detailed analysis of contingent valuation questionnaires with multiple bids, see Alberini *et al.* (2003) and Vossler and Poe (2005).

whether the payment vehicle is accepted as a possible or reliable payment vehicle, can violate the validity of the resulting value estimates. It is therefore crucial to develop a payment method that is convincing to respondents as an appropriate way to pay for the scenario under consideration. Moreover, the payment method must be regarded as fair, meaning that all respondents, independent of their socio-economic background, life experiences and residential localisation, are equally obliged to pay for the defragmentation measures. In view of these conditions, we adopted a 'once-and-for-all-payment', thereby rejecting alternatives such as entrance fees for the Veluwe. To convince the respondents that the payment method is not subject to waste and fraud, it was emphasised that the payment will be exclusively applied to the realisation of the concerning scenario as described in the survey instrument. We deliberately did not choose for a tax, because the term tax has a negative connotation and may lead to misunderstandings and questions about the duration of the tax period. Note that because a one-time payment (or lump sum payment) does not offer the possibility to spread payments over time, it generally produces more conservative estimates than a continuing payment (Carson, 2000). In other words, a one-time payment understates rather than overstates the respondent's willingness to pay. The valuation question in the questionnaire was introduced and formulated as follows (translated from Dutch).

> "We now focus attention on the scenario that connects the central part of the Veluwe to the northeast, with the IJssel river forelands.[5] In particular, we are interested in how important you feel the realisation of this scenario is. We, therefore, would like to know how you would vote on the introduction of a so-called 'once-and-for-all-payment', given that this payment will be exclusively applied to the realisation of the above-mentioned scenario. If the majority of the people vote in favour, all Dutch households are obliged to pay such an 'once-and-for-all-payment'. The reason for this nation-wide contribution is that the Veluwe is considered a natural park of national importance.
>
> Keeping your current household income and expenditures in mind, if the total amount to be paid for the realisation of the scenario is € 6.- / € 14.- / € 20.- / € 40.-, how would you vote on the introduction of this payment?"

If a respondent voted in favour of this payment, he or she was subsequently asked

> "[A]nd how would you vote if the total amount to be paid was € 20.- / € 34.- / € 52.- / € 120.-?"

If, however, a respondent voted against the introduction of this payment, the following question was posed

[5] For the other scenario this statement was replaced by: "We now focus attention on the scenario that connects the central part of the Veluwe to the southwest, with the Rhine river forelands."

"[A]nd how would you vote if the total amount to be paid was € 2.- / € 7.- / € 11.- / € 16.- ?"

As mentioned earlier, respondents were asked to put a price tag on only one of the two scenarios. We therefore developed two versions of the questionnaire, one focussing on the valuation of the first, and the other on the valuation of the second habitat defragmentation scenario. For each version, the four bid cards presented in Table 3.2 were used.

3.2 The survey execution

The administration of the face-to-face interviews started in August 2002 and ended in October of the same year. The Veluwe is a popular destination for day-trippers and holiday-makers, who visit and stay in the area because of its nature and landscape, zoos and museums. Walking and cycling are the most common recreational activities in the area. Respondents to the questionnaire visited the sheepfold on the heath land, sought acorns, picked blueberries, enjoyed the quietness, or just took the dog out for a walk. Popular cultural places in the region appeared to be, among others, the Kröller-Müller Museum in Otterlo, the Apenheul Zoo and the palace 'Het Loo' in Apeldoorn, and the Netherlands Open Air Museum in Arnhem.

The Veluwe-region can be split up in a northern and a southern part, separated by the A1 motorway. The city of Apeldoorn lies in the middle of the region, while the town of Otterlo and the city of Arnhem are located in the southern part. The administration of the questionnaire took place at different location in the Veluwe region. Nevertheless, most respondents were interviewed in the south, which seemed to attract more visitors than the northern part.

Five interviewers conducted the interviews face-to-face. Table 3.3 offers the distribution of the number of interviews over space and time, including both weekdays and weekends. Note that, before the execution of the in-person survey, a first draft of the questionnaire was developed and tested in a number of pilot interviews. Pretests and pilot studies were necessary to assess how well the survey works as a whole and allowed us to improve the language used in the narrative. The interviewers used visual materials such as maps and pictures that facilitate respondent understanding. They were instructed very carefully, especially in the use of visual aid in combination with the reading of the survey material. The five interviewers contacted in total 289 visitors of the Veluwe area, 251 of which completed the questionnaire. The participation rate is thus 87 percent. The most often mentioned reason for refusal is "no time, the questionnaire is too long" and "no interest."

Table 3.3 Distribution of the number of interviews

		Interviewer				
Location	Date (in 2002)	1	2	3	4	5
Heerderstrand	02-08	12	12	-	-	-
Zandenbos	03-08	2	2	-	-	-
Nunspeet – Tourist office	03-08	8	11	-	-	-
Hoog Soeren – Aardhuis	03-08	5	10	-	-	-
	11-08	8	10	-	-	-
Hierdense Beek	04-08	10	9	-	-	-
Hierden	04-08	8	7	-	-	-
Otterlo – De Hoge Veluwe	09-08	5	3	-	-	-
Arnhem – Open Air Museum	09-08	10	15	-	-	-
Rheden – Nature Information Centre	10-08	1	2	-	-	-
	29-09	-	-	-	17	15
Rheden – Tourist office	09-08	1	-	-	-	-
Apeldoorn – Apenheul	11-08	8	10	-	-	-
Hoenderloo	14-08	14	19	-	-	-
Harskamp (and surroundings)	13-08	-	-	1	-	-
	14-08	-	-	15	-	-
Ede – Ginkelse Heide	06-10	-	-	-	21	18
Total		92	110	16	38	33

The Internet survey was developed and carried out by a specialised bureau, namely Telder B.V. in Amersfoort. Internet questionnaires have some unique advantages. First, Internet allows a combination of stimuli, such as visual effects and attractive fonts that keep the attention level of the respondent high. Moreover, links can be inserted in Internet questionnaires so that if a respondent clicks on a word or phrase, a window appears in which concepts or scenarios are further explained. This is in contrast to mail surveys, which cannot be too long and too complex, since there is no interviewer to clear up possible misunderstandings and to probe for answers. Finally, whereas telephone interviews have to be conducted when individuals are at home, a survey that is conducted through the Internet is without such a constraint of time. Individuals are not restricted to a time frame, but can respond to the Internet questionnaire whenever they like. Apart from the part with questions about travel behaviour, which are not applicable to Internet respondents, the Internet questionnaire that is used, is exactly the same as the face-to-face questionnaire.

Because Web usability studies have shown that Internet users are not very fond of scrolling, or even forget to scroll down, the questionnaire was presented in the form of approximately 50 pages, whereby each page corresponded to one question.[6] In order to minimise misunderstandings, the questionnaire contained several links to background information, pictures of red deer and wild boar, maps of the area and maps of the proposed defragmentation. Moreover, the structure of the electronic questionnaire made it impossible for respondents to skip questions, so there was no chance of missing data. The answers were directly entered into the computer system and used to select the next question. For instance,

[6] For more information about assessing the usability of websites see, for example, http://www.teced.com/PDFs/sigdoc97.pdf.

when respondents accepted the initial bid, they were subsequently asked to give a yes-or-no response to a second, higher, bid amount.

The Telder bureau maintains a web survey panel, consisting of 2,471 individuals who, on payment of cash incentives, fill out questionnaires. After the pretesting stage in August 2002, all the 2,471 respondents of the web survey panel were sent an e-mail in mid-September, in which they were directed to a website that contained a link to the questionnaire. One month later, on October 21 2002, the agreed amount of completed questionnaires was reached. On that particular date, we received the responses of 310 individuals, coded and entered into SPSS data set sheets by the Telder bureau. A disadvantage of this approach is that no response rate can be derived.

4 Descriptive statistics of the survey responses

As can be seen from Table 4.1, the pooled sample consisted of 561 respondents – 310 respondents to the Internet survey and 251 interviewees. Overall, 282 respondents valued the first habitat defragmentation scenario and 279 respondents the second. Furthermore, most respondents (152 in total) where faced with the lowest bid amounts. The number of respondents who were confronted with the second, third and fourth bid card were 134, 139 and 136 respectively.

Table 4.1 Number of respondents

Survey method	Total	Scenario		Bid Card			
		1	2	1	2	3	4
Face-to-face	251	126	125	67	58	64	62
Internet	310	156	154	85	76	75	74
Pool	561	282	279	152	134	139	136

The questionnaire's demographics and socio-economic characteristics are summarised in Table 4.2. From this table, it can be seen that the median respondent is between the 38 and 43 years old and lives with a partner. Notice that the respondent's mean age almost equals its median age, implying that the distribution of age is not skewed but normally distributed. He or she has completed upper secondary vocational education (MBO), senior general secondary education (HAVO, MULO), pre-university education (VWO), higher professional education (HBO) or university education.[7] When comparing the two different ways in which the questionnaires were conducted, Table 4.5 also shows that lower educated people are more difficult to contact with an Internet survey than with face-to-face interviews. With respect to their field of study, most respondents have a background in engineering, technology or natural sciences (face-to-face), or economics, trade, finance or business (Internet).

[7] VBO, MAVO and LBO constitute the lower level of secondary education, where VBO is pre-vocational education, MAVO is lower general secondary education and LBO is lower secondary vocational education.

Table 4.2 Demographic and socio-economic data

Characteristics	Face-to-face	Internet	Pool	Netherlands (2002)[a]
Year of birth				
• Mean / median	1957 / 1959	1962 / 1963	1960 / 1962	1964 (mean)
Education level				
• Primary education	4.0%	1.9%	2.9%	12.4%
• VBO, MAVO, LBO	23.5%	10.6%	16.4%	24.8%
• MBO, HAVO, MULO, VWO	35.5%	41.3%	38.7%	39.4%
• HBO, University	36.3%	43.9%	40.5%	23.4%
• Others	0.4%	1.3%	0.9%	
• No answer	0.4%	1.0%	0.7%	
Fields of study				
• Technology or natural sciences	26.7%	19.0%	22.5%	
• Economy, trade or business	22.3%	28.1%	25.5%	
• Medical or social care sciences	18.3%	18.7%	18.5%	
• Culture, art or communication	2.0%	6.1%	4.3%	
• Others	24.3%	19.0%	21.4%	
• No answer	6.4%	9.0%	7.8%	
Single household	29.1%	33.5%	31.6%	33.8%
Number of children	0.89	0.90	0.90	
Average income (net)	€ 2,522.-	€ 2,301.-	€ 2,392.-	€ 2,308.-[b]

Notes: [a] Data is obtained from CBS StatLine (available via the Internet; URL: http://www.cbs.nl).

[b] Based on provisional figures for average disposable income in 2001.

To conclude the sample's socio-economic characterisation, the respondents were asked to report their net household income. To that end, the interviewers who conducted the face-to-face interviews showed the respondents a card with different income categories (in euros per month). Each of these categories was matched to a letter. Respondents revealed their income category from this card by indicating the letter that best described their situation. Comparably, respondents to the Internet survey were asked for their net household income by clicking the category that match their actual situation. The response rate to the income question is for the face-to-face interviews 86% and for the Internet survey 100%. When considering the pooled data set, which contains the data of both the face-to-face and Internet surveys, the median respondent has a household income in the € 2,000.- and the € 2,500.- category. For the face-to-face interviews, 32.3% of the total sample reported a net household income lower than the € 2,000.-, while for the Internet survey this percentage was 44.5%. Around 3% of the respondents to the face-to-face interviews and approximately 4% of the Internet respondents had a monthly household income in the highest category (€ 5,000.- to € 6,000.-).

When we compare some major demographic and socio-economic characteristics of the two samples with those of the Dutch population, it appears that both samples are quite representative for the Netherlands. This holds especially for the mean age of the Dutch

population in 2002, which was 38.4 years, the percentage of single households and average net income; national figures on these characteristics are very comparable to those of the samples.

The number of visits to the Veluwe are presented in Table 4.3. From this table, it seems that interviewees visited the Veluwe more frequently than the Internet respondents. Around 46% of the Internet respondents travelled at most once a year to the area. For interviewees, this percentage is approximately 25%. As expected, individuals who visited the Veluwe more than four times per month were mainly to be found among the group of interviewed respondents.

Table 4.3 Number of annual visits to the Veluwe

	Survey method		
Number of visits	Face-to-face	Internet	Pool
Less than once a year	10.0%	23.2%	17.3%
Once a year	15.1%	22.9%	19.4%
Once in 2 to 6 months	29.9%	31.0%	30.5%
Once a month	7.1%	4.8%	5.9%
Between 2 and 4 times a month	11.6%	4.5%	7.7%
More than 4 times a month	25.9%	5.5%	14.6%
No answer	0.4%	8.1%	4.6%

Responses of the 251 interviewees on travel data show that most visitors came to the Veluwe by car, namely 82%. Only 5% arrived by public transport (train or bus), 9% cycled to the area, 1% arrived on foot, and 3% used another means of transport, such as a motorcycle. By using travel information from the Internet, we were able to compute travel time for public transport.[8] It appeared that visitors who travelled by train and bus to the Veluwe spent on average five hours and 35 minutes on a two-way journey.

Respondents who took a car to travel to the Veluwe were asked to report their postal zip code of their address, the brand and model of their car, the size of the car engine (power of the car), the type of fuel used, and the costs of parking in the area. We used this information for the calculation of individual travel costs for all visitors that came by car. Most of these visitors can be identified as local visitors, because they travelled on average 128 kilometers and spent one hour and 21 minutes on the two-way journey.[9] Table 4.4 provides some further technical information on the cars of these respondents.

Table 4.4 Technical specifications of cars as reported by the respondents

	Fuel			Size of engine (in cc's)			
	Gasoline	Diesel	LPG	≤ 1400	1500 – 2000	≥ 2100	Unknown
Percentage	72.0%	20.3%	7.7%	19.3%	55.1%	9.2%	16.4%

[8] Travel information is available from http://www.ov9292.nl (in Dutch). This website provides information on all forms of public transport in the Netherlands and allows us to define respondent's travel time from door-to-door.

[9] This information is gathered from the *Stratengids CityDisc* CD-ROM.

Most of the visitors, namely 72%, came by cars that were powered by gasoline. Cars driven by diesel and LPG were used by respectively 20.3% and 7.7% of the respondents. Moreover, the vast majority of respondents (55.1%) drove a car with a medium size engine. Furthermore, 16% of the visitors who took a car to travel to the Veluwe had to pay parking costs, which, on average, amounted to € 3.28.

Respondents were also asked whether they had incurred on-site expenditures. Only 4% of the interviewees indicated that they had hired something, for example a bike. Their average amount of money spent on hiring these materials was € 3.13 per person, children (under 15 years) included. Fifty three percent revealed that they had bought things, like food or drinks, in the area. On average, they spent an amount of € 6.- per person, including children.

As stated earlier, in order to obtain information about the respondent's maximum willingness to pay for nature protection, we employ a double bounded dichotomous choice question framework. The double bounded response model used here simply implies that for each *j* respondent four possible outcomes exist, namely (i) both answers are 'yes', (ii) both answers are 'no', (iii) a 'yes' followed by a 'no', and (iv) a 'no' followed by a 'yes'.

Table 4.5 shows the sample frequencies of the responses to the four bid cards. For instance, a 'YN' response indicates that a respondent answers "yes" to the initial bid amount and "no" to a second, higher, bid amount. In other words, a 'YN' response implies that the respondent's maximum willingness to pay lies between the initial bid amount and the increased bid amount. According to the pooled sample results, 10.5% of the respondents is willing to pay more than € 20.- for nature protection in the Veluwe area, while only 3.7% stated a willingness to pay above € 120.-. 'No/no' responses are expected to increase as the bid amount in the WTP question increases. Indeed, the pooled sample results show that for the first bid card, 7.0% of all respondents said "no" to both the initial and second bid amount, whereas for the fourth bid card this 'no/no' sample proportion has been increased to 8.7%. Note, however, that for both the face-to-face interviews and the Internet questionnaires, the highest 'no/no' response rates are not at the fourth bid card, as was expected, but at the third bid card. As far as the Internet questionnaire is concerned, it appears that this group of 'no/no' respondents includes the most so-called protest bidders. They answer "no" to the WTP question independently of the bid amount. Their bids are zero bids given for reasons other than a zero value being attached to the scenario under consideration (Hanley and Spash, 1993). With regard to the face-to-face interviews, bid card 2 invoked most protest bids.

Table 4.5 Responses to the four bid cards (in %)

Bid Cards	Face-to-face				Internet				Pool			
	YY	YN	NY	NN	YY	YN	NY	NN	YY	YN	NY	NN
Card 1	12.7	6.8	0.4	6.8	8.7	4.8	5.8	7.1	10.5	5.7	3.4	7.0
Card 2	6.4	7.6	1.6	7.6	4.2	5.5	5.8	9.7	5.2	6.4	3.9	8.7
Card 3	7.2	8.0	2.4	8.0	3.5	4.8	3.5	10.6	5.2	6.2	3.0	9.4
Card 4	6.0	8.8	2.8	7.2	1.9	3.5	10.3	10.0	3.7	5.9	7.0	8.7

Considering Table 4.5, the sample frequencies of the responses to the four bid cards seem to be well distributed. We are therefore inclined to conclude that the bid cards are adequately designed. This is confirmed by the fact that less than 10% of the respondents answered "yes" to the highest bid, which can be interpreted as a signal that the bid card's distribution has well-captured the range of willingness to pay (Nunes, 2002).

The questionnaire contained three questions about the respondents' opinion with respect to Dutch nature policy and the role the government plays in it. First, the respondents were asked whether nature protection is a task of the Dutch government or whether it should be transferred to NGO's and private organisations. The second question assessed the familiarity of the respondents with nature policy in the Netherlands. Then, a third question asked the respondents for their opinion about the necessity of new nature in the Netherlands. The response pattern on these three questions is presented in Table 4.6.

Table 4.6 Response pattern on questions about Dutch nature policy (in %)

Survey method	Do you think that nature policy is a task of the Dutch government?		
	Yes	No	No answer
Face-to-face	94.8%	4.8%	0.4%
Internet	93.9%	2.6%	3.5%
Pool	94.3%	3.6%	2.1%
	Have you ever heard or read about nature policy in the Netherlands?		
	Yes	No	No answer
Face-to-face	72.5%	27.5%	0.0%
Internet	62.3%	34.5%	3.2%
Pool	66.8%	31.4%	1.8%
	Is it necessary to create new nature in the Netherlands?		
	Yes	No	No answer
Face-to-face	53.0%	36.3%	10.7%
Internet	54.5%	30.7%	14.8%
Pool	53.8%	33.2%	13.0%

The large majority of the respondents, around 94%, believe that the government has the duty to protect nature and to develop and implement nature policy measures. Furthermore, most respondents, especially visitors of the Veluwe area, have at least once heard or read about Dutch nature policy. Slightly more than half of the respondents reported that new nature should be developed, even at the expense of economic activities, such as agriculture.

After a description of the two scenarios, the respondents had the opportunity to indicate whether they preferred one scenario to another. About 30% of all respondents stated to have a preference for scenario 1, while 11% preferred scenario 2. Approximately 59% of the respondents did not have any preference for one of the two scenarios. It were especially respondents to the Internet survey, namely 74%, who were without any preference. This is explained by the fact that, in general, these respondents are less familiar with the area than those who were interviewed. Moreover, 18% of the Internet respondents preferred scenario 1 and 8%

scenario 2. For the face-to-face questionnaire, these percentages were 40%, 46% and 14% respectively. The most often mention reason for scenario 1 was that it is easier to implement, cheaper and less drastic than scenario 2. On the other hand, most respondent who preferred scenario 2 welcome the opportunity to get rid of the polluting industries in the region.

Finally, respondents were asked to give their opinion about priorities in various policy plans and projects related to the management of the Veluwe area. They had to indicate whether a project was important to them or not. We computed a ranking index of the projects, by assigning different weights to each possible response. The following weight values were attached: 20 to 'very important', 15 to 'important', 10 to 'less important', and 0 to 'not important'. The results are given in Table 4.7.

Table 4.7 Opinions of the respondents with respect to various management actions

Ranking	Project	Index
1	Constructing a wildlife viaduct over the A50 motorway, so that red deer and wild boar can safely reach the IJssel river forelands.	16.9
2	Constructing a wildlife viaduct over the A12 motorway, so that red deer and wild boar can safely reach the southern part of the Veluwe.	16.8
3	Extending and adequately maintaining recreational facilities, such as bicycle tracks.	15.7
4	Promoting extensive and environmentally friendly agriculture, aimed at biological products and nature management.	15.3
5	Relocating polluting industries from the Renkum's Brook valley to outside the region.	14.7
6	Placing the secondary road between the towns of Renkum and Wageningen on 'pillars', so that big game can safely reach the Rhine river forelands.	14.5
7	Clearing game-averting fences so that populations of red deer and wild boar will disperse all over the Veluwe.	13.7
8	Reducing the maximum speed limit on local roads to 30 km per hour, in order to prevent as many animal-vehicle collisions as possible.	12.0

Note: The ranking is based on stated priorities and not on the sequence in which the various management actions were presented to the respondent.

As we can see from Table 4.7, the construction of wildlife viaducts over the A12 and A50 motorways receive the highest priority. Also the extension and an adequate maintenance of recreational facilities in the Veluwe area, and the promotion of extensive and biological farming are considered important by the respondents. Reducing the speed limit of local roads to 30 km per hour generally tends to have little priority or attention.

5 Travel cost analysis

5.1 Recreation demand function and estimation results

The recreation travel cost model is based on the relationship between the number of visits that individuals yearly pay to the Veluwe area and, amongst others, the costs they incur with each

visit. In more formal terms, a travel cost model can be defined by the following recreation demand function

$$V = f(C, X, W), \tag{1}$$

where V denotes the number of visits to the Veluwe, C denotes the travel costs, X denotes other socioeconomic variables that significantly explain V, and W denotes site attributes. It is expected that an increase in the total costs per visit results in a decrease in the yearly number of visits per individual. The travel costs consist of three components, namely entry fees, transportation costs and the costs of travel time. Entry fees however, are zero in the present study, because all the face-to-face interviews were conducted at sites that were freely accessible.

The monetary transportation costs are only estimated for interviewees who came by car or public transport to the Veluwe. Respondents who cycled to the area or arrived on foot are assumed to have no transportation costs. The public transport costs include the costs of a two-way train ticket for travel between the closest train station to the respondent's residence and the closest train station to the location where the respondent was interviewed. The transportation costs for interviewees who travelled by car are computed by multiplying the two-way trip length in kilometers by the car costs per kilometer. The latter costs, i.e. car costs, are determined by the brand, model, engine size and the type of fuel used by the respondent's car. Two car costs calculation options are used here, namely (i) fuel costs only and (ii) full car costs (Bateman, 1993; Nunes and van den Bergh, 2004). Whereas the fuel cost option only includes the marginal costs of one additional kilometer in terms of fuel use, the full cost option also covers insurance and maintenance costs, and capital depreciation. In Table 5.1, some examples of the two calculation options are presented.

Table 5.1 Some examples of car costs, with a distinction between fuel cost and full cost monetary values

Brand	Model	Engine size (in cc's)	Type of fuel	Fuel cost (€/km)	Full cost (€/km)
Volkswagen	Golf	1400	Gasoline	0.083	0.351
Opel	Corsa	1200	LPG	0.042	0.296
Seat	Ibiza	1000	Gasoline	0.075	0.278
Mazda	626	1800	Gasoline	0.102	0.425
Renault	Clio	1200	Gasoline	0.078	0.276
Mitsubishi	Spacestar	1900	Diesel	0.061	0.418
Citroen	Xsara	1900	Diesel	0.070	0.364
Volvo	V70	2400	LPG	0.070	0.600
Audi	A4	1800	Gasoline	0.104	0.578
Ford	Mondeo	2000	Gasoline	0.106	0.505
Huyndai	Lantra	1600	Gasoline	0.101	0.416

Sources:: *AutoGids; Kostprijs per kilometer 2001; AutoGids; Kostprijs per kilometer 2002*. With respect to the full cost option, we assumed that the respondent keeps the car for four years and drives on average 15,000 kilometers a year.

From the table it is clear that using the full car cost option raises the transportation costs above those of the fuel cost option.

Besides the two car costs calculation options, another calculation option can be used, which is based on the perceived costs as estimated by the respondents (Bateman, 1993). About a quarter of all the interviewees (26%) did not have any perception of how much money they spend on travelling to the Veluwe and back home again. Respondents who could give an indication of their incurred costs, were divided into four categories. For 37% of the visitors, the perceived costs of travelling were less than € 10.- (category 1). Sixteen percent estimated their travel costs between € 10.- and € 20.- (category 2), 11% between € 20.- and € 30.- (category 3), and 10% estimated them as more than € 30.- (category 4). If we calculate the correlation matrix between these four categories of perceived costs and the true total expenditures of respondents – based upon both the full cost option and full car cost option – we see that the correlation coefficients are all significant at the 5% level. However, when comparing the signs of the coefficients between the four different categories, one finds that they are not consistent with each other. The first category of perceived costs (less than € 10.-) is negatively correlated with total expenditures, whereas the other three categories are positively correlated with these expenditures as would be expected. Due to the unexpected signs on the correlation coefficients of the first category, we will exclude the perceived cost calculation option from our further analysis and focus fully on the fuel cost and full car cost option.

Travel time costs refer to the value of time spent in travel. Although some travel time has zero or negative costs, for example, when people would rather be travelling than being engaged in other activities, most travel time represents a cost. The time costs are calculated as the product of two values, namely the amount of time that a respondent spent on the two-way trip to the interview location and his or her value of time. The latter is based on estimations published in a report by the Ministry of Transport, Public Works and Water Management (Ministry of V&W, 1998). This report describes the results of a study on the value of time for car drivers and public transport passengers undertaken in 1997 in the Netherlands. For both transport modes, i.e. cars and public transport, the value of time depends on the respondent's monthly income and purpose of the trip. More details can be obtained from Table 5.2.

Table 5.2 Value of time for visitors of the Veluwe by income and transport mode (in € per hour)

Gross monthly income per household	Transport mode		
	Car	Train	Bus
≤ € 1,361.-	4.22	3.63	3.54
€ 1,361.- – € 2,269.-	5.08	4.17	3.86
€ 2,270.- – € 3,403.-	6.26	4.72	4.31
≥ € 3,404.-	11.53	7.62	6.58

The recreation demand function (1) includes not only individual travel cost data, but also socio-economic variables and site characteristics. There are various functional forms under which the demand function can be specified, for example linear, quadratic and semi-logarithmic. Data on travel behaviour as obtained here by face-to-face interviews suggest, however, the use of count data models, which are typically based on either a Poisson or a negative binomial distribution (Englin *et al.*, 2003). Count data models are most useful when the counts per person are small (and discrete), which is often the case with the number of individual trips taken to nature areas. Because of a small number of recreational trips, the true data-generation process cannot be normally distributed. In these cases, ordinary least-squares models are inappropriate for estimating the recreation demand function. Moreover, count data models control for the so-called truncation and self-selection biases. A truncation bias arises because the travel cost model only samples those respondents who actually travel to the Veluwe and provides no information on individuals who choose not to visit the area (Garrod and Willis, 1992; Hellerstein, 1992). A self-selection bias involves that frequent visitors of the Veluwe are more likely to be interviewed than individuals who visit the Veluwe at most once a year.

We first estimated a Poisson model, which is the standard regression technique for count data. The Poisson model, however, is often criticised because the use of the model is only appropriate if the data have no overdispersion; that is, if the mean and the variance of the dependent variable under consideration are equal. We therefore applied an overdispersion test, proposed by Cameron and Trivedi (1990), within the context of the Poisson model.[10] This test indicated that overdisperion is present in the data, implying that the Poisson estimates were invalid.[11] Because the assumed equality of the mean and variance functions is regarded as a major shortcoming of the Poisson regression model, various alternatives have been suggested. The most commonly used alternative is the negative binomial regression technique. Unlike the Poisson regression, the negative binomial regression technique does not require that the mean of the dependent variable is equal to its variance. Moreover, if overdispersion is not present, then the estimates of the negative binomial regression are identical to those of the Poisson regression. As Cameron and Trivedi's overdispersion test showed that overdispersion is evident, the negative binomial regression model is the preferred estimation technique in the current case.[12]

Table 5.3 documents the negative binomial regression estimates of the recreation demand function. The estimations are obtained by using the LIMDEP statistical software package. As a product of the negative binomial regression, an overdispersion parameter, α, is estimated. When α is equal to zero, the negative binomial model is reduced to the Poisson

[10] There are a number of tests for overdispersion. The one used here is based on simple regression techniques. See Cameron and Trivedi (1990) and Greene (2002) for a description of the method.

[11] Note that for count data in general and recreational trip data in particular the variance usually exceeds the mean (Cameron and Trivedi, 2001; Haab and McConnell, 2003).

[12] For a detailed exposition of count models of recreational demand, including the Poisson and the negative binomial model, see Haab and McConnell (2003).

regression model. Based on the calculated p-value, it can be concluded, however, that α is statistically significant different from zero, which confirms us in our decision to opt for a negative binomial model. For the sake of completeness, we should also mention that each of the explanatory variables in Table 5.3 has a fairly low correlation with each of the other explanatory variables, and so multicollinearity is not an issue.

The goodness of fit in regression analysis, identified by the symbol R^2, is rarely reported in empirical studies using count data models (Cameron and Windmeijer, 1996). Probably this is because count data models have no natural counterpart to the R^2, although many alternatives have been suggested (see, for example, Cameron and Windmeijer, 1996; Greene, 2002). Two examples of these alternatives are R_p^2 and R_d^2, which are based on standardised residuals and deviances respectively. These two R-squared measures of goodness of fit are provided at the bottom of the table, along with the chi-square statistic, its level of significance and the number of observations. From this it can be seen that for the two car cost calculation options, the two goodness of fit statistics are fairly close in magnitude; that is, for the fuel cost option, R_p^2 is 26% and R_d^2 is 24%, while for the full cost option, they are 30% and 28% respectively. The regression is based on 216 observations, which means that 35 observations are not used in the analysis. These observations were excluded because of missing data, especially with respect to average income.

Table 5.3 Demand function estimation results

Variables	Car costs calculation option					
	Fuel cost option			Full cost option		
	Estimate	Std. error	p-value	Estimate	Std. error	p-value
Constant	-4.5895	5.2863	0.3853	-2.9658	5.040	0.5562
TRAVEL COSTS						
• Transportation costs	-0.0066**	0.0037	0.0722	-0.0058*	0.0017	0.0007
• Time costs	-0.0231*	0.0082	0.0049	-0.0061	0.0096	0.5274
• Parking costs	-0.0180	0.0399	0.6525	-0.0073	0.0397	0.8554
SITE CHARACTERISTICS						
• Sunny weather	-0.0316	0.1092	0.7721	0.0056	0.1090	0.9587
• Week-end	-0.0124	0.1095	0.9100	-0.0151	0.1058	0.8868
• Site located far from proposed scenario	-0.0220	0.0800	0.7827	-0.0196	0.0762	0.7965
RESPONDENT'S CHARACTERISTICS						
• Number of adults in the group	0.0286	0.0220	0.1928	0.0284	0.0214	0.1833
• Number of children in the group	-0.0781*	0.0374	0.0366	-0.0704**	0.0373	0.0593
• Perceived travel costs	0.1186	0.0864	0.1699	0.0960	0.0838	0.2520
• In favour of scenario 1	-0.1327**	0.0777	0.0877	-0.1320**	0.7453	0.0765
• Familiar with Dutch nature policy	0.0590	0.0892	0.5085	0.0493	0.0856	0.5645
• Year of birth	0.0032	0.0027	0.2294	0.0025	0.0026	0.3409
• Average income	0.0001	0.0001	0.1555	0.0001	0.0000	0.2864
• Living with a partner	-0.0344	0.1084	0.7507	-0.0046	0.1047	0.9650
Overdispersion parameter α	0.0413			0.0759		
Chi squared	10.945			7.0982		
Significance level	0.0009			0.0077		
R^2_p	0.2637			0.3034		
R^2_d	0.2402			0.2788		
N	216			216		

Notes: Calculations are performed using count data models in LIMDEP®.
* Significant at 5%.
** Significant at 10%.

For the fuel cost option, transportation costs, time costs, and parking costs are negatively related to the number of visits to the Veluwe. Estimated coefficients for these three variables had the *a priori* expected sign, which is consistent with a downward sloping demand curve. Put differently, the estimation results show that the number of trips taken to the Veluwe decreases with increases in costs of travel between trip origins and the site, other things remaining equal. In particular, both transportation costs and time costs estimates are statistically significant different from zero, although at different levels of significance. For the full cost option, only the transportation costs coefficient is statistically significant at the 5% level. The other two travel

costs variables – time costs and parking costs – are statistically insignificant, but their estimates have the expected negative sign. The value of the coefficient for transportation costs show that the respondent's demand for a trip to the Veluwe falls by 0.66% (fuel cost option) or 0.58% (full cost option) with each € 1.- increase in travel costs. An increase of € 1.- in time costs leads for the fuel cost option and full cost option to a decrease in the annual visiting rate with 2.31% and 0.61% respectively.

The estimation results in Table 5.3 also show that the number of visits is expected to be lower for respondents who have been interviewed in a site that is located further away from the setting of the scenario – be it the IJssel river forelands or the Rhine river forelands – that he or she is asked to value. The same holds for respondents who where interviewed in the week-end: they have a lower annual visit frequency than respondents who were interviewed during midweek. Sunny weather only has a small effect on the demand of visits to the Veluwe. This effect is negative for the fuel cost option, but positive for the full cost approach. Note, however, that independently of the car costs calculation option chosen, the coefficient estimates are highly insignificant. In fact, none of the variables associated with site characteristics are statistically significant.

With regard to personal characteristics, respondents who visited the Veluwe with other adults have a higher annual visit frequency than respondents who came alone. In other words, the number of adults in the group has a major positive impact on the number of annual visits and is significant for both car cost calculation options. The number of children, on the other hand, has a negative effect on the number of visits. Its coefficient is highly significant at, at least, the 10% level. The coefficient estimate for average income is very low and not statistically different from zero. It appears that when holding constant the effect of all other variables, a € 1.- increase in net household monthly income will cause the quantity demanded to increase by 0.01% of a trip per year. Respondents who could give an indication of their two-way travel costs seemed to have a higher demand of visits to the Veluwe than respondents who did not have any perception of these costs at all. Furthermore, the sign of the coefficient for the dummy variable whether or not a respondents is living with a partner is negative for both car cost calculation options, but the coefficient estimates are rather small and have a statistically insignificant effect on a respondent's annual number of visits.

The annual visit frequency is lower for respondents who look with favour on developing scenario 1, than for other respondents. It can be seen that the coefficient estimate for this dummy variable is for both car cost calculation options statistically different from zero. The year of birth has positive effect on the number of visits, although the coefficient estimate is quite low. It indicates that younger respondents, with a later year of birth, visit the Veluwe more frequently than older respondents. Finally, respondents who are familiar with nature policy in the Netherlands are expected to have a higher demand of visits to the Veluwe than the other respondents.

The results in Table 5.3 show that, generally, the values of regression coefficients for the fuel cost option do not differ much from those for the full cost option. Note, however, that the time costs coefficient is statistically significant from zero for the fuel cost option, but insignificant for the full cost option. In addition, the parameter of the variable 'transportation costs' is, for the fuel cost option, statistically significant at the 10% level, whereas for the full cost option it is statistically significant at the 5% level. The opposite is true for the parameter of the variable 'number of children in group', which is statistically significant at the 5% level for the fuel cost option and at the 10% level for the full cost option.

5.2 Demand curve and calculation of recreation benefits

After the estimations of the recreation demand function for the Veluwe, the next step is to derive a demand curve from it. The demand curve represents the part of the demand function that shows the relationship between the visit costs and the number of visits demanded, holding constant the effects of all other explanatory variables. With this curve, we can measure recreation benefits; that is, by using the demand curve we are able to calculate in monetary terms the recreation benefits of the Veluwe received by a visitor. We evaluate the mean values of all the explanatory variables of the demand function, except for the individual travel costs variable. Following Nunes and van den Bergh (2004), the demand curve we derive is merely based on those explanatory variables that are statistically significant different from zero at the 10% level. The complete calculation of the two demand curves is presented in Appendix c.

The demand curve for the fuel cost option is given as follows

$$P_{fuel-cost} = -4.9915 - 81.301 \times \log N, \tag{2}$$

where P indicates the total travel costs and N the annual number of trips to the Veluwe. For the full cost option, the following demand curve is obtained

$$P_{full-cost} = -20.5822 - 172.414 \times \log N. \tag{3}$$

By integrating equations (2) and (3), the total recreation benefits can be computed. Gross recreation benefits per individual are estimated to be € 0.06 and € 0.45 for the fuel cost option and the full cost option respectively. The obtained benefits are in sharp contrast with the ones reported by by Nunes and van den Bergh (2002) for a famous beach resort (*Zandvoort*) in the Netherlands. They estimated annual gross recreation benefits at € 115.- to € 280.- per individual.

6 Contingent valuation analysis

This section discusses the valuation results obtained with the contingent valuation method. First, we describe the 'no/no' WTP responses. Then, the WTP estimates are presented, for both a

lognormal and Weibull distribution. Finally, a WTP function is estimated, based on various possible predicators.[13]

6.1 The 'no/no' zero willingness to pay responses

We found that the 'no/no' response rate for the pooled sample is 27.5%. The 'no/no' response proportions of the face-to-face questionnaire were practically similar to those of the Internet survey: 27.5% and 27.4% respectively. All respondents who stated "no" to both dichotomous choice questions faced a follow-up, open ended willingness to pay question. If respondents did not want to pay anything at all for the realisation of the scenario under consideration, then they were asked to reveal their major motivation for this choice. A list of arguments is given in Table 6.1.

Table 6.1 Reasons for not being willing to pay for the defragmentation scenario (in %)

Argument		Percentage
i	I do not believe in the proposed scenario	18%
ii	The proposed scenario is not worth that much	5%
iii	Nature conservation organisations have to pay all the costs	6%
iv	I do not want to pay something extra; the government has to pay everything out of the regular budget	39%
v	I do not want to pay something extra; the inhabitants of the Veluwe region have to pay everything	0%
vi	I do not want to pay something extra; the day-trippers, holiday-makers and tourists in the area have to pay everything	4%
vii	My income does not allow to pay anything	7%
viii	Others	21%

The most important reason for being unwilling to pay any positive amount of money is, by far with 39%, that the government should cover the costs. In fact, this argument does not reflect a zero valuation of the scenario, but indicates that the respondent disapproves of the proposed payment mechanism. Furthermore, 18% of the respondents simply did not believe that the defragmentation measures would work, while 21% had other arguments for not willing to pay anything. As other arguments were, *inter alia*, mentioned: "We already pay for various nature conservation projects", "Other priorities, such as reducing traffic jams in the area, are more important", "Real nature can never be developed by mankind, nature should help itself', "My experience is that these kind of projects are subject to waste of money", "I want to pay for additional house-building in the area", "We already pay enough taxes" and "Payments imposed on people will lead to irritation and annoyance and therefore, monetary contributions need to be voluntary".

In order to derive a univariate estimation of the stated WTP responses, we assume that these responses are characterised by a particular, but unknown, distribution. In the contingent

[13] For a theoretical treatment of the analysis of contingent valuation data, see Bateman *et al.* (2002). They discuss, *inter alia*, the econometric analysis of WTP and show how to estimate mean and median WTP.

valuation literature, various distributions have been used (see, for example, Nunes, 2002). We follow Nunes and van den Bergh (2004) and analyse the WTP responses by employing the lognormal and Weibull distribution. A lognormal distribution is normally distributed, meaning it conforms to a bell-shaped curve. The Weibull distribution is in fact a family of distributions. This is due to a so-called shape parameter, which allows the Weibull distribution to assume a wide variety of shapes, depending on the value of the shape parameter. As a result, the Weibull distribution can fit many different datasets.

6.2 Lognormal WTP estimation results

The lognormal mean and median WTP estimates are summarised in Table 6.2. It appears that respondents are willing to pay considerably more for scenario 2 than for scenario 1. Realisation of scenario 2, which is aimed at connecting the central part of the Veluwe with the Rhine river forelands in the south-west, involves the highest costs (see van der Heide, 2005). To put it in other terms, higher costs of realisation thus seems to lead to a higher willingness to pay. Moreover, it turned out that respondents who were interviewed at the Veluwe have a higher median WTP than Internet respondents. This is in accordance with our expectations: respondents who can be identified as users of the Veluwe and who are, more or less, familiar with the area are willing to pay higher amounts for defragmentation than those who have never, or hardly ever, been there.

Table 6.2 Lognormal mean and median WTP estimates

Survey method	Scenario		
	1	2	1 and 2
Face-to-face			
• Mean	€ 154.9	€ 223.4	€ 183.9
• Median	€ 21.9	€ 22.5	€ 22.2
Internet			
• Mean	€ 62.6	€ 311.2	€ 129.9
• Median	€ 12.4	€ 15.2	€ 13.4
Pool			
• Mean	€ 106.4	€ 263.7	€ 162.2
• Median	€ 16.7	€ 19.0	€ 17.7

Coefficient estimates, maximum likelihood estimators, standard errors and confidence intervals are reported in Appendix d. The standard errors for the location and scale parameters reflect the variability for the statistical estimates. Roughly speaking, the smaller the standard errors, the better the estimated parameters, i.e. a precise estimate has a small standard error. The standard errors displayed in Appendix d are moderate. Also confidence intervals give an indication of the magnitude of error around the point estimates. Wide confidence intervals in relation to the estimate itself indicate instability, which means that if the survey were repeated estimates would vary from one sample to another. It is important to note that the calculated mean estimate

confidence intervals are rather wide for scenario 2 (see tables G, H and I in Appendix d). This implies that the mean estimates for scenario 2 are less precise than the mean estimates for scenario 1 and for both scenarios together.

The large difference between median and mean estimates is due to the highly skewed distribution of the willingness to pay. It indicates that the mean estimates are sensitive to the respondents who say "yes/yes" to the higher bid amounts. In total, 15% of the 561 respondents who were faced with bid card 4 answered "yes" to both the initial and second WTP question. Their average willingness to pay, which can be derived from the answers given to the open-ended follow-up question, is estimated to be about € 173.-. The mean estimates are thus (heavily) influenced by some high amounts that only a small percentage of all the respondents is willing to pay. A skewed or asymmetrical distribution of the willingness to pay also means that median estimates are particularly sensitive to respondents who say "no" to the two stated bids. In other words, 33% of all respondents answered "no" to both WTP questions, which drags down the median willingness to pay.

In order to check whether the respondents value scenario 1 and scenario 2 equally, the following three hypotheses are tested:

Hypothesis 1 The WTP of the interviewees for scenario 1 is equal to the WTP of the interviewees for scenario 2.

Hypothesis 2 The WTP of the Internet respondents for scenario 1 is equal to the WTP of the Internet respondents for scenario 2.

Hypothesis 3 The pooled WTP for scenario 1 is equal to the pooled WTP for scenario 2.

To evaluate these hypotheses, a chi-square test of pooling is constructed. More specifically, we run a likelihood ratio test that builds on the fact that for large sample sizes (cf. Pindyck and Rubinfeld, 1998, p. 276; Haab and McConnell, 2003, p 304),

$$-2\left(LL_{both}-\sum_{i=1}^{2}LL_{i}\right)\sim\chi_{m}^{2}, \tag{4}$$

where LL_{both} represents the maximum value of the log-likelihood function for both scenarios, while LL_i represents the maximum value of scenario i (i = 1, 2). Finally, m denotes the degrees of freedom of the test statistic, or the number of restrictions. The degrees of freedom is the reduction in the dimension of the parameter space that is specified by the null hypothesis, compared to the alternative. In order to perform the test, we simply compare the calculated value of χ_m^2 with the, for example, upper 90% critical value of the chi-square distribution, which is available in standard tables. If χ_m^2 is greater than the critical value, we can reject the hypothesis that the WTP for scenario 1 is equal to the WTP for scenario 2.

In order to test the first hypothesis, we take the likelihood values that are presented in the tables C, F and I of Appendix d. Inserting these values into equation (4) gives -2 × (-

338.998+338.883) = 0.230. This test statistic is smaller than the critical value of 2.71 at the 10% confidence level. In other words, the empirical evidence does not reject the hypothesis that the willingness to pay of the interviewees for scenario 1 is equal to the WTP of the interviewees for scenario 2. When testing hypothesis 2, the Likilihood ratio test statistic is 3.270. This outcome, which is higher than the critical value of 2.71, leads us to reject the hypothesis that the willingness to pay of the Internet respondents for scenario 1 is equal to the WTP of the Internet respondents for scenario 2. Finally, the computed test statistic for hypothesis 3 is equal to 2.308. Because this statistic is lower than the critical value of 2.71, empirical evidence fails to reject the hypothesis that the pooled WTP for scenario 1 is equal to the pooled WTP for scenario 2.

In addition to differences in WTP between the first and second scenario, we also test whether the methods of data collection (face-to-face interviews and Internet questionnaires) influence the stated willingness to pay responses. That is, we evaluate the following three hypotheses:

Hypothesis 4 The WTP of the interviewees for scenario 1 is equal to the WTP of the Internet respondents for scenario 1.

Hypothesis 5 The WTP of the interviewees for scenario 2 is equal to the WTP of the Internet respondents for scenario 2.

Hypothesis 6 The WTP of the interviewees for both scenarios is equal to the WTP of the Internet respondents for both scenarios.

By using the likelihood values listed in the tables D, E, and F of Appendix d, the fourth hypothesis is rejected by the likelihood ratio test: $\chi^2 = 2 \times (-305.878+303.523) = 4.71$. We repeat the exercise for hypotheses 5 and 6 and can conclude that the empirical evidence does not reject hypothesis 5. Hypothesis 6, on the other hand, is strongly rejected by empirical observations.

6.3 Weibull WTP estimation results

For the Weibull distribution, Table 6.3 gives the mean and median estimates. Appendix e provides a complete overview of the Weibull estimates. It can be seen from this table that the Weibull model provides more conservative estimates than the lognormal model. As for the lognormal case, the WTP is higher for scenario 2 than for scenario 1, while, especially for scenario 1, interviewees are willing to pay considerably more than Internet respondents.

Table 6.3 Weibull mean and median WTP estimates

Survey method	Scenario		
	1	2	1 and 2
Face-to-face			
• Mean	€ 60.8	€ 76.8	€ 67.9
• Median	€ 24.1	€ 24.6	€ 24.3
Internet			
• Mean	€ 33.8	€ 72.9	€ 49.0
• Median	€ 13.4	€ 16.9	€ 14.7
Pool			
• Mean	€ 48.2	€ 75.6	€ 59.7
• Median	€ 18.3	€ 20.8	€ 19.4

As we did for the lognormal case, we can also check under the Weibull model whether the respondents value scenario 1 and scenario 2 equally, or whether the methods of data collection influence the stated willingness to pay responses. The results, which are obtained by using the likelihood ratio test of equation (4), are summarised in Table 6.4. It appears that the same hypotheses are rejected as for the lognormal case. In other words, the likelihood ratio tests for both the scenario effect and the data collection method effect give the same conclusions for the lognormal and Weibull model.

Table 6.4 Tests on the scenario effect and the data collection method effect

Hypothesis		Hypothesis rejected	
		Yes	No
1	The WTP of the interviewees for scenario 1 is equal to the WTP of the interviewees for scenario 2		∗
2	The WTP of the Internet respondents for scenario 1 is equal to the WTP of the Internet respondents for scenario 2	∗	
3	The pooled WTP for scenario 1 is equal to the pooled WTP for scenario 2		∗
4	The WTP of the interviewees for scenario 1 is equal to the WTP of the Internet respondents for scenario 1	∗	
5	The WTP of the interviewees for scenario 2 is equal to the WTP of the Internet respondents for scenario 2		∗
6	The WTP of the interviewees for both scenarios is equal to the WTP of the Internet respondents for both scenarios	∗	

6.4 Estimation of the WTP function

We now can construct a regression equation that predicts the WTP for habitat defragmentation in the Veluwe-region as a function of several other variables, such as socio-economic characteristics, recreational use, preferences for nature protection, travel costs, and on-site expenditures. If such an equation, which defines the WTP function, has reasonable explanatory power and consists of coefficients with the expected signs, then it provides evidence that the valuation survey has measured the intended concept (Bateman and Turner, 1993, Carson, 2000).

The estimation results of the WTP function we obtained for the lognormal distribution are shown in Table 6.5. A distinction is made between the willingness to pay of those who were interviewed face-to-face and those who filled out the Internet questionnaire. With respect to the former, the results show that visitors who travelled by car the Veluwe, are expected to pay less for habitat defragmentation than the average respondents. As expected, a lower willingness to pay applies also to visitors who incurred high parking costs, and who faced high transportation costs and long travel times. With respect to the site characteristics, the results show that visitors who visited the Ginkelse Heide or the Aardhuis are willing to pay more than the average respondent. The same is true for visitors who visited the area under sunny skies: they also have a higher willingness to pay than other respondents. On the other hand, visitors who travelled to the Veluwe during the weekends have, on average, a lower willingness to pay.

From Table 6.5, it can further be seen that interviewees who plan to stay in the area for 14 days are willing to pay less than the average respondent. Also visitors who came with other adults to the Veluwe have a lower WTP than visitors who came alone. This is in contrast to those who visit the Veluwe four times per month – which corresponds to one of the highest visiting frequency presented. They seem to be willing to pay more than the average respondent.

Both interviewees and Internet respondents who indicated that removing game-averting fences is a very important management activity for the Veluwe have a higher willingness to pay for habitat defragmentation than those who believed that such removal is not important. Likewise, respondents who consider the relocation of polluting industries to areas outside the Veluwe as very important are also inclined to pay more for the proposed defragmentation scenario than the average respondent. On the other hand, and as expected, respondents with a strong preference for an extension and better maintenance of the recreational facilities are, on average, willing to pay less for defragmentation. Defragmentation, after all, inevitably involves restrictions on the extension of recreational opportunities.

Respondents with a higher birth of year – that is, who are younger – have a lower willingness to pay than older respondents. The opposite holds for interviewees with a degree at higher professional education or university level in medical and social sciences. They are willing to pay more for habitat defragmentation in the Veluwe area, just as interviewees who live together with a partner and have children at home. Note that, on the other hand, respondents to the Internet survey living with a partner and with children are more likely to pay less than single respondents. Finally, both interviewees and Internet respondents with a high average income have a higher willingness to pay than those who have little money to spend.

Table 6.5 WTP function

Variables	Face-to-face			Internet		
	Estimate	Std. error	p-value	Estimate	Std. error	p-value
TRAVEL COSTS						
• Means of transport: car	-1.8414	1.1956	0.1235			
• Transportation costs (full cost option)	-0.0016	0.0045	0.7188			
• Travel time	-0.0041	0.0094	0.6622			
• Parking costs	-0.0921	0.1304	0.4799			
SITE CHARACTERISTICS						
• Sunny weather	0.0674	0.4434	0.8792			
• Weekend	-0.7067	0.4550	0.1204			
• Area: Ginkelse Heide	0.8982**	0.5113	0.0789			
• Area: Aardhuis	0.5199	0.4891	0.2878			
RECREATIONAL PROFILE OF THE VISITOR						
• Number of adults in the group	-0.1410	0.0886	0.1117			
• Visiting the Veluwe 4 times per month	1.1957**	0.7245	0.0989			
• Time planned to stay in the area: 14 days	-0.2219	0.7486	0.7669			
MANAGEMENT OPTIONS OF THE VELUWE						
• Removing fences	0.3356*	0.1361	0.0137	0.3878**	0.1986	0.0509
• Extending recreational facilities	-0.2794**	0.1623	0.0851	-0.0779	0.2010	0.6983
• Relocating polluting industires	0.2475**	0.1373	0.0715	0.6127*	0.1878	0.0011
SOCIO-ECONOMIC CHARACTERISTICS						
• Living with a partner	0.1641	0.4136	0.6915	-0.5563	0.4187	0.1839
• Child at home	0.4595	0.3399	0.1764	-0.2852	0.3603	0.4285
• Year of birth	-0.0091	0.0107	0.3945	-0.0006	0.0138	0.9642
• Average income	0.0002	0.0001	0.2566	0.0004*	0.0002	0.0322
• Higher professional education or university	0.1243	0.3424	0.7167	0.1733	0.3483	0.6189
• Education in medical and social care sciences	0.4271	0.3937	0.2779	0.5503	0.3902	0.1584
LOGNORMAL PARAMETERS						
• Intercept	22.3307			1.3302		
• Scale	1.7275			2.0058		
• Log-likelihood	-228.9786			-256.4524		
• *N*	182			211		

Notes: Calculations are performed using the PROC LIFEREG procedure in SAS®.
* Significant at 5%.
** Significant at 10%.

In general, the signs of the regression estimates are as expected *a priori*. Moreover, the results in Table 6.5 show that, with an exception for the variables of 'living with a partner' and 'child at home', these signs are identical for the two survey methods. Notice further that not all the observations were used in the two regression analyses. The reason for this is that for particular variables, especially average income and travel time, data were missing. In other words, observations with missing values for a variable were not used in the regression model.

The fact that respondents with long travelling times, high transportation costs, or high parking fees usually have a lower WTP, suggests that the values obtained with the contingent valuation method are to some extent complementary to those of the travel cost method, in the sense that the former method has captured other value categories than the latter. These other value categories relate especially to non-use values.

6.5 Aggregation of WTP estimates

Aggregation of individual estimates of mean or median willingness to pay, to obtain a total valuation of an environmental change at a population level, has been identified as one of the significant issues in using contingent valuation results (NOAA, 1993). However, in order to use the findings of a contingent valuation study to obtain an estimate of aggregate individual WTP amounts, it is necessary to make several assumptions, which possibly are subject to discussion (see Jakobsson and Dragun, 2001). For example, a key question is whether values should be aggregated over individuals or over households. The willingness to pay questions in our questionnaire explicitly considered household income as a budget constraint. Moreover, we stated that all Dutch 'households' are obliged to pay such a payment. Therefore, aggregate estimates have been made over households instead of over individuals. Another issue is whether the mean or median estimate should be used. We decided to present the aggregated values both for the mean and median values.

Aggregation occurs as the product of mean or median value times the number of households. At the time of the study, 2002, there were approximately 6.93 million households in the Netherlands (CBS StatLine)[14]. The payment in the questionnaire was described as a 'once-and-for-all-payment' (or lump sum payment). As already noted earlier, this implies that estimates, both individual and aggregated, are to be regarded as conservative. Erring on the conservative side, however, is recommended by NOAA (1993). Aggregate estimates have been calculated for both a lognormal and Weibull distribution. They are derived by multiplying the number of Dutch households in 2002 by the mean and median WTP estimates as reported in Tables 6.2 and 6.3. The results of this procedure are presented in Table 6.6.

[14] CBS StatLine is available via the Internet; URL: http://www.cbs.nl.

Table 6.6 Aggregate estimates for habitat defragmentation in the Veluwe, using both a lognormal (Logn) and Weibull distribution (in €)

Survey method	Scenario					
	1		2		1 and 2	
	Logn	Weibull	Logn	Weibull	Logn	Weibull
Face-to-face						
• Mean	1.1×10^9	421×10^6	1.5×10^9	532×10^6	1.3×10^9	471×10^6
• Median	152×10^6	167×10^6	156×10^6	170×10^6	154×10^6	168×10^6
Internet						
• Mean	434×10^6	234×10^6	2.2×10^9	505×10^6	900×10^6	340×10^6
• Median	86×10^6	93×10^6	105×10^6	117×10^6	93×10^6	102×10^6
Pool						
• Mean	737×10^6	334×10^6	1.8×10^9	524×10^6	1.1×10^9	414×10^6
• Median	116×10^6	127×10^6	132×10^6	144×10^6	123×10^6	134×10^6

If we focus on both scenarios and consider the two survey methods together, i.e. the pooled sample, then we see from Table 6.6 that for the lognormal distribution the aggregate estimate has a range from € 123 million (median value) to € 1.1 billion (mean value). For the Weibull distribution the range is € 134 million to € 414 million. These ranges are indicative of the benefits of the defragmentation scenarios. If we compare the individual scenarios, then it appears that aggregate estimates for scenario 2 are higher than those for scenario 1, regardless of whether the distribution is Weibull or lognormal. For example, mean-based estimates for scenario 2 are € 524 million (Weibull) and € 1.8 billion (lognormal), while for scenario 1 they are € 334 million and € 737 million respectively.

In an earlier study (van der Heide, 2005), we estimated the economic costs of various defragmentation scenarios discounted to the year 2001 using a discount rate of 5%. We concluded that the total costs of connecting the Veluwe to the IJssel river forelands – which is the first scenario in the current study – amounts to € 66.9 million. This study showed further that the costs associated with the realisation of an ecological corridor between the central part of the Veluwe and the Rhine river forelands – which is the aim of the second scenario in this study – amounted to a maximum of € 289.9 million. These total costs of the two defragmentation scenarios are thus considerably lower than the aggregate WTP estimates that are obtained by using mean values. If, however, aggregate estimates are based on median rather than mean values, then from the perspective of social welfare or economic cost-benefit analysis, the aggregate WTP is insufficient for the implementation of scenario 2.

7 Conclusions

This paper has been devoted to the economic valuation of a nature protection programme in the Veluwe, the Netherlands. In particular, we have estimated the willingness to pay for two habitat

defragmentation scenarios: the first scenario connects the central part of the Veluwe with the IJssel river forelands in the north-east, whereas the second scenario is focussed on defragmentation towards the south-west, where the Rhine river forelands are located. The analysis was based on a questionnaire that was conducted in two different ways, namely through the Internet and by face-to-face interviews in the Veluwe area. In order to obtain both use values and non-use values we employed a travel cost model as well as a contingent valuation method. That is, the travel cost model, which is based on incurred costs (such as fuel costs) of visiting a site, is used to estimate the recreational value of the Veluwe. By means of the contingent valuation method, we attempted to elicit the respondents' willingness to pay for the realisation of habitat defragmentation. To that end, respondents were confronted with a double-bounded dichotomous choice format, which means that they are asked to answer "yes" or "no" to a pre-specified bid amount and if they accept (reject) this payment, they are subsequently asked whether they would pay a higher (lower) amount.

It turned out that, according to the travel cost model estimates, the recreational benefits of the Veluwe ranges from € 0.06 to € 0.45 per visitor per year. These amounts are substantially lower than the recreational benefits recently estimated by Nunes and van den Bergh (2002; 2004) for a beach area in the Netherlands. This suggests that protecting the Veluwe yields fewer economic benefits than protecting this beach area. However, the two areas are very different from each other in many respects, such as size, type of ecosystem, and ownership structure. A direct comparison between the two areas is therefore considered not feasible.

The contingent valuation of the median willingness to pay for the two defragmentation scenarios vary between and € 17.7 and € 19.4 per respondent. Mean estimates are considerably higher: they vary between € 59.7 and € 162.2 per respondent. These WTP estimates, which refer to a one-time or lump sum payment, are based on the answers given by both the interviewees and the Internet respondents. They seem to be somewhat higher than the WTP presented in the earlier mentioned study of a beach area in the Netherlands (Nunes and van den Bergh, 2004). However, we must be careful when comparing different WTP studies. After all, the focus of Nunes and van den Bergh's local beach study is on the prevention of harmful algal bloom species along the Dutch coastline, whereas the economic valuation in this paper was aimed at habitat defragmentation in a terrestrial ecosystem.

The large difference between median and mean estimates indicates that the mean estimates are sensitive to the respondents who answer "yes/yes" to the higher bid amounts. If respondents say "no" to both the initial and second bid amount, we asked if they were willing to pay anything at all. The most important reason for not being willing to pay for defragmentation in the Veluwe was that the government should cover all the costs, instead of the citizens who already have to pay taxes. The WTP estimates are based on a one-time, or lump sum, payment. Literature shows that this kind of payments generally produces more conservative estimates than a continuing payment. What we offered in this paper are therefore careful estimates, which are

more likely to be underestimates rather than overestimates of the respondent's willingness to pay.

The hypothesis that the scenario is not a significant factor in explaining the WTP is rejected for the Internet questionnaire, but not for the face-to-face interviews. Moreover, users of the Veluwe, who are to some extent familiar with the area, are – as expected – willing to pay more for the defragmentation scenarios than those who hardly know the area. The hypothesis that the WTP of interviewees, who can be regarded as the users of the area, is equal to the WTP of Internet respondents is, however, not rejected for scenario 2, but it is for scenario 1. In other words, the effect of the data collection method is only significant for scenario 1.

If we aggregate the individual WTP estimates over Dutch households, then a simple comparison can be made between the total costs of the two defragmentation scenarios and the total benefits in money terms as estimated in this paper. An important question is, however, whether the mean or median estimate should be used for aggregation. In this study, it appears that aggregate estimates based on mean WTP values clearly exceed the costs of defragmention, both for scenario 1 and scenario 2, as well as for the two scenarios together. If, on the other hand, one were to employ median values for the aggregation of WTP estimates, then the aggregate estimates will be insufficient to cover all the costs of implementing scenario 2.

Finally, we feel it is safe to conclude that the combination of the travel cost and contingent valuation estimates are, more or less, complementary with respect to achieving a monetary value of the benefits provided by habitat defragmentation in the Veluwe.

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Appendix a: Face-to-face questionnaire, translated from Dutch

In this Appendix, we present the questionnaire used by the interviewers. This questionnaire is divided into seven sections:

- Section A – initial contact with the respondent;
- Section B – respondent's recreational profile;
- Section C – travel cost and expenditure data of the respondent;
- Section D – respondent's opinion about the management of the Veluwe;
- Section E – formulation of two habitat defragmentation scenarios;
- Section F – respondent's maximum willingness to pay for one of the two scenarios;
- Section G – respondent's socio-demographic profile;
- Section H – evaluation of the respondent's comprehension of the survey instrument.

Note that respondents were asked to reveal their maximum willingness to pay for only one of the two defragmentation scenarios that we introduced. We therefore designed two versions of the questionnaire, whereby the one focussed on the valuation of the first, and the other on the valuation of the second scenario. For each version, the four bid cards presented in Table 3.2 were used. As an example, the questionnaire presented in this Appendix focusses on the valuation of the first scenario. Furthermore, the bid amounts used in this questionnaire where those related to bid card 1, in which the initial bid is € 6.-.

Face-to-face questionnaire

A. Initial contact

To be filled in **before** meeting the respondent.

A.1 Questionnaire Nr: ____
A.2 Interviewer: _____
A.3 Day: _____
A.4 Date: _____
A.5 Hour: _____:_____ hours
A.6 Specific location: _____
A.7 Weather: _____
A.8 Circumstances in the area (e.g. many or few visitors): _____

Good-morning/good-afternoon. My name is **[say your name]** and I am working with the *Vrije Universiteit* in Amsterdam. This short questionnaire is part of a research project that has the goal to study the visitor's maximum willingness to pay for a defragmentation of the Veluwe. Defragmentation can be defined as creating a continuous area within which animals can disperse freely and without any hindrance.

A.8 May I kindly ask you some questions about your attitudes and opinions?
[please circle respondent's answer]
0. No
1. Yes
If **no**: May I ask you the most important reason why you do not want to participate?
_____
_____ [open ended]

Please think careful about each question and give your best answer. There are no right or wrong answers, only personal answers.

B. Recreational data

B.1 How many persons are in your group (including yourself):
____ persons, of who ____ adults and ____ children (< 15 years)

B.2 During one full year, how often do you visit the Veluwe?
[circle respondent's answer]

1. Less than once a month:
1. Once in two months
2. Once in four months
3. Once in six months
4. Once a year
5. Less than once a year

2. At least once a month:
6. Once a month
7. Two times a month
8. Three times a month
9. Four times a month
10. More than four times a month

B.3 Why did you come to the Veluwe today (main reason)?
[circle respondent's answer]

1. (Mountain-)biking
2. Holidaying
3. Walking
4. Jogging
5. Bird and game watching
6. Other: _____ [open ended]

B.31 If multiple reasons, which ones (by descending order, max.3): _____

B.4 How long do you plan to stay in this area?

1. A couple of hours
2. At least half a day (either morning or afternoon)
3. The whole day
4. Other: _____ [open ended]

B.5 Do you also go to the Veluwe during the winter period?

0. No
1. Yes

If **yes**, what recreation activities do you usually undertake?
_____[open ended]

C. Travel cost and expenditure data

C.1 Where do you live? Zip code: | | | | | - | | |

for example: | 2 | 0 | 1 | 2 | - | C | A | Haarlem

C.2 How did you come to the Veluwe? **[circle respondent's answer]**

1. By car

1.1. What is the type of car:

1 Brand: _____ **2.** Model: _____ **3.** Motor size: ____ cc

1.2. Fuel type **[circle respondent's answer]**

1. Gasoline **2.** Diesel **3.** LPG

1.3. How much are you spending on parking today: € _____

2. By bike

3. By public bus or train

4. On foot

5. Other: _____ [open ended]

C.3 Do you have a perception of how much did it cost to you to travel today to the Veluwe and back home again (entire family / group)?

0. No

1. Yes

If **yes**, how much?

[circle respondent's answer]

3.1. less than € 10,-

3.2. between € 10,- and € 20,-

3.3. between € 20,- and € 30,-

3.4. more than € 30,-

C.4 Did you hire or buy anything here (e.g. a bicycle)?

0. No

1. Yes

If **yes**, how much did you spend on this? € _____ [open ended]

C.5 Did you buy anything here (e.g. a map, drinks or food)?

0. No

1. Yes

If **yes**, how much did you spend on this? € _____ [open ended]

D. Opinion about management of the Veluwe

Recently, a collaboration between various stakeholders has led to the development of detailed policy plans and directives in order to increase the overall quality of the Veluwe. The implementation of these plans will occur through specific – sizeable – projects, which require a large amount of financial investment. For each project, I would like you to tell me whether you think it is very important, important, less important, or not important.

Show Card

Read each item on the list and circle the respondent's answer before proceeding ot the next item.

		Not Important	⟷		Very Important
D.1	Clearing game-averting fences so that populations of red deer and wild boars will disperse freely all over the Veluwe **[show map]**	0	1	2	3
D.2	Constructing a flyover over the A50 motorway, so that red deer and wild boars can safely reach the IJssel river forelands **[show map]**	0	1	2	3
D.3	Encouraging extensive and environmentally friendly agriculture that is aimed at local products, nature management, and biological products	0	1	2	3
D.4	Placing the secondary road between Renkum and Wageningen on 'pillars', so that big game can safely reach the Rhine river forelands **[show map]**	0	1	2	3
D.5	Extending and a better maintenance of the recreational facilities, such as bicycle tracks, camping sites and holiday parks	0	1	2	3
D.6	Constructing a flyover over the A12 motorway, so that red deer and wild boars can safely reach the southern part of the Veluwe **[show map]**	0	1	2	3
D.7	Reducing the maximum speed limit on local roads to 30 kms per hour so that less animals will get killed by cars and motorcycles	0	1	2	3
D.8	Relocating polluting industries the 'Renkums Beekdal', such as rubber factory 'Vredestein', to outside the Veluwe **[show map]**	0	1	2	3

E. Two scenarios

In the Netherlands, diversity of fauna and flora has decreased nationally and regionally. In order to stop this development and to reach a more sustainable conservation of nature and landscape, in 1990 the Dutch government launched an ambitious Nature Policy Plan. **[Pause]**

E.1 Do you think that developing and implementing nature policy, such as nature protection measures, is a task of the Dutch government? **[circle respondent's answer]**

0. No
1. Yes
99. No answer
If **no**: Why not? _____
_____ [open ended]

The aim of the Nature Policy Plan is to protect what is left of our natural heritage as well as to create and develop new nature. Another objective of the Nature Policy Plan is the designation and establishment of new national parks.

E.2 Have you ever heard or read about nature policy in the Netherlands?
[circle respondent's answer]
0. No
1. Yes
99. No answer

E.3 Do you think it is necessary to create new nature in the Netherlands, even at the expense of economic activities, such as agriculture? **[circle respondent's answer]**
0. No
1. Yes
99. No answer

The Veluwe has become an important element in Dutch nature policy-making. In search of the best vegetation, grazing red deer and other wild species should be able to roam safely between the Veluwe and the river forelands. For that purpose, the Province of Gelderland and the Dutch government are thinking about to introduce an action programme. This programme consists of **two scenarios**, which focus especially on the free dispersal of red deer and wild boars:

1. The aim of the 1st scenario is to connect the central part of the Veluwe to the northeast, with the IJssel river forelands. This scenario deals with the removal of game-averting fences and the construction of a flyover over the A50 motorway, south of Hattem.

Show Card

2. The aim of the 2nd scenario is to connect the central part of the Veluwe to the southwest, with the Rijn river forelands. This scenario deals with the removal of game-averting fences, the construction of a flyover over the A12 motorway, east of Ede, a relocation of the rubber

factory 'Vredestein' in Renkum to outside the area, and the placing of the secondary road between Renkum and Wageningen on pillars so that species can migrate underneath it. **[Pause]**

Show Card

E.4 Are these two scenarios clear for you?

[circle respondent's answer]

0. No

1. Yes

If **no**: What exactly is not clear?

_____

_____ [open ended]

E.5 Do you have any preference for one of the two described scenarios?

[circle respondent's answer]

0. No

1. Yes

If **yes**: Which one and why?

_____

_____ [open ended]

F. Hypothetical valuation question for scenario 1

The remainder of this questionnaire focuses attention on only one of the two scenarios, namely the scenario that connects the central part of the Veluwe to the north-east, with the IJssel river forelands. In order to realise this scenario, it important to know how much it is worth to you.

Show Card

Therefore I would like to know how you would vote on the introduction of a so-called 'once-and-for-all-payment', given that this payment will be exclusively applied to the realisation of the above-mentioned scenario. If the majority of the people vote in favour, all Dutch households would have to pay such an 'once-and-for-all-payment'. The reason behind this is that the Veluwe is a natural area of national importance. **[Pause]**

F.1 Keeping your current household income and expenditures in mind, if the total amount to be paid for the realisation of the scenario was € 6.- how would you vote on the introduction this payment?

1. VOTE IN FAVOUR → **F.2**
2. VOTE AGAINST → **F.3**

99. No answer → **F.3**
DO NOT READ

F.2 And how would you vote if the total amount to be paid was € 20.-?

1. VOTE IN FAVOUR → **F.4**
2. VOTE AGAINST → **G**

99. No answer → **F.4**
DO NOT READ

F.3 And how would you vote if the total amount to be paid was € 2.-?

1. VOTE IN FAVOUR → **G**
2. VOTE AGAINST → **F.5**

99. No answer → **F.5**
DO NOT READ

F.4 What is the maximum amount that you are willing to pay?
€ _____ [open ended]

F.5 Are you willing to pay anything at all?
0. No → **F.6**
1. Yes
99. No answer
If **yes**: How much? € _____ [open ended]

F.6 Can you give the most important reason why your household is not prepared to pay? **[circle respondent's answer]**

1. I do not believe in the proposed scenario
2. The proposed scenario is not worth that much
3. The nature conservation organisations, such as the Society for the Preservation of Nature ('Natuurmonumenten') have to pay all the costs
4. I do not want to pay something extra; the government has to pay everything out of the regular budget
5. I do not want to pay something extra; the inhabitants of the Veluwe has to pay everything
6. I do not want to pay something extra; the day-trippers and holiday-makers in the area have to pay everything
7. My income does not allow me to pay this anything
8. Other, specify:

_____
_____
_____ [open ended]

G. Socio-demographic data

To finish this questionnaire, I would like to ask you some personal questions. Your answers will be handled confidentially. We do not need to know the name of your family. You will remain anonymous.

G.1 Year of birth: _____

G.2 What is the highest form of education that you have received?

[circle respondent's answer]

1. Primary education
2. VBO, MAVO, LBO
3. MBO, HAVO, MULO, VWO
4. HBO, University
5. Other, specify: _____
99. No answer

G.3 What is the primary focus of your education?

[circle respondent's answer]

1. Technology or natural science
2. Economy, trade or business
3. Medical or social care
4. Culture, art or communication
5. Other, specify: _____
99. No answer

G.4 Do you have a partner with whom you live together?

[circle respondent's answer]

1. Yes **2.** No **99.** No answer

G.5 How many of your children are living at home? _____

G.6 I will present you different income categories. Can you tell me in which category the common monthly take-home pay of your HOUSEHOLD (you and **your partner** – if **G.4** is **yes**) can be placed? You need to take into account the NET income. The data will only be used for statistical analysis. You will remain anonymous

Show Card

Please indicate the LETTER that best describes your situation (euros per month).

P. < € 1,500.-

H. > € 1,500.- and < € 3,000.-

D. > € 3,000.-

99. No answer

If **P** is selected letter then

Show Card

and ask again the LETTERS that best describe the situation

PP. < € 500.-

PH. > € 500.- and < € 1,000.-

PD. > € 1,000.- and < € 1,500.-

If **H** is selected then

Show Card

and ask again the LETTERS that best describe the situation:

HP. > € 1,500.- and < € 2,000.-

HH. > € 2, 000.- and < € 2,500.-

HD. > € 2,500,- and < € 3,000,-

If **D** is selected then

Show Card

and ask again the LETTERS that best describe the situation:

DP. > € 3,000.- and < € 4,000.-

DH. > € 4,000.- and > € 5,000.-

DD. > € 5,000.- and < € 6,000.-

This is the end of the questionnaire.
THANK YOU VERY MUCH for your collaboration.
(give a pen with VU-label)

INTERVIEWER please GO to SECTION H before starting a new questionnaire

H. Control questions (to be answered by the interviewers)

H.1 According to you, did the interview pass well?
0. No
1. Yes

H.2 Why did the interview NOT pass well?
1. Because the respondent did not understand the questionnaire well
2. Because the respondent wanted to know too much details
3. Because the respondent clearly did not have any interest
4. Because the respondent frequently interrupted the questions
5. Other, specify:
_____
_____
_____ [open ended]

H.3 Which parts are not (well) understood by the respondent?

Survey Section		Not well understood	Understood	Well understood
B.	Recreational data	1	2	3
C.	Travel cost and expenditure date	1	2	3
D.	Opinion about management of the Veluwe	1	2	3
E.	Two scenarios	1	2	3
F.	Hypothetical valuation question for scenario 1	1	2	3

Appendix b: Internet questionnaire

The questionnaire that is filled out by the web survey panel is the same as the face-to-face questionnaire, except for the travel cost and expenditure data of the respondent. After all, Internet respondents were not interviewed in the Veluwe area itself, so they could not be asked about their travelling behaviour either. Needless to say that the Internet questionnaire does neither contain questions about the initial contact with the respondent (section A in the face-to-face questionnaire) or about the respondent's comprehension of the survey instrument (section H in the face-to-face questionnaire). As a result, the Internet questionnaire is shorter, but otherwise similar, than the face-to-face questionnaire and consists of five sections:

- Section A – respondent's experience with the Veluwe-region;
- Section B – respondent's opinion about the management of the Veluwe;
- Section C – formulation of two habitat defragmentation scenarios;
- Section D – respondent's maximum willingness to pay for one of the two scenarios;
- Section E – respondent's socio-demographic profile.

The Internet questionnaire started in section A with the question whether the respondent ever visits, or has ever visited the Veluwe. If the respondent's answer was positive, then questions were posed about the annual visit frequency and the respondent's main reason for visiting the Veluwe (see the questions B.2 to B.31 asked in the face-to-face questionnaire). These questions about the respondent's experience with the Veluwe-region were followed by section B, which dealt with the respondent's opinion about the management of the Veluwe.

Like the respondents to the face-to-face questionnaire, also Internet respondents were asked to reveal their maximum willingness to pay for only one of the two defragmentation scenarios that we introduced. We therefore designed two versions of the questionnaire, whereby the one focussed on the valuation of the first, and the other on the valuation of the second scenario. For each version, the four bid cards presented in Table 3.2 were used.

Appendix c: Demand curve for recreation activity at the Veluwe

Table A shows the estimation results of the demand curve for annual visits to the Veluwe area. The table contains the results of both the fuel cost option and full cost option. In this table, the coefficient for travel costs equals the sum of the transportation, travel time and parking costs. As a result, the estimation results are different from those in Table 5.3.

Table A. Demand function estimation results

Variables	Car costs calculation option					
	Fuel cost option			Full cost option		
	Estimate	Std. error	p-value	Estimate	Std. error	p-value
Constant	-3.8958	5.2690	0.4597	-2.9151	5.02611	0.5619
Travel costs	-0.0123**	0.0018	0.0000	-0.0058**	0.0009	0.0000
SITE CHARACTERISTICS						
• Sunny weather	-0.0288	0.1033	0.7805	0.0065	0.1010	0.9483
• Week-end	0.0081	0.0974	0.9334	-0.0134	0.0939	0.8861
• Site located far from proposed scenario	-0.0251	0.0775	0.7465	-0.0199	0.0741	0.7884
RESPONDENT'S CHARACTERISTICS						
• Number of adults in group	0.0271	0.0215	0.2062	0.0284	0.0211	0.1790
• Number of children in group	-0.0745**	0.0366	0.0421	-0.0703**	0.0368	0.0562
• Perceived travel costs	0.1199	0.0864	0.1653	0.0958	0.0836	0.2517
• In favour of scenario 1	-0.1211	0.0766	0.1138	-0.1314**	0.0738	0.0750
• Familiar with Dutch nature policy	0.0502	0.0877	0.5669	0.0492	0.0851	0.5629
• Year of birth	0.0029	0.0027	0.2805	0.0024	0.0026	0.3445
• Average income	0.0000	0.0000	0.2704	0.0001	0.0000	0.2376
• Living with a partner	-0.0325	0.1063	0.7600	-0.0044	0.1039	0.9661
Overdispersion parameter α	0.0395			0.0716		
Chi squared	10.530			7.0933		
Significance level	0.0012			0.0077		
R^2_p	0.2661			0.3034		
R^2_d	0.2414			0.2788		
N	216			216		

Notes: Calculations are performed using count data models in LIMDEP®.
** Significant at 10%.

Table B shows the sample mean values for all the explanatory variables that we used for estimating the recreation demand curve.

Table B Sample means of explanatory variables for both calculation options

Fuel costs	Full costs	Sunny weather	Week-end	Far away	Number of adults	Number of children	Perceived costs	Scenario 1
€ 21.2	€ 55.4	0.2778	0.6389	0.4028	2.6528	0.8241	0.7731	0.4676

Dutch policy	Year of birth	Average income	With partner
0.7546	1957.1	2.495	0.7083

If we multiply each regression coefficient with p-values lower than 10% – see Table A – by the mean value of the variable, sum these products, and add them to the value of the constant term, then we can express the two demand curves (in their reduced form) for yearly visits as

$$\begin{aligned}\log N = & -0.0123\times P_{fuel-cost} + 0\times 0.2778 + 0\times 0.6389 + 0\times 0.4028 \\ & + 0\times 2.6528 - 0.0745\times 0.8241 + 0\times 0.7731 + 0\times 0.4676 \\ & + 0\times 0.7546 + 0\times 1957.1 + 0\times 2.495 + 0\times 0.7083\end{aligned} \tag{A.1}$$

and

$$\begin{aligned}\log N = & -0.0058\times P_{full-cost} + 0\times 0.2778 + 0\times 0.6389 + 0\times 0.4028 \\ & + 0\times 2.6528 - 0.0703\times 0.8241 + 0\times 0.7731 - 0.1314\times 0.4676 \\ & + 0\times 0.7546 + 0\times 1957.1 + 0\times 2.495 + 0\times 0.7083.\end{aligned} \tag{A.2}$$

In these two equations, N denotes the yearly number of trips and P the travel costs. From equation (A.1) we derive the fuel-cost inverse demand function to be

$$P_{fuel-cost} = -4.9915 - 81.301\times \log N\,. \tag{A.3}$$

Likewise, the full-cost inverse demand function is derived from equation (A.2) and is given by

$$P_{full-cost} = -20.5822 - 172.414\times \log N\,. \tag{A.4}$$

Appendix d: Lognormal mean and median WTP estimates

Table A Both scenarios, and both face-to-face and Internet questionnaires

Parameters	Estimate	Standard Error
Location	2.8718	0.1089
Scale	2.1058	0.1339
Likelihood	-616.608	
	Point Estimate	90% Confidence interval estimate
Mean	€ 162.2	€ 80.4 – € 376.3
Median	€ 17.7	€ 14.3 – € 21.9

Table B Both scenarios, Internet questionnaires

Parameters	Estimate	Standard Error
Location	2.5954	0.1651
Scale	2.1312	0.2074
Likelihood	-274.919	
	Point Estimate	90% Confidence interval estimate
Mean	€ 129.9	€ 45.7 – € 515.3
Median	€ 13.4	€ 9.7 – € 18.5

Table C Both scenarios, face-to-face questionnaires

Parameters	Estimate	Standard Error
Location	3.0991	0.1443
Scale	2.0568	0.1725
Likelihood	-338.998	
	Point Estimate	90% Confidence interval estimate
Mean	€ 183.9	€ 76.6 – € 555.9
Median	€ 22.2	€ 16.7 – € 29.4

Table D Scenario 1, and both face-to-face and Internet questionnaires

Parameters	Estimate	Standard Error
Location	2.8150	0.1405
Scale	1.9249	0.1692
Likelihood	-305.878	
	Point Estimate	90% Confidence interval estimate
Mean	€ 106.4	€ 47.1 – € 300.4
Median	€ 16.7	€ 12.7 – € 22.0

Table E Scenario 1, Internet questionnaires

Parameters	Estimate	Standard Error
Location	2.5152	0.1997
Scale	1.8009	0.2436
Likelihood	-132.741	
	Point Estimate	90% Confidence interval estimate
Mean	€ 62.6	€ 21.7 – € 287.8

Median	€ 12.4	€ 8.4 – € 18.3

Table F Scenario 1, face-to-face questionnaires

Parameters	Estimate	Standard Error
Location	3.0866	0.1956
Scale	1.9780	0.2281
Likelihood	-170.782	
	Point Estimate	90% Confidence interval estimate
Mean	€ 154.9	€ 51.8 – € 695.4
Median	€ 21.9	€ 14.9 – € 32.1

Table G Scenario 2, and both face-to-face and Internet questionnaires

Parameters	Estimate	Standard Error
Location	2.9427	0.1685
Scale	2.2944	0.2115
Likelihood	-309.576	
	Point Estimate	90% Confidence interval estimate
Mean	€ 263.7	€ 85.3 – € 1153.8
Median	€ 19.0	€ 13.6 – € 26.4

Table H Scenario 2, Internet questionnaires

Parameters	Estimate	Standard Error
Location	2.7244	0.2679
Scale	2.4560	0.3448
Likelihood	-140.543	
	Point Estimate	90% Confidence interval estimate
Mean	€ 311.2	€ 51.4 – € 4810.5
Median	€ 15.2	€ 9.0 – € 25.8

Table I Scenario 2, face-to-face questionnaires

Parameters	Estimate	Standard Error
Location	3.1130	0.2135
Scale	2.1429	0.2618
Likelihood	-168.101	
	Point Estimate	90% Confidence interval estimate
Mean	€ 223.4	€ 61.4 – € 1390.5
Median	€ 22.5	€ 14.8 – € 34.2

Appendix e: Weibull mean and median WTP estimates

Table A Both scenarios, and both face-to-face and Internet questionnaires

Parameters	Estimate	Standard Error
Location	3.6095	0.0986
Scale	1.7562	0.1149
Likelihood	-606.414	
	Point Estimate	90% Confidence interval estimate
Mean	€ 59.7	€ 41.8 – € 89.3
Median	€ 19.4	€ 17.3 – € 21.6

Table B Both scenarios, Internet questionnaires

Parameters	Estimate	Standard Error
Location	3.3571	0.1478
Scale	1.8215	0.1822
Likelihood	-270.240	
	Point Estimate	90% Confidence interval estimate
Mean	€ 49.0	€ 28.1 – € 94.5
Median	€ 14.7	€ 12.4 – € 17.0

Table C Both scenarios, face-to-face questionnaires

Parameters	Estimate	Standard Error
Location	3.8041	0.1306
Scale	1.6732	0.1449
Likelihood	-333.322	
	Point Estimate	90% Confidence interval estimate
Mean	€ 67.9	€ 43.5 – € 114.1
Median	€ 24.3	€ 20.7 – € 28.0

Table D Scenario 1, and both face-to-face and Internet questionnaires

Parameters	Estimate	Standard Error
Location	3.5020	0.1262
Scale	1.6200	0.1465
Likelihood	-300.163	
	Point Estimate	90% Confidence interval estimate
Mean	€ 48.2	€ 31.3 – € 80.0
Median	€ 18.3	€ 15.8 – € 20.9

Table E Scenario 1, Internet questionnaires

Parameters	Estimate	Standard Error
Location	3.1767	0.1777
Scale	1.5801	0.2211
Likelihood	-130.563	
	Point Estimate	90% Confidence interval estimate
Mean	€ 33.8	€ 18.6 – € 73.1

Median	€ 13.4	€ 10.9 – € 15.9

Table F Scenario 1, face-to-face questionnaires

Parameters	Estimate	Standard Error
Location	3.7623	0.1729
Scale	1.5828	0.1888
Likelihood	-166.839	
	Point Estimate	90% Confidence interval estimate
Mean	€ 60.8	€ 34.8 – € 120.8
Median	€ 24.1	€ 19.4 – € 29.0

Table G Scenario 2, and both face-to-face and Internet questionnaires

Parameters	Estimate	Standard Error
Location	3.7295	0.1536
Scale	1.8916	0.1795
Likelihood	-304.949	
	Point Estimate	90% Confidence interval estimate
Mean	€ 75.6	€ 43.1 – € 147.7
Median	€ 20.8	€ 17.3 – € 24.4

Table H Scenario 2, Internet questionnaires

Parameters	Estimate	Standard Error
Location	3.5694	0.2403
Scale	2.0293	0.2928
Likelihood	-137.970	
	Point Estimate	90% Confidence interval estimate
Mean	€ 72.9	€ 30.1 – € 235.0
Median	€ 16.9	€ 12.7 – € 21.2

Table I Scenario 2, face-to-face questionnaires

Parameters	Estimate	Standard Error
Location	3.8499	0.1977
Scale	1.7700	0.2228
Likelihood	-166.239	
	Point Estimate	90% Confidence interval estimate
Mean	€ 76.8	€ 39.2 – € 179.3
Median	€ 24.6	€ 19.2 – € 30.2

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(lxv) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications” organised by Fondazione Eni Enrico Mattei and sponsored by the EU, Milan, September 25-27, 2003
(lxvi) This paper has been presented at the 4th BioEcon Workshop on “Economic Analysis of Policies for Biodiversity Conservation” organised on behalf of the BIOECON Network by Fondazione Eni Enrico Mattei, Venice International University (VIU) and University College London (UCL) , Venice, August 28-29, 2003
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(lxviii) This paper was presented at the ENGIME Workshop on “Governance and Policies in Multicultural Cities”, Rome, June 5-6, 2003
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