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The Valuation of the IJmeer Nature Reserve using Conjoint Analysis

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Abstract. This paper describes an application of conjoint analysis. The subject of the valuation study is the IJmeer nature reserve, which will be partly destroyed when the new residential area IJburg is built. This paper addresses the following question: 'What is the extent of the loss of green and recreational values?'. In this study, the conjoint analysis consists of three different analyses based on a three-piece valuation question. The respondents are asked to subsequently rank, mark and indicate the acceptability of a set of six cards.

JEL classification: C35, D60, Q20, Q26, Q30

1. Introduction

Conjoint analysis (CA) has been widely used in consumer market research and in transportation studies since the 1970s. For instance, when introducing a new product the producer is interested in the relative importance of attributes of that product, like colour, weight, technical specifications, package, price and so on, and not just in the valuation of the product as a whole. Green and Srinivasan (1978: 104) define CA as:

> any decompositional method that estimates the structure of a consumer's preferences [...], given his or her overall evaluation of a set of alternatives that are prespecified in terms of levels of different attributes.

The typical CA question presents each respondent with a number of commodity descriptions or situations on a set of cards, that differ according to the attributes described, and survey respondents are then asked to rank and rate the desirability of each card. The inclusion of price as one of the attributes allows for the derivation of implicit prices for each of the other attributes. At least one important behavioural argument exists in support of the decomposition of preferences by using CA (Louviere 1996). This argument lies in the theory of individual behaviour, especially Lancaster's (1966) work, which assumes that a consumer's utility for a good can be decomposed into utilities for separate attributes or benefits provided by that good.

More recently, CA has also been applied in environmental valuation studies (i.e., Boxall et al. 1996; Mathews et al. 1995). Indeed, CA is very suitable for the valuation of environmental goods, since these goods are pre-eminently goods with a multidimensional character. In this paper CA is used in a valuation study about the IJmeer nature reserve, which will be partly destroyed when the new residential area IJburg is built. This paper addresses the following question: 'What is the extent of the loss of green and recreational values?'.

The paper is organized as follows. The methodology of CA is described in more detail in section 2. Section 3 describes the valuation study and the valuation questions. Section 4 discusses the results of the CA questions. Finally, section 5 gives the conclusions.

2. Conjoint Analysis (CA)

CA does not directly ask for a willingness to pay (WTP), but requires that respondents rank possible outcomes from most preferred to least preferred, while several attributes of the good are varied. This results in a relative value, in the sense that the expressed value depends upon the other alternatives that have to be ranked. This indirect way of questioning in the CA approach has some potential advantages over a direct way of questioning such as used in the well-known contingent valuation approach.[1] For example, a ranking procedure might be easier for people to handle conceptually when faced with the situation of putting a money value on a non-market good, relative to the procedure involved in contingent valuation (Freeman 1993).[2]

CA as used in the research described in this paper combines ranking and rating tasks and does not include paired comparisons. Respondents are asked to order a set of cards with several qualitative and quantitative characteristics of the environmental good under valuation. Subsequently, respondents are asked to mark the cards and to indicate which of the cards are acceptable to them, i.e., would they really pay for the situation portrayed in the cards. Provided that one of the cards' characteristics is a monetary value, it is theoretically possible to deduce prices from the answers relating to the cards as stated by the respondents. The rest of this section describes the theoretical model underlying the analysis of the responses to these valuation questions.

CA departs from the random utility maximization model, which admits for the fact that, from a researcher's point of view, consumers do not always seem to choose what they prefer, and that some choices vary over choice occasions (McFadden 1974). Usually, a rank-ordered logit model is applied to specify the utility function U (Beggs et al. 1981; Hausman and Ruud 1987). The utility function of individual i for card j consists of a deterministic part V_{ij} and a stochastic part ε_{ij}.[3] The various attributes N (nature), R (recreation) and P (price) are included in V_{ij}.

$$U_{ij} = V_{ij} + \varepsilon_{ij} = \beta_{i1} N_j + \beta_{i2} R_j + \beta_{i3} P_j + \varepsilon_{ij}$$

Respondent i might, for instance, prefer card 1 to card 2, and card 2 to card 3, and so on, until card 6. This particular rank order can be presented as follows (where we dropped the individual index i for the sake of simplicity):

$$U_1 > U_2 > U_3 > U_4 > U_5 > U_6$$

In more general terms, if the index of the alternative ranked jth is denoted by r_j, the probability of observing the rank order for a particular individual i, $R_i = (r_1, r_2, r_3, r_4, r_5, r_6)$, can be represented as follows:

$$\text{Prob}[R_i] = \prod_{j=1}^{6} \left[\frac{\exp(\beta_1 N_j + \beta_2 R_j + \beta_3 P_j)}{\sum_{k=j}^{6} \exp(\beta_1 N_j + \beta_2 R_j + \beta_3 P_j)} \right]$$

The parameters $\beta_a (a = 1, 2, 3)$ can be estimated by using the maximum likelihood procedure. The logit model of choice implies certain restrictions on individuals' choices and preferences. The most notable restriction is that choices must have the property of the Independence of Irrelevant Alternatives (IIA). One implication of this property is that the addition or deletion of vignettes from the choice set does not affect the ratio of the probabilities associated with any other combination of vignettes (McFadden 1974: 113). One approach to dealing with IIA is to redefine the choice set so that two or more very close substitutes are modelled as one alternative. Another approach would be to guarantee the independence of the alternatives (vignettes) as much as possible, by constructing an approximately orthogonal set of vignettes. In short, this implies that the vignettes in the choice set will have to differ as much as possible (no correlation or collinearity between the attributes).

Anyway, in the case of stated preferences the assumption of IIA is not too restrictive compared to revealed preferences. The reason lies in the fictitious nature of the alternatives which are completely described by their stated attributes.

> Under the usual assumption that the utility function is correctly specified and that, in particular, all relevant individual-specific explanatory variables are taken into account, this implies that the utilities generated by the alternatives do not correlate for a given individual. (Van Ophem et al. 1999: 118)

3. The IJburg Valuation Study

IJburg is a new residential quarter in Amsterdam (The Netherlands), to be built on artificial islands in the IJmeer (a lake to the east of Amsterdam). The new quarter will contain 18,000 dwellings, with completion dates starting in 2002. In short, 'the good' that is under valuation encompasses the values of the recreation and green areas of that part of the IJmeer that is lost if IJburg is built (like certain kinds of water birds, plants and shellfish, as well as diminished opportunities for e.g. sailing and rowing).

To compensate for these lost values, the authorities plan to construct alternative scenic, wildlife and recreation areas. The new green areas will be developed elsewhere in the IJmeer, and will serve as an alternative location for plants and animals. These new recreation areas will contain opportunities for water sports as well as for other means of relaxation. For instance, a yachting marina and beaches will be built on and around IJburg, and areas for walking and cycling, as well as sports fields, will be constructed in the areas along the IJmeer. The respondents are told that an 'IJmeer Fund' has been established, which will pay for the costs of this development project, and that every household is asked to pay a voluntary, one-time-only contribution to this Fund.[4] Moreover, the questionnaire's text makes clear that these contributions will be used only for the construction of the new green and recreation area, and that if more money is contributed than is needed, the surplus will be paid back to the contributors, proportionally according to their contributions.

In February of 1997, a sample of 602 people of the Amsterdam population was drawn from a database provided by the Dutch Post Office (PTT). Since not everybody was in favour of the plan, the question whether or not IJburg should be built was the subject of a referendum in March of 1997. The referendum entailed a large amount of information on IJburg. For our survey we were able to take a free ride on this information flow and campaign fever. Because of the topicality, the extensive information available to the public, and the reality of the questions surrounding the project, IJburg was a pre-eminently suitable subject for a valuation study. Moreover, this background formed an excellent soil for conducting a mail survey instead of doing any of the more expensive alternative surveys.

3.1. THE CONJOINT ANALYSIS QUESTION

The willingness to contribute to the IJmeer Fund is inferred from the rank order, the report marks, and/or the acceptability of the cards. Figure 1 gives an example of a card.

Situation X
Nature: the quantity of plants and animals in the IJmeer increases by 25%
Recreation: the possibilities for water sports and other forms of recreation increase by 10%
one-time contribution: €4.54

Figure 1. An example of a card.

Every CA questionnaire contains 6 cards (or situations), with 3 attributes each (cf. Table I). The first attribute is *nature*, which can take on 4 different values; the second attribute is *recreation* with 5 different values; and the third attribute is a *one-time contribution* to the IJmeer Fund, which can take on 5 different values.[5]

Table I. Three attributes and their possible values.

Nature	Recreation	One-time contribution
25% increase	25% increase	€1.13
Remain the same	10% increase	€2.27
25% decrease	Remain the same	€4.54
50% decrease	10% decrease	€6.81
	25% decrease	€11.34

We constructed 30 sets of 6 cards. The levels of the attributes were chosen in such a way that the sets of cards are approximately orthogonal, that is, no correlation or collinearity exists between the attributes. The exact wordings of the valuation questions are given in the appendix.

The first valuation question asks respondents to rank the six cards presented to them from most preferred to least preferred. Apart from the order of the cards, in the next question the respondents are asked to give each card a report mark (between 0 and 10). Finally, the respondents are asked which of the six cards are acceptable to them. The purpose of asking a three-piece valuation question is that respondents are forced to reconsider their rank order when asked to mark each card, and to reconsider their ranks and marks again when asked the acceptability question. This gives us the opportunity to compare the three answers.[6] However, since we used one sample and not a split-sample design, we are only able to make a comparison for a the whole sample. Recently, Boyle et al. (2001) compared three response formats – rating, ranking or a choice question – using a split-sample design. They found that the three response formats result in different valuation results (i.e., no convergent validity). Therefore, they advise not to use ratings and later recode these ratings into ranks or choose-one. However, their research does not point to a clearly preferable conjoint response format.

3.2. THE RESPONSE

Of the sample size of 602 Amsterdam residents 219 respondents returned the questionnaires. Overall, the response rate (36.4%) is good for a Dutch mail survey if we take into account that, in the Netherlands, the non-response in surveys is known to be relatively high. On average 55% refuses to co-operate, while this percentage rises to 80 when politically sensitive subjects are involved, and IJburg is such a politically sensitive subject, as the fierce campaign has indicated.[7] Many valuation researchers have recorded response rates as low as 25%, and 40 to 60% seems average for mail surveys in contingent valuation studies in the United States (Loomis 1987).

The sample is representative of the Amsterdam population. To examine the representativeness of the sample, certain statistics of the respondents – sex, highest level of education, income, mean percentage of registered people seeking a house, and average number of cars per household – were compared with the values of these statistics in the Amsterdam population. It was found that persons with the highest education are overrepresented in the sample and those with a lower level of education are underrepresented. Consequently, the mean income is also significantly higher in the sample. After reweighting the sample with regard to the education characteristics, the overrepresentation for income is also corrected for.

4. Results of the Conjoint Analysis Question

The CA respondents are asked to subsequently rank, mark and indicate the acceptability of a set of six cards. In the analysis below, the information based on all three valuation questions will be used. The answers of the respondents provide an insight into the importance of the three attributes and allow us to deduce price compensations for changes in the level of the two other attributes, nature and recreation. Subsection 4.1. discusses the results from the analysis based on the rank orderings given by the respondents. The analysis based on report marks is given in subsection 4.2., and subsection 4.3. deals with the results based on the acceptability question. In subsection 4.4. these three analyses are compared. Finally, in subsection 4.5. the report marks are related to several personal characteristics.

4.1. THE ANALYSIS BASED ON RANK ORDERINGS

Departing from the theoretical model as described in section 2.1., we analysed the rank-ordered data. Table II below gives the results of the rank orderings in the IJburg experiment (the parameters $\beta_a (a = 1, 2, 3)$). All three attributes are significant factors. Nature and recreation have a positive sign, whereas price has a negative sign, as was to be expected. Nature has the strongest effect, recreation the weakest.

Table II. Rank-ordered logit results based on rankings*.

Variable	Parameter estimate	Standard deviation	*t*-value
Nature	0.0777	0.00291	26.70
Recreation	0.0192	0.00365	5.26
Price	−0.0483	0.00650	−7.43

*Based on a sample size of 219 minus three item non-responses.

The ultimate aim of the conjoint analysis is to come up with the prices of the attributes. For instance, how much could the price be increased if the attribute

nature is increased by 10% and the attribute recreation by 5%? In short, the relationship between price on the one hand and nature and recreation on the other hand needs to be established. Departing from the above-mentioned results based on the rank orderings given by the respondents, the price compensation is determined as follows:

$$\begin{aligned} P_j^{new} - P_j^{old} &= \beta_1(N_j^{new} - N_j^{\text{old}}) + \beta_2(R_j^{new} - R_j^{\text{old}}) \Leftrightarrow \\ \Delta P_j &= 1.6087(\Delta N_j) + 0.3975(\Delta R_j) \end{aligned}$$

If N is increased by 10% and R is increased by 5%, the price would be €8.20. Or, in terms of the survey, the contribution to the IJmeer Fund would be €8.20.

4.2. THE ANALYSIS BASED ON REPORT MARKS

It is also possible to model the probability that a card receives a particular report mark. The model used to predict these probabilities is an ordered logit model.

Table III. Ordered logit results based on report marks.*

Variable**	Parameter estimate	Standard deviation	t-value
α_1	−3.3028	0.1381	−23.92
α_2	−2.7298	0.1256	−21.73
α_3	−2.1307	0.1151	−18.51
α_4	−1.5073	0.1067	−14.13
α_5	−0.8796	0.1009	−8.72
α_6	−0.0937	0.0977	−0.96#
α_7	0.5177	0.0986	5.25
α_8	1.2248	0.1039	11.79
α_9	1.9242	0.1150	16.73
α_{10}	2.7320	0.1391	19.64
Nature	0.0544	0.00247	22.02
Recreation	0.0146	0.00355	4.11
Price	−0.0308	0.00627	−4.91

*Based on a sample size of 219 minus 15 item non-responses and minus 10 inconsistent answers.

**The variables α_{z+1} are the intercepts belonging to the results for report marks z ($z = 0, \ldots, 9$). For instance, the probability that a particular card is given a report mark z, is given by:

$$\text{logit}(\text{prob}\{\text{report mark} \leq z\}) = \alpha_{z+1} + \beta_1 * N + \beta_2 * R + \beta_3 * P$$

#Not significantly different from zero at a 5% level.

As in the rank ordered analysis, here also all three attributes are significant factors for the prediction of the report mark of the card. And again, all attributes

have the expected sign. The probability that a card receives a high report mark is positively related to the level of the nature and recreation attribute, and negatively related to the price attribute. The effect of the attribute nature is the strongest, whereas the effect of the attribute recreation is the weakest, just as before.

It is interesting to investigate the trade-offs between prices on the one hand and nature and recreation on the other. With the estimates from Table III the following price equation can be deduced in the same way as in subsection 4.1.:

$$\Delta P_j = 1.7662(\Delta N_j) + 0.4740(\Delta R_j)$$

If N is increased by 10% and R is increased by 5%, the price, or the contribution to the IJmeer Fund, would be €10.16.

4.3. THE ANALYSIS BASED ON ACCEPTABILITY

Finally, it is possible to determine the logit probability that a particular card is acceptable. Table IV below gives the estimation results of this probability.

Table IV. Logit probability that a card is acceptable.*

Variable	Parameter estimate	Standard deviation	*t*-value
α	0.7172	0.1231	5.83
Nature	0.0512	0.00385	13.13
Recreation	0.0101	0.00459	2.20
Price	−0.0349	0.00896	−3.88

*Based on a sample size of 219 minus three item non-responses.

Again, all three attributes are significant factors for explaining the acceptability of a card. Nature and recreation have the expected positive signs, and price has the expected negative sign. The effect of the attribute nature is the strongest and the effect of the attribute recreation is the weakest, whereas the strength of the effect of the attribute price lies in between.

The price change is now calculated based on the acceptability of a card. The price equation is derived in the same way as above, using the estimates from Table IV.

$$\Delta P_j = 1.4670(\Delta N_j) + 0.2894(\Delta R_j)$$

Increasing N by 10% and R by 5% now entails a price of €7.31.

4.4. COMPARISON OF THE THREE ANALYSES

In the previous three subsections, the results from three different card-exercises were discussed. In this subsection, these three results will be compared.

Result based on the **rank order** of the vignettes:

$$\Delta P_j = 1.6087(\Delta N_j) \; + \; 0.3975(\Delta R_j)$$
$$\{1.3840 < \beta_1 < 1.8334\} \qquad \{0.3049 < \beta_2 < 0.4906\}$$

Result based on the **report marks** of the vignettes:

$$\Delta P_j = 1.7662(\Delta N_j) \; + \; 0.4740(\Delta R_j)$$
$$\{1.3978 < \beta_1 < 2.1346\} \qquad \{0.3237 < \beta_2 < 0.6243\}$$

Result based on **acceptability** of the vignettes:

$$\Delta P_j = 1.4670(\Delta N_j) \; + \; 0.2894(\Delta R_j)$$
$$\{1.0745 < \beta_1 < 1.8595\} \qquad \{0.1383 < \beta_2 < 0.4405\}$$

Since the same respondents answered the three valuation questions, it is to be expected that the results will be similar. The $1{*}\sigma$-confidence intervals for each parameter β are presented as well (between $\{.\}$). The standard deviations are assessed by the usual delta-method (e.g., Greene 1993: 297–299).

When comparing the three equations, it is obvious that they are not the same, but that they are similar and that the confidence intervals largely overlap. The price equation based on the acceptability analysis has the lowest coefficients for changes in the attributes nature and recreation. On the other hand, the results based on the report marks analysis give the strongest effects on P of changes in N and R. The results based on the rank orderings of cards lie somewhere in the middle.

4.5. RELATING REPORT MARKS TO PERSONAL CHARACTERISTICS

When applying contingent valuation, the researcher usually explains the WTP in terms of several variables, like income, age and environmental preference. When using CA, it is also possible to take into consideration these personal characteristics of the respondents. For instance, we could relate the report marks as stated by respondents to personal characteristics. The choice for report marks instead of rank orderings or acceptability is motivated by the fact that the informational efficiency of ratings is higher than that of rankings, since ratings express preference intensities as well as a preference order.

Report marks can be viewed as an indicator of, say, satisfaction with the offered card, given the personal circumstances of the respondent. Since report marks are measured on a limited, discrete scale from 0 to 10, it is not possible to run an OLS regression on this variable without objections. Therefore, the report marks are transformed to a $[-\infty, +\infty]$ scale according to a method first described in Plug and Van Praag (1995). This method replaces the report mark RM from 0 to 10 by numbers RM^*, defined as:

$$RM^*(RM) = N^{-1}\left(\sum_{j=1}^{RM-1} p_j + \frac{1}{2}p_{RM}; 0, 1\right)$$

where N stands for the standard normal distribution, and p_{RM} is the sample fraction of individuals who gave report mark RM (= 0, ..., 10). This transformation is called the empirical-normal transformation. The results of the OLS regression with these transformed report marks are presented in Table V.

Table V. Relating report marks to personal characteristics.

Variable	Coefficient	Standard deviation	*t*-value
Intercept	−1.929	0.399	−4.832
Nature	0.024	0.001	24.309
Recreation	0.010	0.002	6.229
Price	−0.020	0.003	−7.160
ln[net monthly household income]	−0.233	0.043	−5.469
Age	0.015	0.009	1.760*
[Age]^2	−0.0001	0.00008	−1.733*
Level of education	−0.080	0.053	−1.513*
Sex	0.010	0.049	0.215*
Family size	−0.075	0.021	−3.486
Presence of children in the household	0.172	0.086	1.998
Environment-friendliness	0.327	0.163	2.003
Intention to move out of Amsterdam	−0.176	0.056	−3.149
No desire to live in IJburg	−0.268	0.056	−4.803
N = 179** R^2 = 0.3917			

*Not statistically significant at a 5% level.
**Based on a sample size of 219 minus 15 item non-responses and minus 10 inconsistent answers.

The three attributes in the cards are significant and have the expected signs: nature and recreation have a positive impact on the report marks, whereas price has a negative impact.

Furthermore, the results show that respondents with higher net monthly household incomes state lower report marks. Older people state higher report marks, although this effect is not significant. The variable 'level of education' is a dummy variable with a value of 1 if the respondent has a higher level of education (higher general secondary and pre-university education, higher vocational education, or university), and a value of 0 otherwise. The results indicate that the level of education is negatively related to the report marks: the higher someone's education,

the lower the report mark for a certain card. Apparently, higher educated people are more critical towards and less satisfied with the offered cards. However, this relation is not significant. The variable 'sex' is a dummy variable with a value of 1 if the respondent is female and a value of 0 if the respondent is male. Sex does not have a significant influence on the stated report marks. This variable is nevertheless included to prevent an omitted-variable effect. The larger the household (variable 'family size'), the lower the report mark stated, whereas the report mark is higher if children are present (variable 'presence of children in the household'). Respondents who view themselves or their households as environment-friendly, state higher report marks. People who have plans to move out of Amsterdam give lower report marks. Finally, the variable 'no desire to live in IJburg' has a positive effect on the stated report mark: respondents who do not want to live in IJburg, give a lower report mark to a certain card.

5. Conclusions

The CA results cannot be presented in a simple one-dimensional figure, because CA does not just result in a mean WTP but in price equations with the attributes from the cards as inputs. In short, CA results in a multidimensional equation measuring various potential changes and providing an insight into the importance of the attributes.

$$\Delta P_j = \beta_1(\Delta N_j) + \beta_2(\Delta R_j)$$

What is the practical relevance of these price equations? Since the exact effect of the construction of IJburg on the quantity of plants and animals in the IJmeer (N) and on the possibilities for water sports and other forms of recreation (R) is unknown, it is difficult to compute the corresponding costs or benefits from the conjoint analysis. However, it is plausible to expect only small changes in N and R. The reasons for this conjecture are that IJburg is relatively small compared to the IJmeer and that much effort (and money) is put into the restoration of the green and recreation areas. According to the project planners, a realistic scenario is a scenario in which the attribute recreation increases by 10% and the attribute nature remains the same (that is: the consequences of the construction of IJburg for the natural environment are fully compensated). Respondents are willing to contribute between €1.31 and €2.15 (mean value €1.73) if this scenario is followed. Summed for the total Amsterdam population this would amount to €0.675 million (that is, multiplying €1.73 by the number of households 390,000).

The eventual price or compensation depends upon the changes in the levels of the attributes (different ΔN_j and ΔR_j). We used a three-piece valuation question – ranking, rating, acceptability. We found that the eventual price or compensation also depends upon the analysis chosen: β_1 and β_2 are unequal but similar for the analyses based on rank orderings, report marks and acceptability of cards.

However, our comparison of the three conjoint question formats is compromised by the relatively small sample size (n = 219) and by the fact that we did not use a split-sample design (e.g., all respondents answered each of the three conjoint questions). Because of this latter fact we were only able to make a comparison between the three question formats for the whole sample. Research based on similar question formats with a split-sample design is conducted by Boyle et al. (2001). Their study shows that no convergent validity exists between the three question formats. However, their research does not point to a clearly preferable conjoint response format. Further research could give us a better insight into what conjoint response format we should use in future CA studies.

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Notes

1. Some of the researchers who use CA are very optimistic about the possibilities of CA as an alternative to contingent valuation (i.e., Adamowicz et al. 1998; Mathews et al. 1995). On the other hand, there are other CA researchers who are sceptical about the possibilities of replacing contingent valuation by CA (i.e., Roe et al. 1996).
2. The conjecture is that individuals are more likely to be capable of ordering hypothetical combinations of environmental amenities and fees than to be able to directly express their WTP for any specific change in these amenities. An example in support of this conjecture is provided by Green and Srinivasan (1978), who found that ranked data are likely to be more reliable. Furthermore, Lareau and Rae (1989) and Hausman and Ruud (1987) showed that respondents can provide consistent and stable rankings.
3. The stochastic terms ε_{ij} are assumed to be independently and identically distributed extreme value random variates (Weibull distribution).
4. Although the IJmeer Fund is merely a hypothetical idea, plans to create alternative areas to compensate for the loss of green and recreational values do actually exist.
5. In the survey we used Dutch guilders instead of euros.
6. Moreover, this gives us the opportunity to eliminate inconsistencies between the answers. Inconsistencies exist, for instance, if report marks do not imply the same rank ordering as given in the ranking question. Out of the sample of 219 (4.6%), only ten respondents gave inconsistent answers. However, consistency may be (partly) due to anchoring on responses to previous questions.
7. *Volkskrant* (1997), Meten is niet automatisch weten (Measuring does not automatically imply knowing the facts) (October 22) (*in Dutch*).

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Appendix Valuation Questions

Question 7

Below you find 6 different situations concerning the new green and recreation areas in and around the IJmeer, and concerning the individual contributions to the IJmeer Fund. If you were asked to arrange these situations hierarchically, from best to worst, which situation would you put first (that is: the best situation), which one would you put second (that is: the second best situation), et cetera, up till and including the situation that you would put in the sixth place (the worst situation).

Situation 1	Situation 2	Situation 3
Nature: the quantity of plants and animals in the IJmeer decreases by 25% **Recreation**: the possibilities for water sports and other forms of recreation remain the same **One-time contribution**: €6.81	**Nature**: the quantity of plants and animals in the IJmeer remains the same **Recreation**: the possibilities for water sports and other forms of recreation remain the same **One-time contribution**: €1.13	**Nature**: the quantity of plants and animals in the IJmeer decreases by 25% **Recreation**: the possibilities for water sports and other forms of recreation increase by 25% **One-time contribution**: €11.34
Situation 4	Situation 5	Situation 6
Nature: the quantity of plants and animals in the IJmeer increases by 25% **Recreation**: the possibilities for water sports and other forms of recreation increase by 10% **One-time contribution**: €2.27	**Nature**: the quantity of plants and animals in the IJmeer decreases by 50% **Recreation**: the possibilities for water sports and other forms of recreation increase by 10% **One-time contribution**: €4.54	**Nature**: the quantity of plants and animals in the IJmeer remains the same **Recreation**: the possibilities for water sports and other forms of recreation decrease by 25% **One-time contribution**: €1.13

Please indicate your ordering of the six situations below. Consider the various situations well and keep in mind your income and other expenses. (Please state the number of the situation of your choice on the dotted lines.)

– my first choice would be situation	No. . . .	– my fourth choice would be situation	No. . . .
– my second choice would be situation	No. . . .	– my fifth choice would be situation	No. . . .
– my third choice would be situation	No. . . .	– my sixth choice would be situation	No. . . .

Question 8

Could you please give report marks (between 0 and 10) for each of the six situations, where 10 represents what you feel to be the best possible situation and 0 represents what you feel to be the worst possible situation. Your choices can get marks ranging from 0 to 10, and each subsequent choice gets a lower mark than did the previous one (the second choice gets a lower mark than does the first choice, the third choice gets a lower mark than does the second choice, and so on). Please give marks for each choice.

– first choice:	mark . . .	– third choice:	mark . . .	– fifth choice:	mark . . .
– second choice:	mark . . .	– fourth choice:	mark . . .	– sixth choice:	mark . . .

Question 9

You have now ranked and graded the six different situations, but could you please also indicate the situation that is the most acceptable to you (meaning the situation that you would really be willing to pay for). Please cross one answer only.

– only the first choice	– the first, second, third, fourth and fifth choice
– the first and the second choice	– all six choices
– the first, second and third choice	– none of these choices
– the first, second, third and fourth choice	