The impact of water protection measures in the Vittel impluvium on recreational values: A choice experiment with local residents

Tristan Amiri[1], Jens Abildtrup[2], Serge Garcia [2], Claire Montagné-Huck [2]

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Abstract

Actions undertaken for the protection of source water catchment areas by mineral water companies also produce positive externalities. Mineral waters create value for the water companies and its consumers, but for the territory and the local population also, in particular through the environmental and social services (e.g., habitats, landscape, and recreation) jointly produced with the protection of water quality. This paper aims at assessing the environmental and social preferences of the local population of Vittel (France) and surroundings, the area where Nestlé Waters produces the natural mineral waters of VITTEL®, CONTREX® and HEPAR®. From a choice experiment (CE) method, we test different scenarios of recreation activities considering two types of recreational areas: the countryside and the forest. While most of attributes are common to both scenarios, some are also specific to the forest and others to the countryside.

Keywords: Mineral Water Company; Vittel; Water quality protection; Environmental and recreational services; Choice Experiment.

1 Université de Lorraine, Université de Strasbourg, AgroParisTech, CNRS, INRAE, BETA, 54000 Nancy, France. tristan.amiri@inrae.fr

2 Université de Lorraine, Université de Strasbourg, AgroParisTech, CNRS, INRAE, BETA, 54000 Nancy, France.

1. Introduction

Nestlé waters is the world leader in the sector of bottled water. In France eight brands of mineral natural or spring waters are distributed by Nestlé waters (PERRIER®/PERRIER FINES BULLES®, VITTEL®, HÉPAR®, CONTREX®, S.PELLEGRINO®, NESTLÉ PURE LIFE® et ACQUA PANNA®). Among these brands, VITTEL® is probably one the most emblematic; and the brand name has always been "*strongly associated with images of health and vitality*" (Perrot-Maître 2006).

In 1988, the production unit of Vittel noticed a "*deterioration in the quality of its mineral water, a slow but notably significant increase in nitrates*". The main cause was identified as "n*onpoint source pollution from intensive farming practised in the fields surrounding the Vittel springs*" (Deprès *et al*., 2005). One of the reasons of that pollution was identified as the production of corn, which is considered as an "*important factor in nitrate increase in groundwater*" (Deffontaines and Brossier 1997; Perrot-Maître and Davis 2001).

To address this problem, several alternatives were available to Nestlé waters (see Deprès *et al*, 2005 for the details). One of these alternatives consisted in achieving contractual arrangement with farmers. After a collaboration between the National Institute of Agronomic Research (INRA), Agrivair (a subsidiary company of Nestlé Waters dedicated to this issue, and local farmers, some concrete measures were adopted to guarantee the water quality: cessation of corn culture, compost of animal waste, etc. By doing so, the Vittel case became the "*first recognized initiative*" of Payment for Environmental Services (PES) in France (Hernandez and Benoit, 2011). The originality is that the PES scheme is supported by a private actor, Nestlé Waters-Agrivair and corresponds to a situation where direct payments by service beneficiaries are made to service providers, in which both providers and beneficiaries are private entities (individuals, groups of individuals, or private companies) (Greiber, 2011). The Organization for Economic Co-operation Development (OECD, 2005) and Perrot-Maître (2010) share the same conclusion: "*in the presence of market failure, private transactions and voluntary approaches are more efficient, effective, equitable and sustainable than government approaches and need to be encouraged*" (Perrot-Maître, 2010).

According to the United Nations Economic Commission for Europe (UNECE, 2007) "*Economic analysis is an essential tool for efficient decision-making regarding the establishment of PES schemes. It provides a coherent framework that allows a comparison of the costs and benefits of changes in water-related ecosystem services in an integrated manner*". These benefits are larger than the water quality preservation. According to Leonardi *et al*. (2018) "*increasing attention is being paid to co-benefits of PES schemes* […]". Indeed, economic and social benefits (for example) "*increase the acceptability and effectiveness of the overall scheme*" (Leonardi *et al*., 2018). These benefits can be observed at a local or a global level, and in some cases "*a local activity has national or global implications*" (Lipper *et al*., 2009). Identifying these benefits is therefore an important issue.

For example, in the case of Vittel, according to Perrot-Maître (2010), "*the impairment of the water quality would have eventually led to the closing down the natural mineral water business in the region that would also have affected the economy",* including local farmers, employment and more global economic activity. The development of the local biodiversity is another good example of a positive externality: "[…] *successful PES schemes re-enforce the multifunctional role of ecosystems (through co-benefits) and highlight the economic and social benefit, which increase the acceptability and effectiveness of the overall scheme*". In the case of Vittel, "*measures specifically targeting biodiversity protection were also supported by Nestlé, insofar as these were functional to the realisation of the core objective of sustainable farming practices to maintain high-quality mineral drinking water*" (Dupuis and Vinuales, 2013).

In order to give a value to the environmental and social services jointly produced with the preservation of water quality, we propose to use a choice experiment (CE). This method "*generally considered as* […] appropriate […] *for the valuation of multi-attribute non-market goods*" (Tu *et al*., 2016) is based on the idea that any environmental good can be described in terms of attributes, and in terms of levels that these attributes can take (Hanley *et al*., 2001; Birol and Koundouri, 2008).

We test various scenarios of recreational activities considering diversity of landscapes (i.e., countryside and forest) and thus different recreational sites. While most of attributes are common to both scenarios, some are also specific to the forest and others to the countryside. We thus estimate the willingness to pay (WTP) for these different environmental and social attributes in order to elicit some direct use values (related to recreation) and indirect use values (related to landscape and biodiversity)[3]. Furthermore, we test the hypothesis that local attachment to the region increase the likelihood to choose the status quo option.

This paper is organised as follows: in the following section, we present our methodology by describing the literature background on recreation activities and CE, the experimental design, and the survey carried out in region of Vittel in France. In Section 3, we present the empirical application. In Section 4, we present the (preliminary) estimation results based on a sample of 80 fully completed questionnaires. Section 5 concludes the paper.

2. Methodology

2.1. Recreation activities and CE

Nonmarket valuation as based on individual choices and preferences underlying those choices is one (but not the only) way that researchers and practitioners have sought to define and measure the values that individuals assign to environmental goods and services.

Standard economic theory defines value in terms of the trade-offs that individuals are willing to make between different situations. The value of a good or a service, estimated as the variation of its quantity (or the improvement or a degradation of its quality in a case of environment and natural resources), is the maximum amount of another good that an individual would be willing to give up in exchange of an improvement of that is being valued.

The total economic value (TEV) of a good can be decomposed according to a standard classification (National Research Council 2005). That classification shows that the TEV of a natural resource or an environmental good not only includes the benefits individuals get through the (direct) use of the good but also the value they place on the good even if they do not actually use or come in contact with it (non-use and option values). In this paper, we use CE to estimate the direct and indirect use values associated with the recreational activities of the local population around the impluvium. In other terms, we use choices of recreational sites to collect information about respondents' preferences for environmental services, such as landscape and biodiversity.

3 This present preliminary version of the paper does not include WTP estimates, as the survey is still on-going

To estimate the values linked to environmental attributes, different valuation methods are available, often classified in two categories: methods based on revealed preferences and methods based on stated preferences. The first one consists in estimating non-market values by observing actual behaviour that is linked in some way to an environmental good or attribute, while the second one consist in directly asking individuals questions related to their preferences in a survey and inferring values from their stated responses.

According to Holmes *et al.* (2017), "*there has been an explosion of interest*" in CE during the past two decades. If the method began to be applied in the early 80's (Costa and Hernandez, 2019) with the works of Louviere and Hensher (1983, 1989), and Louviere and Woodworth (1983), the paper that "*generated attention in the environmental economics community*" (Carson and Czajkowski, 2014) was the one of Adamowicz *et al*. (1994).

More recently, the Discrete Choice Experiment (DCE) technique had been used in ecosystem services valuation (see Chaikaew *et al.* 2017 for more details) or to examine the choice of farmers to adopt environmentally friendly practices (Chèze *et al.* 2018). After a literature review of stated preference studies in agriculture, environment and health, over the period 2004-2013, Mahieu *et al.* (2014) concluded: "*Our main result from a systematic review of the literature of stated preferences studies published over the last ten years is that CE is becoming more popular than contingent valuation*".

In this paper, we use the CE method, which belongs to the second category. More specifically, we implement a survey on the recreational activities of the local population to estimate the direct use value associated with recreational site attributes. We consider two types of recreational sites: the countryside and the forest. Respondents are asked to choose between two hypothetical sites, one referring to the countryside, and the other one referring to the forest and a status quo alternative which is the last visited forest. Before the choice experiment the respondent are asked to indicate if their last visits was in a forest or in the countryside and to describe the site based on the attributes considered in the CE.

2.2. Experimental design

A literature review was the first step to select the relevant attributes. Because the Vittel case is known as the first example of PES in France (Hernandez and Benoit, 2011), the scientific literature on that case is quite important (see Perrot-Maître, 2006, Chia and Raulet Croset, 1994, among others). These papers help to identify the services jointly produced by water protection measures, like the preservation of biodiversity or landscape quality. Moreover, the existing literature on CE for recreational activities gave us some inspiration to think about the levels to consider in our study (i.e: Carson *et al.* 1990, Boxall *et al*., 1996, Bateman *et al*., 2003 and Christie *et al.*, 2007).

Table 1 presents the eight attributes selected in our CE and the attribute levels. Some of the selected attributes are common to the forest and to the countryside; some others are specific either to the countryside or to the forest.

Table 1. Recreation attributes and levels

Attribute	Level
Characteristics common to forest and countryside	
Equipment (picnic tables, bins, information signs)	Presence or absence (1/0)
Marked hiking and biking trails	Presence or absence (1/0)
Water stream	Presence or absence (1/0)
Pesticides	Use or not use of pesticides (1/0)
Distance	Two-ways distance to the recreational site (eight levels: from 1 to 40 km). The greater the distance to be covered, the higher the cost.
Characteristics specific to countryside	
Hedgerows and biodiversity	level of hedgerows and associated level of biodiversity (absence, low number, high number)
Agricultural land use	Type of farming practised in the countryside (grasslands, cereal fields, livestock, or mixed).
Characteristics specific to forest	
Tree species	Forest composition in term of tree species (deciduous, coniferous, or mixed)

In order to see if the chosen attributes and levels were relevant for members of the local population, a focus group was organized, on June 3, 2019 as follows:

a) Presentation of the survey;
b) Completion of the questionnaire;

c) Answers to the questions, comments and suggestions from the respondents;

d) "*Most enhanced characteristics*" exercise: participants had to write on a paper what was the attribute they appreciate the most during a recreational outing. A quite similar question (about the five favourite characteristics this time) has been included in the survey.

The respondents were divided into two groups: one session took place during the morning, the other during the afternoon with six people in each group. Among the 12 respondents, all were local residents, six worked for Agrivair, three for Nestlé Waters, and the others were farmers or peasants. The main objective was to test the questionnaire. Doing so, we were able to make modifications (on form and substance) in order to make the questionnaire as clear and as relevant as possible. The focus group also gave us an opportunity to discuss about the chosen attributes.

Furthermore, the number of levels (as well as the number of attributes) has a direct impact on the experimental design. The choice of the number of levels for each attributes is therefore an important issue. The focus group allowed us to make some modifications about the attributes levels. For example, considering the fact that the corn culture has a negative impact on water quality, we first chose to include a corn attribute in the design. However, during the focus-group period, some respondents argued that looking only at this particular culture was too restrictive. Consequently, we decided to include other forms of agricultural land use, like the presence of livestock or grasslands.

Regarding the final numbers of levels, half of the attributes (i.e., equipment, marked hiking and biking trails, water streams, and pesticides) are binary. These attributes correspond to the presence or the absence of the attribute on the recreational site. We chose to use more levels for three attributes, considering their complexity. Two of them are specific to the countryside:

a) The attribute "*hedgerows and biodiversity*" must allow respondents to choose whether they appreciate the presence of hedgerows (and associated increased biodiversity) on a recreational site, but also the quantity they prefer: no hedgerow, low hedgerow quantity or high hedgerow quantity;

b) The attribute "*agricultural land use*" has four attributes: grasslands, cereal fields, livestock, or "*mixed agricultural plots*" which refers to a mix of the first three agricultural land uses.

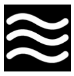
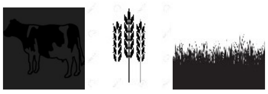
The attribute "*tree species*" is specific to the forest, and describe it composition, depending on the species we can find in the different forest sites in the Vittel region. We chose to include three different types of forests: a forest composed exclusively of deciduous trees, a forest composed exclusively of coniferous, or a mix of these species.

Finally, the distance attribute has eight levels, from one kilometre (km) to 40 km. The information collected about the distance that people accept to travel will be used to estimate the monetary value they give to the attributes by converting travel distance to travel costs.

According to Hanley *et al* (1998), "*the choice experiment approach involves the use of statistical design theory to construct choice scenarios which can yield parameter estimates that are not confounded by other factors*". Researchers use an experimental design "*to map attributes and levels into sets of alternatives to which respondents indicate their choices*" (Johnson *et al.*, 2013). The design aims at isolating the effects of individual attributes on choice (Hanley *et al.*, 1998). The experimental-design step consists in generating "*the variation in the attribute levels required to elicit a choice response. Efficient experimental designs maximize the precision of estimated choice-model parameters for a given number of choice questions*" (Johnson *et al.*, 2013). In our case, we generated 24 choice sets which were allocated to three blocks with 8 choice sets to reduce the number of choices per respondent. An efficient statistical design was estimated applying NGENE (ChoiceMetrics 2014).

Each choice set was composed of three alternatives: the status quo, based on information about the last visit made by the respondents in a forest or in the countryside during the last 12 months with a recreational goal. If no visit has been made during this period, we asked the same question for the last 5 years. If the number of visits is still zero, the respondents do not have the opportunity to answer to the CE. The two others alternatives are generated on a hypothetical basis, but with the same attributes. Table 2 shows an example of a choice set. Each attribute is illustrated with a pictogram, even in the status quo alternative. The choice of using monochrome pictograms and not photos was motivated by the desire to not influence the answers.

Table 2: Example of a choice set

Characteristics	Last visited forest or countryside scenario (status quo)	Countryside scenario	Forest scenario
Equipment			
Marked hiking and biking trails			
Water streams			
Pesticides			
Agricultural land use			
Tree species			
Hedgerows and biodiversity			
Distance	22 km	15 km	20 km
Your choice	○	○	○

2.3. Survey

This step concerns the practical implementation of the survey. The first issue sampling and the geographical targeting. Considering the fact that the aim was to survey the local population around the two municipalities Vittel and Contrexéville, a perimeter of 15 kilometres has been established. In that perimeter, municipalities (except the largest ones, i.e., Vittel, Contrexéville and Mirecourt), were randomly selected, see Fig. 1. The following step was to establish a rule to construct a 600 household's sample: we chose to survey 5% of the households in the three largest municipalities (in red in figure1) and 10% in the others (in orange) (see Table 3). In total, 13 municipalities and 624 households are included in the sample. The figure 1 shows the municipalities that belong to the sample, and the sites that respondents visited for a recreational purpose during the last 5 years (inside and outside the impluvium).

Figure 1: Map of the municipalities included in the sample

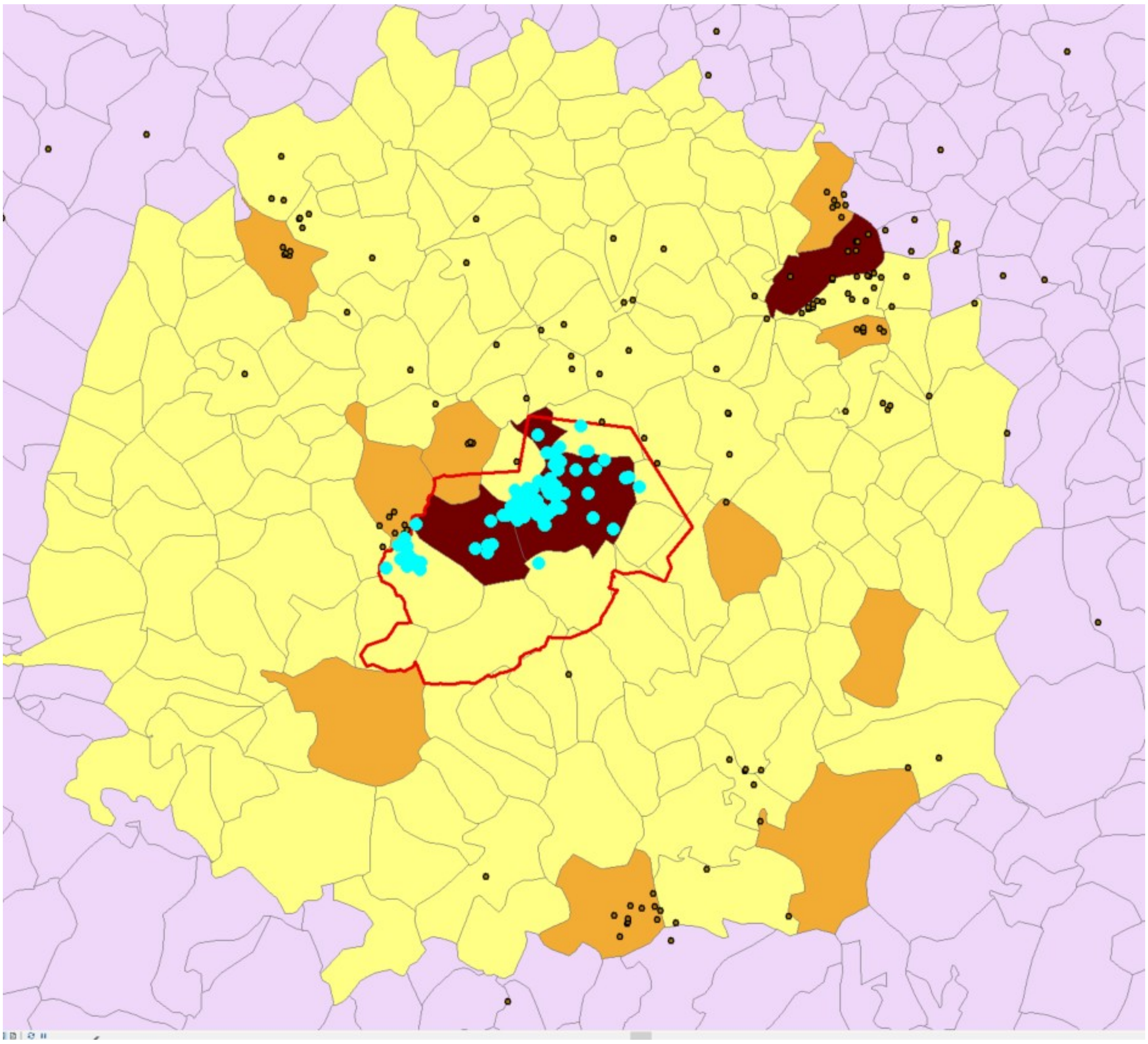


Table 3. Sample and randomly selected municipalities

Municipality	Number of inhabitants	Number of households	5% of the households	10% of the households
Mirecourt	5,285	2,561	128	
Vittel	5,192	2,702	135	
Contrexéville	3,232	1,577	79	
Monthureux-sur-Saone	862	383		38
Mandres-sur-Vair	464	162		16
Poussay	698	311		31
Rouvres-la-Chétive	452	192		19
Hymont	477	219		22
Bulgnéville	1525	624		62
Lerrain	476	206		21
Hennezel	404	188		19
Escles	435	179		18
Martigny-les-Bains	799	363		36
Total	20,201	9,667	342	624

Note. Total number of municipalities = 13.

We worked with the company Wood'up to implement the survey. As we chose to do it in face to face, two surveyors were hired to visit the respondents with tablets. This process allows them to answer potential questions and to help respondents with the tablets if necessary. To make sure that the households were randomly selected, we constructed a random protocol. Following this idea of randomization, the person allowed to answer to the questionnaire was the last adult (available) to have celebrated his or her birthday. In order to facilitate the implementation of the survey, a flyer of presentation of the survey had been distributed in the selected municipalities. Finally, feedbacks are organized on a regular basis with the surveyors to monitor the progress of the survey.

3. Empirical application

3.1. The random utility model

According to Birol and Koundouri (2008) CE has a theoretical grounding in Lancaster's characteristics theory of value (Lancaster, 1966), and an econometric basis on random utility models (RUM, Thurstone, 1927; Manski, 1977): RUM aims at modelling the choices of individuals among discrete sets of alternatives j. These models assumes that the preferences of an individual among the available alternatives can be described by a utility function.

In a given sample with N respondents, each respondent n faces T choice situations. Every choice situation has a choice set of J alternatives. The total utility for respondent n choosing alternative j in the choice set in situation t is U_{njt}. This utility depends on a component that the researcher can observe, called the deterministic part of utility attributes (V_{njt}) and a random component that the analyst cannot observe (ε_{nj}) (Horowitz et al, 1994):

$$U_{njt} = V_{njt} + \varepsilon_{njt}, (1)$$

The relative contribution of each attribute X_{knt} to the overall utility U_n can be represented by a parameter β_{kn}. As a consequence U_{njt} can be written on this way:

$$U_{njt} = \beta_n X_{njt} + \varepsilon_{njt}, n = 1, \ldots, N, j = 1, \ldots, J\, t = 1, \ldots, T (2)$$

Where $\beta_n ¿ X_{njt}$ are vectors of parameters and attribute values, respectively. The individual n chooses the alternative j that brings the highest utility.

3.2. Econometric specifications

To explain the choices of the respondents and to interpret the results different statistical models can be used: according to Train (2003), the generalised multinomial logit model, also called the conditional (multinomial) logit is the most frequently used model to explain discrete choices. This model relies on the assumption of independence of irrelevant alternatives (IIA). This assumption states that the odds of the probability of any two alternatives chosen by the respondent are independent of the presence of any other alternatives in the choice set (Hensher *et al.* 2005). Moreover, the conditional logit assumes that the utility functions across respondents are identical, which means that preferences must be homogeneous. That last strong hypothesis may appear as irrelevant, that is why some other models try to address this issue: the mixed logit model accounts for heterogeneity by allowing model parameters to vary randomly over individuals. It is generally assumed that preferences vary across respondents but not across choices of the same respondent. Hence, "*a clustered specification is applied that allows for repeated choices for each individual*" (Revelt and Train, 1998). We estimate both conditional multinomial logit model and mixed logit to test the robustness of our results.

The probability of an individual n to choose alternative i conditional on knowing β_n can be expressed by:

$$P_n\left(i \vee \beta_n\right)=\frac{\exp\left(\beta_n X_{¿}\right)}{\sum_{j=1}^{J} \exp\left(\beta_n X_{nj}\right)}(3)$$

In the case of multiple choices for each respondent, the logit probability refers to the probability that the individual *n* makes a sequence of *T* choices specified as $t=\{1,\ldots,T\}$. Knowing the probability of each choice as presented by equation (3), the logit probability of the observed sequence of T choices is given by:

$$P_n\left(j_{n1},\ldots,j_{nT_n} \vee \beta_n\right)=\prod_{t=1}^{T} P_n\left(j_{nt} \vee \beta_n\right)(4)$$

where j_{nt} represents the alternative chosen by individual *n* in choice situation *t*. The unconditional logit probability that individual *n* makes the observed sequence of choice *j* is integrated over the distribution of β:

$$L_n(\theta)=\int P_n\left(j_{n1},\ldots,j_{nT_n} \vee \beta_n\right) f\left(\beta_n|\theta\right) d\beta(5)$$

In a mixed logit model, the distribution parameters θ of vector β can be specified with a continuous distribution, such as normal, lognormal or triangular. The log-likelihood is maximized using maximum simulated likelihood methods (Train, 2003). In our paper, we used the statistical software STATA MP 16 and the mixlogit package (Hole, 2007). Note that the conditional logit can be written from equation (3) by replacing β_n by β, where preferences are considered as homogenous and β is the same for all individuals. We use the clogit command of STAT, which manage fixed effects and thus well adapted to our dataset where individuals plays a sequence of T choices.

3.3. (Preliminary) descriptive statistics

The survey is still in progress, so the first results presented here are based on 400 fully completed questionnaires. We only considered fully completed questionnaires, so 72 questionnaires were removed from the initial database (472 questionnaires). This partial analysis gave us an idea about respondents' preferences in terms of type of recreational site (countryside or forest), favourite characteristics, etc.

We asked respondents if they visited, one or several times, for a recreational purpose, either the forest or the countryside during the last 12 months. We also asked, to people who did not, if they did during the last 5 years.. During that period, 124 out of 400 respondents (i.e., 31% of the sample) did not visit neither the countryside nor the forest. Table 4 shows some statistics based on recreational visits during for the 276 people who did at least one visit during the last 5 years. Among people who visited either the forest or the countryside during the last 5 years (276 individuals), more than 94% actually did it at least once last year. Almost the half of them (48.18%) visited the forest and the countryside several times. 39.13% only visited the forest and 12.68% only visited the countryside. The average number of visits either in a forest or in the countryside over the last year is 20.77/person/year.

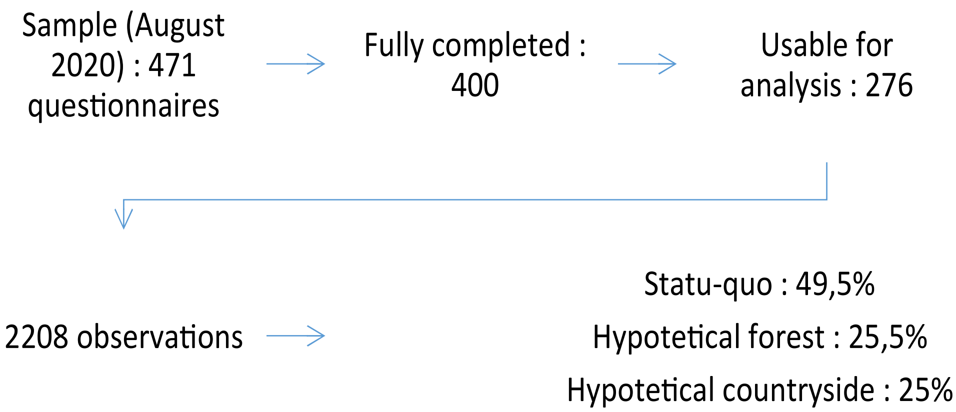
Table 4. Descriptive statistics based on recreational visits for the 276 respondents

Visits over the last 12 months	**Respondents (276)**
No visit (last 12 months)	16 (5.8%)
At least one visit (last 12 months)	260 (94,2%)
	Share of the 276 respondents
Several visits in the forest and the countryside	133 (48.18%)
Several visits (exclusively in the forest)	89 (32.25%)
one visit in the forest	19 (6.88%)
Several visits (exclusively in the countryside)	30 (10.87%)
One visit in the countryside	5 (1.81%)
Mean number of visit (regardless of the type of site)	≈ 20.77 visit/person/year

Note. Total number of observations = 276.

Figure 2 summarises choices made by the respondents in the CE. The respondents who visited either the forest or the countryside during the last 5 years (276 people) had to consider eight choice sets and to choose between three alternatives (status quo, forest, or countryside) within each choice set. It means that 276 respondents made eight choices, so we have 2208 observations. Out of these 2208 choices, the (hypothetical) alternative “countryside” had been chosen 552 times. It represents about 25% of the choices versus 25.5% for the hypothetical forest. That means that the status quo is clearly the favourite option (about 49.5% of the choices).

Figure 2 : Sample, number of observations and choices



For each choice set, the status quo, which refers to the last forest or countryside visited during the last 12 months (or during the last 5 years if no visits had been made during the last year) is systematically the most chosen alternative whatever the hypothetical options proposed. Furthermore, 32 out of the 276 respondents (11.59%) did not consider all the attributes when choosing.

Lastly, if we focus on the last attribute, the distance made to join the recreational site and to come back is between 0.5 and 500 kilometres, with a mean distance of approximatively 17.38 kilometres. The data on the distance will be crucial to give a monetary value to the environmental and social services (using a travel cost methodology). Finally, in Table 5 the main demographic and socio-economic characteristics are presented.

Table 5. Demographic and socio-economic statistics

Variable	Mean or proportion
Age of respondents	49
Education level	
General Certificate of Secondary Education	28.99%
High school diploma	24.28%
High school diploma + 2 years	21.74%
High school diploma + 3 years	10.87%
High school diploma + 4 years and 5 years	3.99%
Doctorate	0.72%
Others	6.52%
Non-respondent	2.90%

4. (Preliminary) estimation results

Based on the first responses to the CE we estimated the RUM. The estimated parameters indicate how the attributes (characteristics) of a recreational site influence the utility of visiting the site. In other words, if the estimated parameter is positive it is an attractive characteristic for an average visitor and if it is negative, the attribute has a negative impact on the utility of the visitor. The following interpretation should be considered with precaution due to the low number of choices and the preliminary nature of this analysis.

First, from Table 8 presenting estimation results of the conditional logit, we see that visitors, in general, have a higher utility of visiting the site they visited last time (status quo constant). We find that sites with water streams, without application of pesticides, forest with mixed species are preferred to forest with coniferous or decidious trees and statistically significant. Agricultural plots with different land uses (grasslands, corn, and livestock) have a positive value as well. On the contrary, parameters of pesticides and the distance are both negative (as expected). The negative sign on the facilities is more surprising.

Table 6: conditional logit model

VARIABLES	(1) choice
distcat	-0.0425***
	(0.00223)
ASCsq	0.834***
	(0.121)
SQForest	-0.196
	(0.138)
Facilities	-0.00652
	(0.0637)
Trails	0.132**
	(0.0631)
Waterruns	0.142**
	(0.0637)
Pesticides	-0.548***
	(0.0751)
PesticidesDK	-0.283***
	(0.103)
mixtedparcel	0.328***
	(0.114)
Lotsofhedgerows	0.163
	(0.122)
Mxtforest	0.271***

	(0.0804)
Observations	2208
Log likelihood	-1780.5272
Prob > chi2	0.0000
Chi-squared	1290.42

Note. *** p<0.01, ** p<0.05, * p<0.1. This table shows only the parameters of attributes – the estimated model included also dummy variables to account for individuals not knowing the characteristics of the last visited site.

<u>The "*basic*" mixed logit model</u>

By "*basic*", we mean that we did the estimation without including a variable that captures the fact that respondents always choose the status-quo option while they care about the area they live in. Estimation results are reported in Table 10. In this model, for the attributes which are common in forest and countryside, we included interaction term between attributes levels and the dummy variable for visiting a forest to allow for site specific preferences for these attributes. For example, Water streams are preferred the forest. The equipment is preferred in the forest than in the Countryside unlike trails. The mixed agricultural plots are valued but a high level of hedgerows is not. Somehow, we can notice the high level of heterogeneity associated with that attribute. Note that we in mixed logit model (table 9 and 10) included an interaction term between the attribute, the status quo, and a variable that indicates if the respondent did not know the nature of attribute at the site visited the last time (variables ending with DK for "don't know").

Table 7: "Basic" mixed logit model

VARIABLES	(1) Mean	(2) SD
distcat	-0.0612***	
	(0.00368)	
ASCsq	1.077***	0.991***
	(0.259)	(0.162)
SQForest	-0.496	0.287
	(0.324)	(0.211)
Facilities	-0.0178	0.00805
	(0.0954)	(0.171)
Frstfacilities	0.231	-0.286
	(0.382)	(0.378)

Trails	0.190**	0.305*
	(0.0920)	(0.165)
Frsttrails	-0.176	0.238
	(0.375)	(0.547)
Waterruns	0.0643	0.611***
	(0.101)	(0.177)
Pesticides	-0.703***	0.775***
	(0.111)	(0.163)
PesticidesDK	-0.104	2.420***
	(0.278)	(0.292)
mixtedparcel	0.498***	1.221***
	(0.179)	(0.233)
Lotsofhedgerows	-0.0963	0.227
	(0.183)	(0.344)
Mxtforest	0.405***	-0.459**
	(0.125)	(0.212)
Observations	2208	2208

Log likelihood -1604.483

Prob > chi2 0.0000

Chi squared 351.62

The mixed logit model with attachment

We then estimated the same mixed logit model, testing the hypothesis that a high level of place attachment may encourage respondents to choose the status-quo option. Estimation results are reported in Table 10. The variable "*AttachmentASCsq*" is positive and significant, despite a quite strong heterogeneity. Looking at the coefficients of the parameters, we observe a relative stability between the estimation where we considered place attachment and the first estimation. It means that the model is quite stable.

Table 8: Mixed logit model with attachment

VARIABLES	(1) Mean	(2) SD
distcat	-0.0597***	
	(0.00356)	
ASCsq	-0.0842	-0.376
	(0.467)	(0.240)
AttchmtASCsq	1.048***	1.739***
	(0.393)	(0.186)
SQForest	-0.163	0.123
	(0.357)	(0.223)

Facilities	-0.0226	-0.00260
	(0.0963)	(0.173)
Frstfacilities	-0.421	0.139
	(0.401)	(0.434)
Trails	0.177*	-0.170
	(0.0905)	(0.229)
Frsttrails	0.0673	-0.189
	(0.391)	(0.334)
Waterruns	0.0674	0.573***
	(0.103)	(0.163)
Pesticides	-0.739***	-0.775***
	(0.113)	(0.145)
PesticidesDK	-0.0285	1.145***
	(0.270)	(0.280)
mixtedparcel	0.574***	1.199***
	(0.182)	(0.244)
Lotsofhedgerows	-0.160	-0.352
	(0.187)	(0.315)
Mxtforest	0.459***	-0.565***
	(0.131)	(0.189)
Observations	2208	2208

Choices (respondents)	2208 (276)
Log likelihood	-1596.213
Prob > chi2	0.0000
Chi squared	362.85

5. Conclusion

This paper aimed at providing the first results of a CE used to evaluate the environmental and social preferences of the local population of Vittel (France) and surroundings. We detailed the construction process of the CE based on the recreational activities practiced by the residents (sport, landscape observation etc.) when they go to the forest or in the countryside. Focusing on these activities, is a way to capture the direct use values potentially modified by the environmental friendly practices implemented on the impluvium of Vittel (non-use of pesticides, hedgerows plantation etc.). The preliminary results show that, among the hypothetical scenarios, the “forest scenario” is the most chosen, even if the hypothetical scenarios are almost equally chosen. Concerning the number of visits during the last 12 months, almost the half of the respondents did several visits in the forest and the countryside. The mean number of visits, regardless the type of recreational area, is about 20 visits/person/year. The proximity of the site seem to be particularly appreciated by the respondents whose last visit was in the forest. Interestingly, the distance to the site is also important for people whose last visit was in the countryside, like the beauty of the landscape. The estimation of the mixed logit model shows give an insight of the favourite attributes of the respondents, and allows us to take the heterogeneity of the preferences for an attribute into account.

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