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ASSESSMENT OF OPTION VALUE AND NON-USE VALUES – THE CASE-STUDIES OF VENICE (ITALY) AND NORMERVEN (THE NETHERLANDS)

Final Report

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WILLINGNESS TO PAY FOR THE DEFENCE OF VENICE (ITALY) AS WORLD HERITAGE SITE

Final Report

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I.0 INTRODUCTION

Venice and its Lagoon was designated a World Heritage Site by UNESCO in 1987 under the UNESCO Natural and Cultural Heritage protection program. This site is considered unique in the world for its architectural, historical and natural characteristics; therefore, inspired by the 'new property rights approach' proposed by Mitchell and Carson (1989, pp.18-41), we believe that the world community has a sort of "common property right" over Venice and its lagoon as world heritage .

This stretch of coastline in the Northern Adriatic Sea, so famous in the world, demands rational management and protection because it is affected by floods and high waters phenomena which sometimes have the nature of extreme events. Coastal protection is a fundamental task of public organisations such as local, regional and national government. In their role of increasing the social welfare and custodianship of the common resources (sustainable development), they have planned to defend the coast from flooding through the implementation of a project which also consists of low crested structures (LCS). The amount of public funds involved is in general considerable, and because public funds are scarce the implementation of a coastal defence project competes with that of other projects. Policy-makers who have to decide about its implementation require a clear understanding of its benefits and costs, and have to be convinced that the population will have a net benefit. In other terms, the pursuit of a sustainable development requires the destination of public funds for the defence of the coast to be guided by a complete Cost-benefit Analysis (CBA).

One of the main difficulties of the CBA is to convert into financial terms all the benefits and costs which can be ascribed to a project about coastal protection, even those not established by the market. In DELOS, as regards the site of Venice and its lagoon, the focus is only on the estimation of future use benefits and non-use values of the city of Venice as cultural and historical heritage. The reason is that, with regard to this city, monetary estimates about its future use and non-use values do not exist; nor is it possible to 'transfer' benefits from other sites because this city is unique in the world. As regards use value, instead, the City Council of Venice has already established an entrance fee for people who want to visit Venice: buses with at least 17 people on board (including driver) can enter the limited traffic area for buses, to visit the historical centre of Venice, by paying an entrance fee of 150 euros per day, and 225 euros for two days (different fees are established for the Lido Island, school trips, or payment in advance). Therefore, given the available funds, in August 2002 a specific CVM survey in the WTP version was carried out.

The main aims of this survey are: i) to assess the average annual WTP of tourists and day-visitors in Venice to a non-profit agency per year for the whole project designed to prevent a reduction in the current level of the conservation quality of Venice as cultural heritage; ii) to investigate the donation and non-donation motives of the willingness to pay; iii) to collect information about the social characteristics of respondents, and type and frequency of visits to Venice. Therefore this DELOS report consists of three parts. The first describes the theoretical economic framework for the evaluation of future benefits and non-use values; the second part focuses on the most suitable method for estimating these non-marketable values; the third part presents the results of the application of the contingent valuation method (CVM) in the willingness to pay (WTP) version.

I.1. ECONOMIC FRAMEWORK FOR RATIONAL COASTAL MANAGEMENT: OPTION VALUE AND NON-USE VALUES

I.1.1. The total economic value (TEV) of Venice as public good

Public goods, or collective goods, are defined by Samuelson (1954, p. 387) as those goods that "all enjoy in common", because they do not have the characteristics of divisibility and exclusivity. For its architectural and historical importance, Venice as cultural heritage is a public good, the value of which is not established by the market. Economists also distinguish between public good and quasi-public good, and this distinction can be applied to Venice. From the point of view of the recreational use, Venice and its Lagoon can be considered a quasi-public good because it is affected by the crowding phenomenon: when Venice is crowded the characteristic of non-exclusivity is not valid because some people prefer not to visit this site.

What are the different values that can be ascribed to a cultural and historical heritage site such as Venice? Venice as cultural heritage is a product of the human mind, therefore we refer to the anthropocentric view of valuation, which is based on the preference or utility or welfare of human beings.

According to the anthropocentric view of valuation, the total economic value (TEV) of a site is the sum of present use values, option value and non-use values that can be ascribed to it. The *use value* is the figure that people would equate with the present use of a site. Option value and non-use values, instead, arise when the possible loss of a site 'may be of concern to the general public, including people who have never visited the [site] and may never do so, the latter being referred to "passive users".' (Shechter et al., 1998, p.457).

More specifically, with regard to *option value,* a person could be willing to visit Venice in the future and s/he may be concerned about the possible damages to Venice due to the high water phenomenon because these damages would become a loss of utility. Therefore that person may be willing to pay for the option to visit Venice in the future, but the market does not establish this value.

The architectural and cultural characteristics of Venice also justify the recognition of non-use values. They can be distinguished in: i) *bequest value*, which measures the amount a person would pay for the preservation for use by future generations; ii) *existence value*, which represents the amount the person who makes the valuation would pay only for knowing that Venice as cultural heritage exists, because he/she also attributes it an intrinsic value; and iii) *other non-use motives* such as altruism as regards people of the same generation, good cause and other motives. Non-use values are also non-marketable, because of their nature of public good; for example, many individuals can enjoy knowing Venice exists, without precluding others from doing the same thing. Madariaga and McConnell (1987) highlight that the question of non-use values has two aspects: pragmatic and substantive. From the pragmatic point of view we can ignore motives, lump all the non-use values and add them to the site value to obtain the TEV. From the substantive point of view, instead, the nature of motives has to be considered. The analysis of motives also involves Ethics, therefore it is not always possible to know it by observing behaviour. We can know which motives justify a certain behaviour only by asking people what they are. The CVM permits non-use values to be

estimated, and also reveals the nature of motives by including specific questions about WTP and non-WTP motives in the questionnaire.

I.1.2. Option Value and Non-use Values: Theoretical Economic Basis

We have shown that from a conceptual point of view, the TEV is composed not only by use values but also by i) future use value and ii) non-use values (NUV). The formal definition of use value is presented in DELOS report D28/A, here we present a formal definition of option value and non-use values.

i) *Option use value and option price*
Use values, in general, can be defined as the following difference:

$$UV = TEV - NUV. \qquad (1)$$

Use values can be investigated according to their nature. We can distinguish present on-site use and off-site use (Cummings and Harrison,1995), and future use. About Venice we are interested in future use, more specifically in option use value and option price.

As regards the management of resources, economists have been addressing the question of the optimal intertemporal utilization of their stocks. Venice can be considered a wonder whose supply cannot be enlarged by man; in other words it is impossible to replace it and no close substitute is available. Therefore, some individuals might be willing to pay or retain an option to use, or to visit Venice. Krutilla (1968, p. 780) explains that the option demand " may exist even though there is no current intention to use the area … in question and the option may never be exercised." This point can be better explained with an example, following Weisbrod (1964, pp.471-3).

Let us consider the following imaginary situation. Let us assume that all the visitors of Venice pay an entrance fee. Let us assume that the City Council of Venice behaves like a private entrepreneur, and that the present value of future costs for maintaining Venice generated by visitors (collecting waste and so on) is greater than the present value of future revenues. In this imaginary situation, allocative-efficiency considerations would suggest that the City Council should close Venice to recreational visitors. Nevertheless "it may be unsound socially for it to do so." A reason is that people who are willing to pay something for the option to visit Venice in the future may exist. Therefore the City Council should also try to estimate option value because user charges are an inadequate guide to the total recreational value of Venice. The total fees paid by current visitors plus the total fees potentially payable by possible future visitors – including those who will never visit Venice – could cover the costs to maintain Venice.

More specifically, the economic nature of the option value is that of a risk-adverse premium. Potential visitors, if they are risk-adverse, would be willing to pay more than the mere value of their expected consumer surplus for visiting Venice. Linsday's (1969) interpretation of option value will help to clarify the point (Bishop, 1982). Let us present a numerical example. For sake of simplicity, let us assume that the willingness to pay for the preservation of Venice is the correct measure of visitor' benefits or surplus, that the discount rate is zero and entrance fee is also zero. Let us evaluate the benefits of Venice for two years. We hypothesise the situation described in table I.1, where during the first year 10,000 people

are certain to visit Venice, while during the second year 20,000 people are only probable visitors.

Table I.1

Year	visitor surplus	Probability	Number of visitors
1	50	1	10,000
2	75	0.5	20,000

In the first year the total benefit of visitors who are certain to visit Venice is 50,000, whereas in the second year, the total expected surplus is 75,000 because the potential visitors have a 0.5 probability to decide to visit Venice. Therefore in the first year, if a market is created to purchase the option to visit Venice in the second year, 75,000 would be the price paid for this option. Nevertheless, if we also assume that potential visitors of Venice are risk-averse, they should be willing to pay more than 75,000 to reduce the risk of not visiting Venice because of flooding. This additional payment over the expected visitor surplus is named option value (OV), and under risk-aversion conditions the OV would be positive; while the sum of the OV and the expected visitor surplus (E_{CS}) is named option price (OP). Therefore, we can write:

$$OV = OP - E_{CS}. \qquad (2)$$

Nevertheless, Bishop (1982, p.14) highlights that from the empirical point of view, there are doubts about the real possibility of successfully dividing option price into option value and expected consumer surplus.

ii) *Non-use values*

As regards non-use values, one way to refer them to the individual preferences or utility is the following. Let us suppose, first of all, that individuals have utility function $U(\mathbf{x}, Q)$, which has as arguments a vector of n commodities $\mathbf{x}$ at prices $\mathbf{p}$, and a cultural resource available in quantity and quality Q. Given the utility function $U(\mathbf{x}, Q)$, the minimum expense or income corresponding to the utility level u can be represented as follow:

$$e(\mathbf{p}, Q, u) = \min (\mathbf{px} / U(\mathbf{x}, Q) = u). \qquad (3)$$

Let us now consider two situations. S*ituation 1* considers a specific site at the quality level of the status quo Q with prices at the level $\mathbf{p}$. The minimum amount of expense or income, which permits the individual to attain the level of utility u, is Y'. *Situation 2*, instead, is characterized by a reduction of the quality of the site from Q to Q^*, while prices are at the same level $\mathbf{p}$. In this case, the minimum income to maintain the same level of utility u, is Y''. Then we can write:

$$TEV = Y'' - Y' = e(\mathbf{p}, Q^*, u) - e(\mathbf{p}, Q, u). \qquad (4)$$

In particular, following Madariaga and McConnell (1987) and Cummings and Harrison (1995), a formal definition of non-use value is as follows. Let us also suppose that $\mathbf{x} = (\mathbf{x}',$ $\mathbf{x}'')$, where $\mathbf{x}'$ is a vector of private goods complementary to Q, such as a magazine or a pay channel which describes the characteristics of Venice as cultural heritage and the recreational visit to the site. In addition let us consider that the corresponding prices $\mathbf{p}'$ are at the "choke" levels. This means that the use of Q by these complement goods is impossible because the

prices are too high, and therefore the Hicksian demands for **x'** are zero. The non-use value (NUV) of a change in the resource, such as a reduction in quality, from Q to Q^* is the change in the expense, or revenue, from $Y°$ to Y^*, of maintaining the same utility level u at the same price **p'**:

$$NUV = Y^* - Y° = e(\mathbf{p'}, Q^*, u) - e(\mathbf{p'}, Q, u). \qquad (5)$$

Therefore, the NUV can be considered the quantity of money that a person would be willing to pay for maintaining the resource even if s/he does not use the resource.

I.2 METHODOLOGY: THE CONTINGENT VALUATION METHOD IN THE WILLINGNESS TO PAY VERSION

The evaluation of non-marketable future use benefits and non-use values is justified by the belief that unless a cost or a benefit is expressed in monetary units "it will continue to be assigned a zero value, and will not therefore be incorporated into the decision making process" (King, 1995, pp.130). Only political decisions can consider these kinds of values, and the task of the economists has been to establish methods to estimate them. The practical difficulty lies in obtaining rational and consistent expressions of these values from people, because the market is unable to establish them. Therefore we need a specific methodology. Different techniques exist, and their application depends on the good to be valued, and more in general on the specific situation considered (NOAA, 1993). A detailed review of the existing methods is in P.Palomè, A. Van der Veen, S. Marzetti (2001).

The economic framework for measuring option price and non-use values about Venice is that of the quality conservation of a resource, more specifically of an architectural and artistic coastal site whose 'supply' is fixed. One method is the procedure of the Benefit Function Transfer (BFT), whereby the willingness to pay for a good can be generalised to other *very similar* situations (see Palomè, 2003). More specifically, because performing a valuation survey is time consuming and very expensive, researchers have suggested saving time and money by using benefits *transferred* from other studies (study sites) for a new site (named policy site). Nevertheless, if data from other sites are not available, the transfer is not possible, and the economic method used is the CVM[1]. The basic idea under the CVM is that, if the value of a resource that a market does not establish has to be estimated, the best thing is to create a hypothetical market which permits respondents to express by means of a survey non-marketable value for the environmental change considered in that site. By this technique, every respondent expresses a value which is contingent on the hypothetical scenario created within the survey. The CVM philosophy is: " If you want to know what something is worth, go to those who might value it and ask: 'what are you *willing to pay* for it?'" (Arrow et al., 1993; Price, 2000). Of course this procedure can evaluate damages, and the question is: What are you *willing to accept* as compensation for it?

The CVM is open to criticism. First of all, even if the elicitation question can be phrased as WTP for a benefit or to avoid a loss, or WTA having a loss or renouncing a benefit, in a number of surveys respondents elicited higher WTA values than WTP values for the same public good. As regards the reasons of this behaviour, we only mention that

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[1] The explosion of the application of the CVM was during the 1980s. During the 1960s instead it was used sporadically only in the USA. In the 1970s there was an increase in the application of this method, and by the end of the decade the CVM was officially recommended as valuation technique by the US Water Resources Council. In Europe the first application was in the 1970s (Bateman, Willis, 1999).

transaction costs, loss aversion, uncertainty and survey-related phenomena are considered reasons for giving different values to WTP and WTA. In particular, Mitchell and Carson (1989, pp.30-8) highlight that, when the quantity is fixed, people would be more sensitive to a loss than a gain, and therefore would elicit a higher WTA than WTP. Nevertheless, respondents would find it difficult to elicit a WTA value because they do not find it plausible. Moreover Mitchell and Carson (1989, p. 41) explain that, when the quantity is fixed, "the Hicksian compensating surplus …is the amount the [visitor] is willing to pay to forgo the reduction in the quality level of the good and still be as well as before"; so in a valuation survey the respondent should be "asked to set the highest amount [he or] she would willing to pay annually…for a given program which guarantees to maintain the present level of supply of a good for the next and succeeding…years". Therefore the Contingent Valuation Method in the WTP version is considered the most suitable method for estimating option value and non use-values about Venice.

The CVM in the WTP version needs the specification of a payment vehicle, such as entrance fee, a new tax, an annual contribution, and a lump sum. The choice of the payment vehicle can determine responses biased towards underestimation or overestimation. Green and Tunstall (1991), for example, highlight that "the risk of introducing unfamiliar mechanism is that responses may reflect attitudes towards the payment mechanism rather than attitudes towards the good." On the contrary, if the payment vehicle is familiar, respondents may consider only the range of values that they are used to paying. In addition some payment vehicle such as extra tax may be unpopular. The usual payment vehicle used for option and non-use values is an annual extra payment to a non profit agency. Voluntary donation is considered a very suitable method of contributing to resource conservation, and is quite realistic with respect to the budget problems of many people (Stevens et al., 1991). In Italy this tool has been used in the Rivoli Castle and Campi Flegrei surveys with good results. We believe it is also available for the Venice survey because of its world importance which justifies the high number of foreign visitors.

In addition, the CVM in all its versions presents the problem that the result obtained by the survey are a function of the information given to the respondent about the good to be valued. (Whitmarsh *et al.*, 1999). Some respondents may not have information and therefore they learn from the description of the good presented by the interviewer (Whitehead and Blomquist, 1991). This lack of knowledge of the good to be evaluated may be a cause of the difference between the stated WTP and the true WTP. In the DELOS Venice survey this "information effect" did not exist because respondents have use experience, being visitors to Venice. In addition the risk that respondents might interpret the change incorrectly, as a consequence of protection, was reduced by describing it by drawings in face-to-face interviews where interviewers also describe the change verbally.

I.2.1. The Relevant Population of the Venice CVM Survey

It has been shown above that the CVM is based on the economic theory of the consumer, which admits the passage from individual values to the aggregate value. If respondents elicit how much utility they would obtain from the conservation of a public good, it is also appropriate to compute the aggregate utility of that public good. Therefore, the data obtained from the evaluation of option value and non-use value about Venice are used: i) to assess the average individual WTP per year; ii) to assess the total annual WTP of tourists and day-visitors in Venice.

As regards point ii), the annual aggregate WTP (B) is computed by multiplying the total number of the relevant population (N) by the estimated mean WTP per adult (WTP_m):

$$B = N \ WTP_m. \qquad (6)$$

In the CBA the relevant population for the aggregation level is the national population in general, and therefore it is suggested not to interview foreign people. Nevertheless for a UNESCO World Heritage Site the relevant population cannot be only national, but by definition is the entire world (see also King, 1995). Therefore, because of this characteristic, the extent of the hypothetical market created by a CVM survey on option value and non-use values about Venice should also be global.

In addition, option price and non-use values may belong not only to non-users but also to users, such as residents, day-visitors and tourists (Shecter et al., 1998). The loss of utility due to future damages to Venice from high waters may be of concern for them, but also for others including the future generations, and for the very existence of the site. We are aware that some authors think that 'the only valid measure of existence values is the WTP amounts of non-users', because site users may also wrongly include a component of the current recreation value in the amount elicited (Silberman et al., 1992, p.226). However, as suggested by Silberman et al., it would be very complex to carry out a survey to interview the world non-users of Venice who visit alternative cultural sites, with the aim of inferring the users' non-use values of Venice.

In DELOS, given the available funds, an *on-site survey* was chosen in order to estimate the option value and non-use values of visitors (tourists and day-visitors, national and foreign) to Venice who are *in* Venice. This choice needs specifications. In fact we have explained that the correct survey for evaluating these values about Venice is a world survey with a random sample representing all the people in the world willing to pay for the preservation of Venice, both users and non-users. But, from the organisational point of view, this would be a very complex, time consuming and very expensive survey. In addition, even interviewing a random sample of residents at home would increase the cost of the survey. Therefore, because Venice is visited by millions of people of all nationalities, the cheapest way to find out the national and foreign willingness to pay for the preservation of Venice was considered to be a CVM survey in Venice.

I.3. THE CVM SURVEY

We have found no application of valuation methods to an architectural and historical town whose conservation depends on coastal defence project like Venice. Venice is unique in the world. Therefore the transfer of benefits from other sites is not possible, and a specific interview survey was carried out to quantify non-marketable values about Venice.[2]

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[2] More specifically, our bibliographical research shows only three CVM applications about historical sites: two in Italy and one in Great Britain. The two Italian case studies mainly consider non-use values: the first (Scarpa *et al.*, 1998) deals with the evaluation of an extra payment, other than the entrance fee, for keeping open the Rivoli Castle, built for the Italian royal family in Piedmont (Italy); the second (Riganti and Scarpa, 1998) is about the conservation value of the Campi Flegrei area (Naples, Italy) which is an Archaeological Park near the bay of Pozzuoli, where a part of Roman ruins is under sea level. It considers not only use value but also option value and bequest value. The British case study (Willis K.G., 1994) concerns the use of Durham Cathedral (England) to which access is free. Finally Scarpa *et al* (1998) mention another CV application to sixteen historical buildings at Neufchatel in Switzerland by Grosclaude and Soguel.

I.3.1. The Site of Venice and its Lagoon: its Protection Project

The lagoon of Venice in the Northern Adriatic Sea, almost 50 km long and 10 km wide, is a fragile environment created by the balancing of forces coming from land and sea. The lagoon houses the city of Venice, the port of Marghera, which is one of the most industrial Italian ports, a modern industrial zone, an airport and a lot of fish farms. In addition international tourism is very well developed, and it has been estimated that Venice is visited by about 10 million people per year (COSES, 1999).

Its survival depends on the water exchange, which is regulated by tides. When the height of the tide reaches more than 1 metre, more than half of St. Mark's Square and a quarter of its monuments are submerged (Cellerino, 1998). In this condition economic activities are endangered and residents and visitors suffer discomfort. The high water phenomenon is becoming even more frequent. In this century it is foreseen that Venice and its lagoon will undergo about 2700 high water events, and the great fear is that it could be engulfed by the sea.

Photo 1: Pellestrina Island protection   **Photomontage 1:** The MOSE

Italian local, regional and national authorities are engaged in the defence projects of Venice to satisfy the demand for preserving Venice, also to defend the world importance of Venice as World Heritage Site. In Venice the Consorzio Venezia Nuova represents the Italian government, and is a primary end user of DELOS. The coastal defence programme about Venice and its Lagoon consists of different kinds of interventions: i) defence and rebalance of the morphological and hydrodynamic system of the lagoon, ii) defence of buildings, iii) elevation of floors and pavements, iv) protection of the natural barriers (coastal strips) of Pellestrina and Lido islands from sea erosion by the building of artificial beaches protected by LCS (photograph 1), and v) the temporary closure of the three mouths with mobile metal floodgates (MO.S.E.) built inside the lagoon across the bed of each mouth (photomontage 1).

The cost of implementation and maintenance of this complex defence system of Venice and its lagoon is very high, running into some thousands of millions of Euro.

I.3.2. The CVM survey design

The Venice CVM survey consists of 1000 face-to-face interviews (Arrow et al., 1993) of 10-15 minutes each, done in the most crowded streets of Venice. Face-to-face interviews were done because, in general, the physical presence of the interviewer helps the respondent to co-operate with the survey and the complex scenario, such as the defence project of Venice and its lagoon, can be better explained. A multistratified random sample of tourists and day-visitors, aged 18 plus, was chosen. Anonymity was guaranteed. The questionnaire was constructed also taking into account the experience of Silberman et al. (1992), Seip and Strand (1992), Goodman et al. (1996), Champ et al. (1997), and Shechter et al. (1998). A pilot survey of 50 interviews was done to test the questionnaire before carrying out the main survey.

In its final wording the questionnaire is divided into six sections. The first section aims to select people for the interview. Not only residents, but also commuters to Venice for work or study and non-residents who are staying in Venice more than one year were not interviewed, because they cannot be considered tourists (Marzetti, 1991). The second section seeks information about the respondent's recreational activities in Venice, while the third section investigates the respondent's attitudes toward the cultural goods in general.

The fourth section is the heart of the questionnaire since it includes the elicitation questions. The "modified" double-referendum format is used (double dichotomous choice plus open-ended question). First of all respondents are reminded that there are many other worthy causes to contribute to, and presented with the Venice defence programme from the high water phenomenon (photomontage 1 was presented and described); then they are asked i) whether they are willing to pay one euro per year to a non profit agency for that programme; if the reply is yes, ii) they are asked whether they are willing to pay more; if the reply is still yes, iii) the maximum willingness to pay is asked. Given the hypothetical nature of a contingent market, the elicited WTP could be different from the true WTP, therefore respondents are also asked if they would really pay the amount elicited. In addition, respondents are also asked to specify the donation motives of their willingness to pay. A list of possible donation motives is then presented to respondents, from which a first and a second choice are possible: a) Option to visit Venice in the future, b) so that other people can enjoy it too, c) preservation for the future generations, d) just to know that Venice exists, e) satisfaction of giving money to a good cause, f) other donation motive (to be specified by respondent). Finally, respondents have to specify non-donation motives in the following list: g) non-profit foundations waste money, h) money should be spent on some other project, i) I cannot afford to pay further taxes, l) paying for this project is a State's duty, m) other non-donation motive (to be specified by respondents).

The fifth section asks respondents' socio-economic characteristics, while the last section is addressed only to the interviewer, mainly to collect information about respondents' comprehension of the questionnaire.

We highlight that the WTP question is asked as a lump sum and thus cannot be split according to the donation motives given by respondents. In particular, as regards the donation

motive a), even if we speak of option value, the elicitation question does not allow us to understand whether the WTP for future use benefits is option value or option price. All this information was sacrificed because of limited funds.

I. 4. THE RESULTS OF THE VENICE CASE-STUDY

I. 4.1. Social characteristics and attitude towards cultural heritage

The random sample consisted of 24.2% Italians and 75.8% foreigners (European and non-European). According to the opinion of interviewers, 78.4% of respondents completely understood the meaning of the economic valuation questions. In addition no extreme values were obtained.

As regards nationality, a very high percentage of respondents comes from foreign countries, in particular from Germany, Great Britain and USA (see figure 1).

Percentage of respondents according to nationality
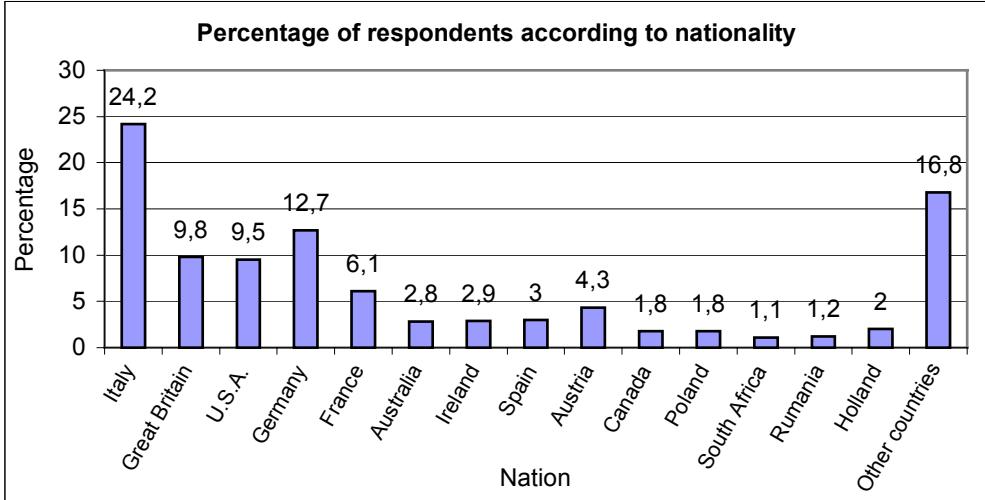
Figure 1

Considering people from Ireland and from South Africa, the percentage of boys and girls under 30 is higher (respectively 65.5% and 72.7%) than observed in the whole sample (35.4%). As regards occupation, the majority of Canadian (55.6%) and South African (54.5%) respondents are managers or office workers. 69.5% of people from the USA and only 28.1% of Italian tourists have a university degree.

Tourists were 55.7% and day-visitors 44.3%. In particular 71.1% of Italians and 35.8% of foreigners are day-visitors. Tourists (i.e. 557 respondents staying in Venice at least one night) stay an average period of 3.61 nights (Std. Deviation= 2.32). More specifically, 52.8% of tourists stay less than 3 nights, while 10.2% more than 7. 61.2% of tourists were accommodated in hotels; 22.8% on campsites.

The distribution of respondents according to their annual household income is shown in figure 2.
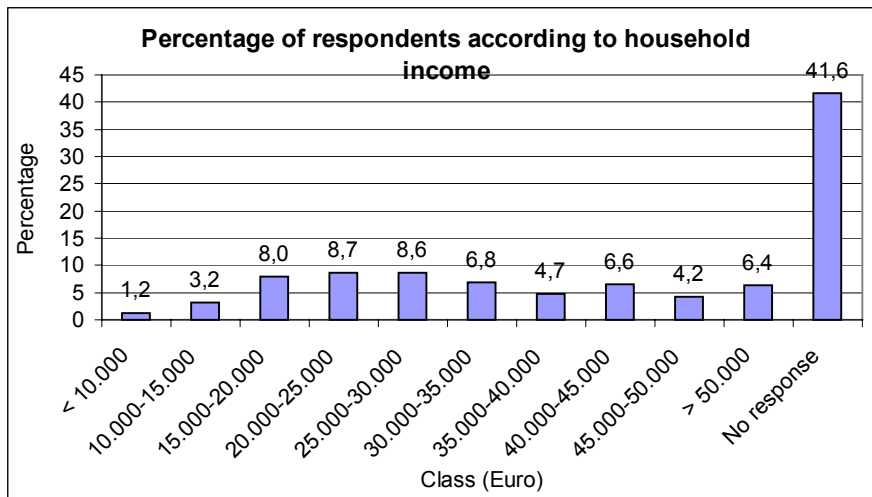
Figure 2

Only 58.4% of respondents specify their annual household income. 54.96% of these respondents declare an income between 15,000 and 35,000 €, while 26.54% between 35,000 and 50,000 €; moreover 64 people have an income greater than 50,000 € and only 1.2% of people have a annual household income lower than 10,000 €.

The main recreational activity in Venice is walking around the streets, and the second is visiting museums (see figure 3).
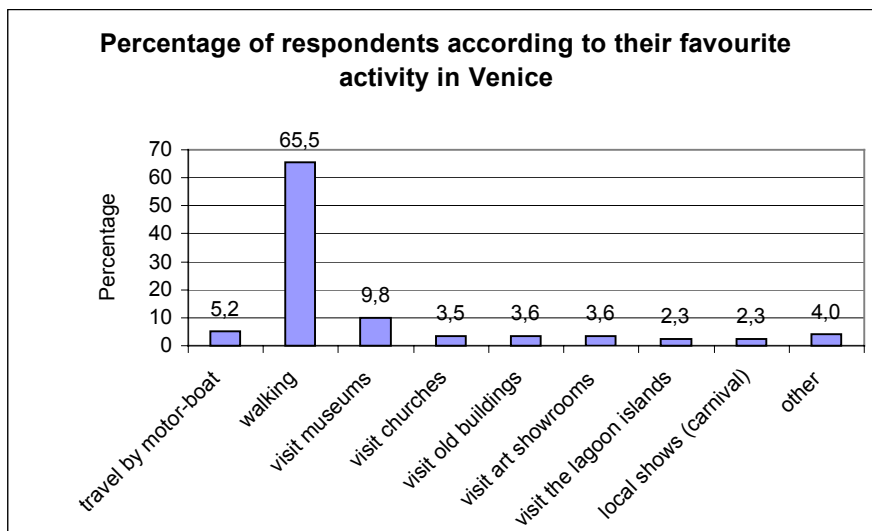

Figure 3

The preferences about the recreational activities change according to nationality, as shown in figures 4 and 5.

Percentage of respondents according to nationality and favourite activity

Activity	Italian	English	American	German	French	Other
walking	65,3	76,5	77,9	51,2	65,6	64,5
visit museums	8,3	7,1	7,4	11,8	14,8	10,6
visit art show rooms	9,1	1,0	1,1	2,4	4,9	2,1

Figure 4

Percentage of respondents according to nationality and favourite activity

Activity	Italian	English	American	German	French	Other
travel by motor-boat	2,9	2	7,4	5,5	9,8	6,1
visit old buildings	1,2	2	1,1	10,2	0,0	4,5
visit churches	1,7	6,1	1,1	6,3	1,6	4,0
visit the lagoon	2,5	2,0	1,1	2,4	4,9	2,1

Figure 5

As regards respondents' attitude about cultural sites, more than 66.3% of respondents think that their country should spend more money for the protection of cultural sites, and only 3.3% less. Foreign people are more satisfied than Italians with their government's public spending. As regards motives of protection, 47.5% of respondents think that cultural heritage sites have to be protected "for our future and for that of our children", while 21.9% because "they exist and represent our past" (see figure 6). In particular, according to nationality, 39.3% of Italian people and 50.1% of foreign people say "for our future and for that of our children", while 7.9% of Italians and 2.6% of foreigners "it is a good cause".
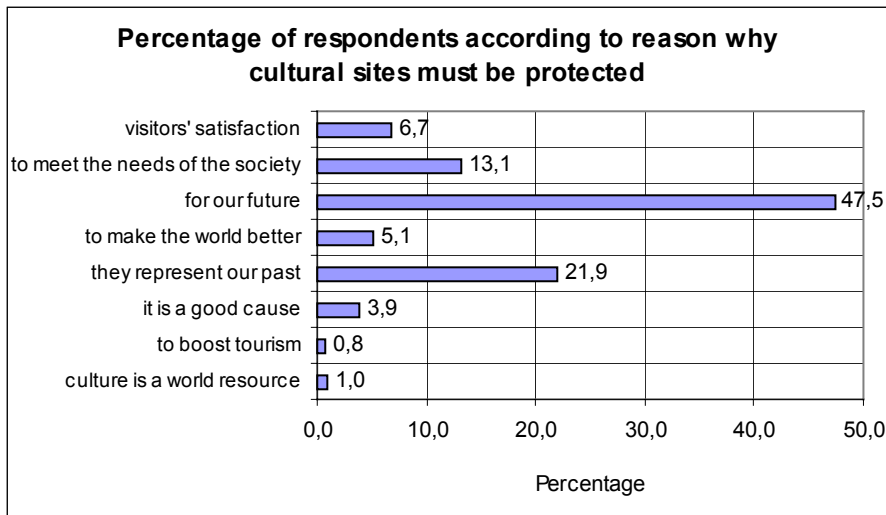
Percentage of respondents according to reason why cultural sites must be protected

Reason	Percentage
visitors' satisfaction	6,7
to meet the needs of the society	13,1
for our future	47,5
to make the world better	5,1
they represent our past	21,9
it is a good cause	3,9
to boost tourism	0,8
culture is a world resource	1,0

Figure 6

The second most important reason for protecting the cultural heritage sites is "they exist and represent our past" for 36.8% of respondents. Other reasons are "for our future and for that of our children" (16.6%) and "it is a good cause" (12.3%). In addition, the majority of respondents (85.1%) in the past visited other Italian cities of art and (93.0%) abroad. We highlight that 19.3% of foreigners and only 1.2% of Italians have never visited other Italian cities of art.

To the question 'Are you, or is anyone in your family, a member of any cultural heritage conservation organizations?', 83.1% of respondents say that nobody in their family is a member of any cultural heritage conservation organization. Only 9.8% are members of these associations, and they are mainly (13.2%) managers and office workers and teachers, in addition 86.7% them are foreigners, especially British. The mean expenditure on cultural heritage protection is 172.50 € (Std. Deviation= 297.10). On average, Italians declared 229.33 € and foreigners 156.13 €.

Mean household expenditure on cultural heritage protection according to income

income bracket (Euro)	Mean expenditure (Euro)
< 10.000	362,22
10000-15000	125,83
15000-20000	204,47
20000-25000	251,04
25000-30000	167,32
30000-35000	146,33
35000-40000	125,43
40000-45000	211,73
45000-50000	190,00
>50000	254,46

Figure 7

15
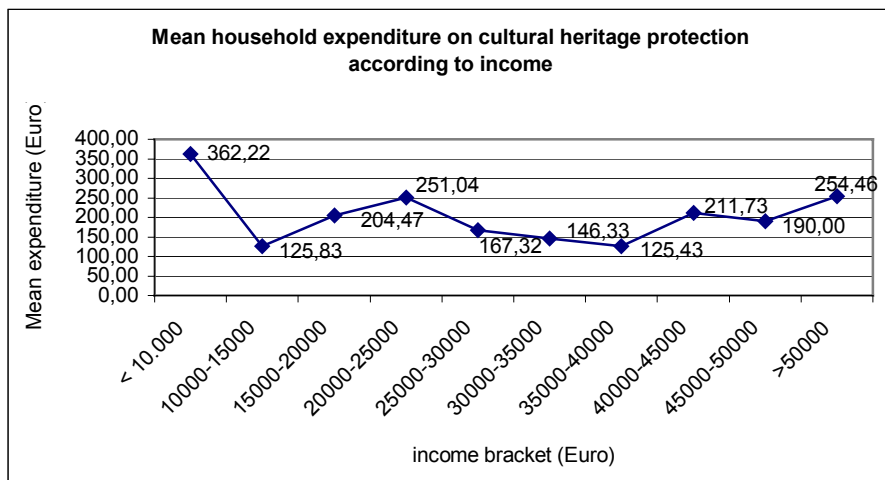
I.4.2. The Economic Value of Venice as a Coastal Cultural Heritage

The great majority of respondents (93.0%) are in favour of the implementation of the protection programme of Venice; in particular, only 3.3% of Italians and 6.1% of foreigners are against the project, while 1.6% do not answer. Italians' and foreigners' opinions are not very different: 95.0% of Italian people are in favour, 3.3% are against the project and 1.7% do not answer; while 92.3% of foreign people are in favour, 6.1% are against the project and 1.6% do not answer.

As regards the elicitation questions, 71.1% of interviewees would be willing to pay at least 1 Euro to cover the cost of the flood and coastal defence programme, in particular 77.7% of Italians and 69.0% of foreigners. Moreover 40.9% of respondents would be willing to pay more than 1 Euro to protect Venice (figure 8); 133 interviewees willing to pay more than 1 € do not specify the maximum amount and were considered as willing to pay 1 €.

Considering the whole sample, respondents indicate values from 0.00 € to 100.00 €; the mean willingness to pay for the defence of Venice per year is 4.85 (Std. Dev. 11.16) Euro. Day-visitors' mean donation is 3.95 €, while tourists' mean donation is 5.56 €.
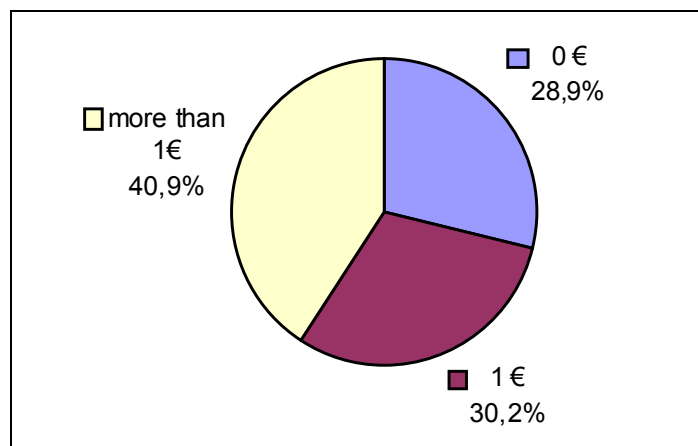
Figure 8: Willingness to pay - percentage of respondents

Figure 9 shows the distribution of respondents according to their maximum donation.
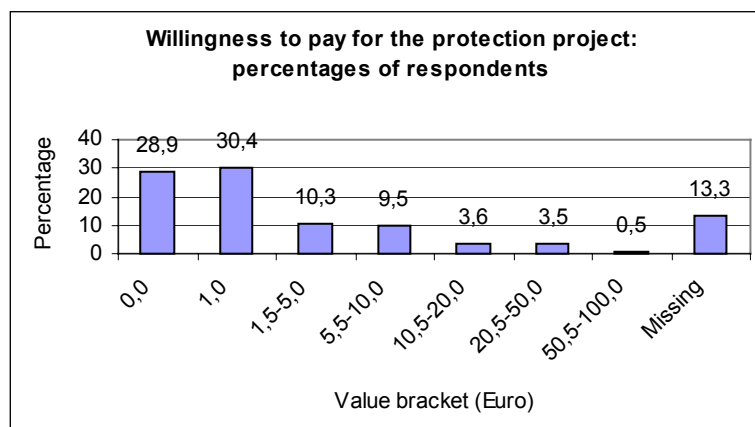
Figure 9

To the question: "Are you 100% sure that if asked to do so, you would actually pay the amount you declared?", 64.4% of the people claiming to be willing to pay at least 1 € to

cover the cost of the Venice defence programme are 100% sure that they would pay the amount declared if actually asked to pay (see figure 10). Only 1.3% of respondents claim to be very uncertain.
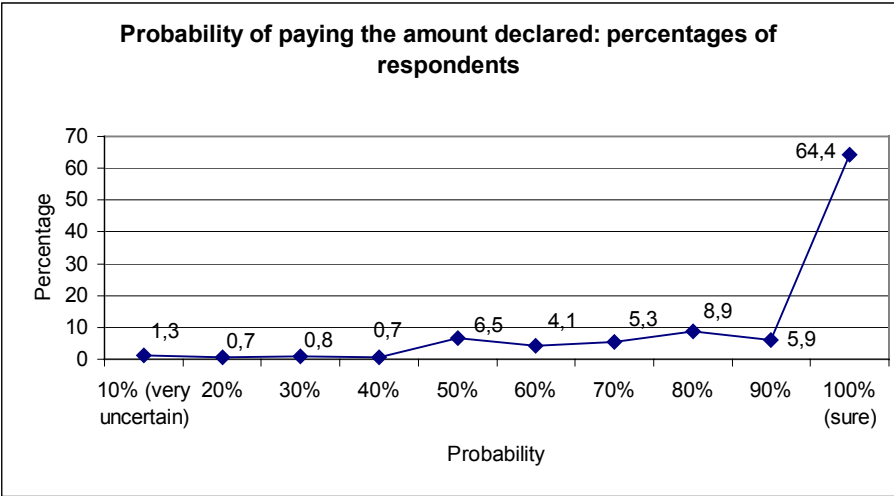

Figure 10

Considering the degree of uncertainty expressed by respondents as their subjective probability to pay for the defence project of Venice, the average subjective probability that people would pay the amount declared is 88.3% (Std. Dev. = 20.00). In particular, table 1 shows the mean probability to pay according to nationality.

Table 1

Nationality	Mean probability
Italy	0.89
Great Britain	0.95
U.S.A.	0.93
Germany	0.80
France	0.90
Other countries	0.87

Considering both the declared willingness to pay (WTP) and the subjective probability of paying, it is possible to compute the expected mean willingness to pay. The individual values of the expected WTP are between 0.00 € and 100.00 €; in the whole sample, the mean expected WTP is 4.39 € (Std. Dev. = 10.41), the median is 1.00 € and the mode is 0.00 € (*table 5*). Considering only those respondents who are certain to pay (368 people), the mean WTP is 7.81 € (median = 5.00 and Std. Dev. =13.18).

As regards nationality, the mean WTP is very different: French and German respondents give the smallest mean values (1.90 € and 2.13 € respectively), while Italian and US respondents are willing to pay more (see figure 11) .

Figure 11

According to occupation, the smallest willingness to pay value is given by unemployed people (0.87 €), while managers and office workers declared the highest mean value (6.57 €). Moreover, we highlight that there is not a strong relation between WTP and age, while mean values are very different according to education: on average, people with only primary school education declared 0.62 €, while graduate respondents 6.33 €. The relation between income and willingness to pay is shown in figures 12.
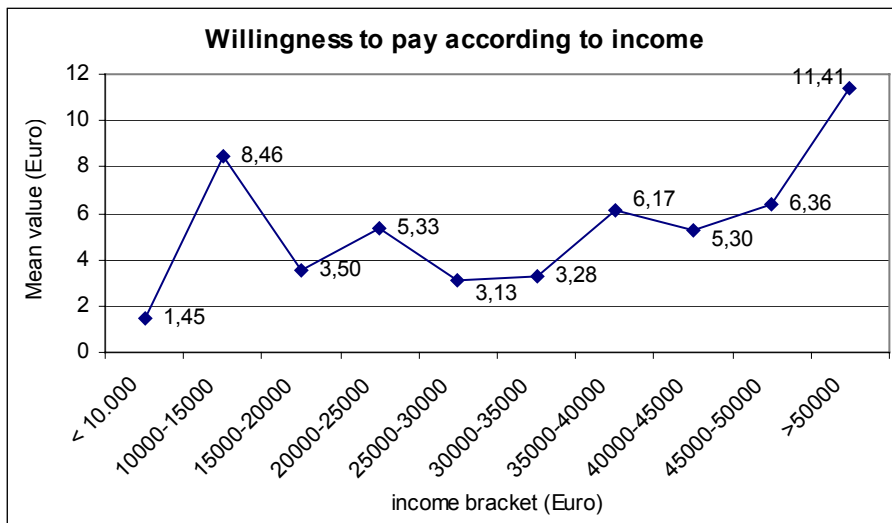
Figure 12

I.4.3. Donation and non-donation motives for the Venice defence project

People willing to pay at least 1 € for the cost of the programme were asked their donation motives. As first choice, 53.7% of them would pay to preserve Venice for the future generations, 17.4% to visit this city in the future, 12.2% to allow other people to enjoy it and 10.5% just to know that Venice exist, no matter whether they will ever visit it again. "So I have the satisfaction of giving money to a good cause" is the main reason for only 4.1% of respondents. These percentages change according to nationality, as shown in figures 13 and 14.
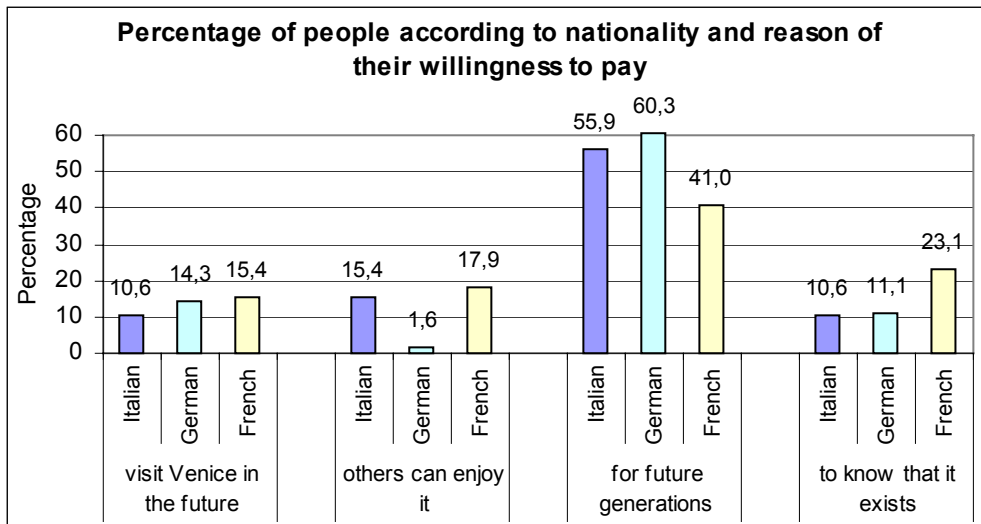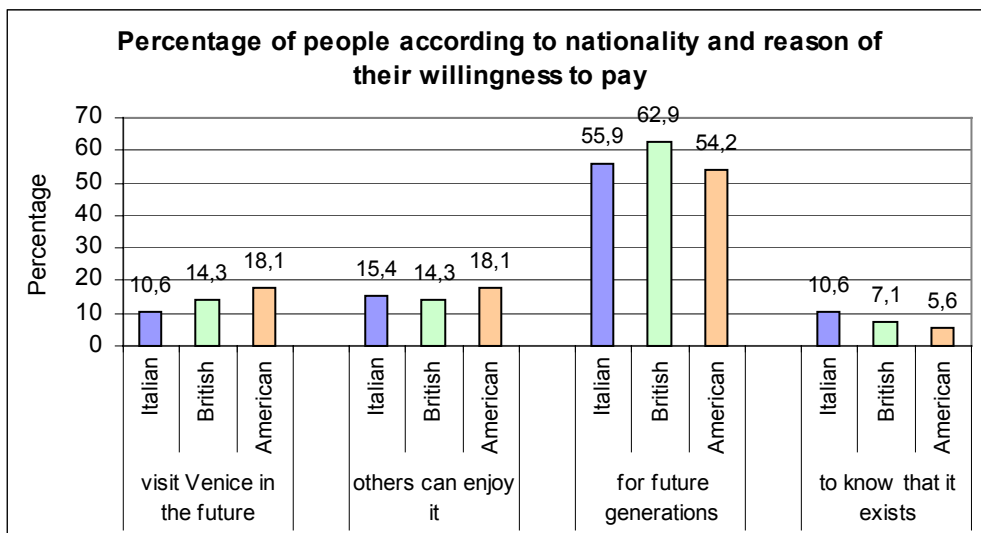
Figure 13

Figure 14

In particular, the percentage of German people who would give a donation to protect Venice so that other people can also enjoy it is very low (1.6%); only 41.0% of French interviewees are willing to pay for future generation and 23.1% to know that Venice exists.

As second choice, there is an almost uniform distribution of respondents according to the second reason for their willingness to pay. 21.8% answers "So I have the satisfaction of giving money to a good cause", 18.8% "Option to visit Venice in the future"; 16.3% "So that other people can enjoy it too"; 15.3% " Preservation for the future generations"; 13.5% says that there is no second reason; 12.0% "Just to know that Venice exists, no matter whether I will ever visit it again".

People who would give no donation for the protection programme (289 respondents) were asked non-donation motives. 37.7% thinks that paying for this project is a State's duty; 18.3% says that the protection is not his problem because he does not live in Venice; 11.8% thinks that money should be spent on some other project; 11.4% claims that non-profit foundations waste money. 20.4% of foreigners say that the protection of the city of Venice is not their problem because they do not live in Venice.

I.5. REGRESSION ANALYSIS

If we want to know the determinants of the WTP for Venice, it must be modelled parametrically. In other terms, we try to find a causal relationship between the individual WTP and its explanatory variables, such as household income, attitude, membership of cultural heritage associations and money usually spent for cultural heritage protection in general. Nevertheless, as Whitmarsh et al. (1999) highlight, there is no model able to describe all the variables on which the WTP depends. Therefore, a number of attempts were made to test the validity and reliability of the economic results of this survey.

In this survey 28.9% of respondents elicited zero value for the different valid reasons explained above. Therefore, taking into account the spike phenomenon (Clinch and Murphy, 1998; Shechter et al, 1998), we first modelled whether or not respondents are willing to pay 1 € for the defence project, and then a regression for non-zero responses was done. We present the results of a combination of logit equation (first stage) and linear regression (second stage) considering the expected willingness to pay (EWTP). Because only 58.4% of respondents declared their household income brackets, both models were estimated with and without income.

As regards the logit model, the results with and without income are very similar, therefore in table 2 we present only the logit with income: number of observations = 1000; pseudo R^2 = 0.0574; log likelihood = -566.74; P = 0.10 cut-off value.

Table 2: Expected willingness to pay 1 €: Logit results

Explanatory variables	Coefficient	P-value
Night stays in Venice	0.422	0.001
Donation cultural heritage site	0.00085	0.066
Tourist	0.643	0.015
General attitude towards cultural goods	0.469	0.002
Annual household income category: 0 to 9,999 €	1.159	0.000
Annual household income category: 10,000/19,999 €	1.062	0.000
Annual household income category: 20,000/24,999 €	0.720	0.000
Annual household income category: 25,000/29,999 €	0.653	0.000
Annual household income category: 30,000/34,999 €	0.829	0.000
Annual household income category: 30,000/34,999 €	0.740	0.000
Annual household income category: 35,000/39,999 €	0.836	0.000
Annual household income category: 40,000/44,999 €	0.411	0.001
Annual household income category: 45,000/49,999 €	0.75 9	0.000
Annual household income category: over 50,000 €	0.715	0.000
Pensioner	-1.544	0.000
Married	1. 050	0.031
Widowed	1.450	0.059
Education level. Primary school	- 0.246	0.086

Table 2 shows that significant determinants of the WTP of 1 € are household income, being a tourist, having an attitude towards cultural goods in general, being married, and being widowed.

Focusing on non-zero responses (711 people), the results of the linear regression with and without income are quite different. Therefore, as regards respondents willing to pay at

least 1 €, in table 3 the results of the linear regression without income are presented. Number of observations = 711; R^2 = 0.0654; P = 0.10 cut-off value.

Table 3: Regression coefficients: WTP > 0

Explanatory variables	Coefficient	P-value
Night stays in Venice	1.6265	0.072
Reason for preservation of cultural goods: good cause	27.6065	0.000
Manager/Free lance	-3.5159	0.070
Student	- 3.654	0.090
Constant	4.0407	0.056

In particular linear regression confirms that there is a significant relation between the number of night-stays in Venice and the expected WTP, that there is a significant negative relation between EWTP and being a manager/free lance and also student. Finally a positive significant relation also exists between believing that the preservation of cultural goods is a good cause and EWTP.

Finally, focusing only on those respondents who are willing to pay and also declared their income bracket, in table 4 the linear regression results are presented. Number of observations = 419; R2 = 0.1141; P = 0.10 cut-off value.

Table 4: Regression coefficients: Income and WTP >0

Explanatory variables	Coefficient	P-value
Night-stays in Venice	2.711	0.029
Tourist	- 3.336	0.037
Reason for preservation of cultural goods: good cause	25.267	0.000
Reason for preservation of cultural goods: society needs	- 1.812	0.003
Reason for preservation of cultural goods: they are our past	- 2.999	0.060
Annual household income category: 35,000/39,999 €	4.459	0.067
Annual household income category: over 50,000 €	9.096	0.001

Only two income brackets are significantly and positively related to the expected WTP; in addition, while the positive relation between EWTP and good cause as reason for protecting cultural goods is confirmed, a negative relation exists between EWTP and two other reasons for protecting cultural goods - 'society needs' and 'they are our past' - and also being a tourist. Finally EWTP is positively related to the number of night-stays.

I.6. Conclusions

The CVM about Venice is the first application of this economic method to Italian coastal heritage sites. In this survey the great majority of respondents understood the evaluation question and are in favour of coastal defence from flooding and high water phenomenon. In particular, the Venice CVM survey shows that bequest value is the most important motive of donation, and future use the second most important motive; nevertheless, 35.6% of the respondents claiming to be willing to pay are not 100% sure that they would pay the amount elicited if asked.

The computation of the total annual aggregate value of Venice as a cultural heritage site is not the task of this paper. It cannot be computed with the data obtained by this survey, because as regards the UNESCO World Heritage Sites the aggregation level should be the entire world (King, 1995). As regards Venice, only the expected aggregate mean willingness to pay per year of day-visitors and tourists in Venice at the time of the survey can be estimated by this DELOS survey. Because it is reasonable to think that the historical city of Venice is visited by about 10 million people (COSES, 1999), in 2002 the expected aggregate annual willingness to pay would have been 4,390 million Euro. Even if it represents only a part of the total aggregate WTP for the conservation of Venice, this figure is remarkable; it is the result of the fact that the majority of respondents at the time of the survey were in favour of the implementation of the coastal defence project (also consisting of LCS) for the quality conservation of Venice as world heritage.

ACKNOWLEDGEMENTS

BIBLIOGRAPHY

Arrow K., R. Solow, P.R. Portney, E.E. Learner, R. Radner and H. Shuman (1993), "Report of the NOAA Panel on Contingent Valuation. Report To the General Counsel of the US National Oceanic and Atmospheric Administration". US Department of Commerce. Natural resource damage assessments under the Oil Pollution Act of 1990, *Federal Register*, vol. 58, n. 10, pp. 4601-4614.

Belfiore S. (2000), "Recent Development in Coastal Management in the European Union", *Ocean and Coastal Management*, vol. 43, pp. 123-35.

Bishop R.C. (1982), "Option value: an exposition and extension", *Land Economics*, vol. 58. No. 1, pp. 1-15.

Bishop R.C. and D. Romano (1998), *Environmental Resource Valuation. Applications of the Contingent Valuation Method in Italy*, Kluwer Academic Publishers, Boston.

Bishop R.C., M.P. Welsh, (1992), "Existence Values in Benefit-Cost Analysis and Damage Assessment", *Land Economics*, vol. 68, n.4, pp. 405-17.

Bonnieux F. and Rainelli P.(1999), "Contingent Valuation methodology and the EU Institutional Framework", in Bateman I.J., Willis K.J., *Valuing Environmental preferences*, Oxford University Press, Oxford, pp. 585-612.

Bower B.T. and Turner R.K. (1998), "Characterising and Analysing Benefits from Integrated Coastal Management (ICM)", *Ocean and Coastal Management*, vol. 38, pp. 41-66.

Bradford D.F.(1970), "Benefit-Cost Analysis and Demand Curves for Public Goods," *Kyklos*, vol. 23, pp. 775-91.

Brookshire D.S., Eubanks L.S., Randall A. (1983), Estimating Option Prices and Existence Values for Wildlife Resources, vol. 59, No. 1, pp. 1-15.

Brookshire D.S., L.S. Eubanks, C.F. Sorg (1986), "Existence Values and Normative Economics: Implications for Valuing Water Resources", *Water Resources Research*, vol. 22, n. 11, pp. 1509-1518.

Carson T. R., Flores N.E., Mitchell R.C.(1999), "The Theory and Measurement of Passive-Use Value", in Bateman I.J., Willis K.G., *Valuing Environmental Preferences: Theory and Practice of the Contingent Valuation Method in the US, EU and Developing Countries*, Oxford University Press, Oxford.

Cellerino R. (1998), *Venezia Atlantide, L'impatto economico delle acque alte*, Franco Angeli, Milano.

Champ P.A., Bishop R.C., Brown T.C. and McCollun D.W. (1997), "Using Donation Mechanisms to Value Nonuse Benefits from Public Good", *Journal of Environmental Economics and Management*, Vol.33, pp.156 –62.

Cicchetti C.J. and Freeman A.M. III (1971), "Option Demand and Consumer Surplus: Further Comments", *Quarterly Journal of Economics*, vol. 85, pp. 528-39.

COSES (1999), Lezione IUAV, 7 settembre.

Ghetti A. and Batisse M.(1983), "The Overall Protection of Venice and its Lagoon", *Nature and Resources*, vol. XIX, No. 4, pp.1-13.

Goodman S.L., S.A. Jaffry and B. Seabrooke, "Assessing public preferences for the conservation quality of the British coast", in M. O'Connor and Spash C.L. (1999), *Valuation and the Environment: Theory, Method and Practice*, Edward Elgar, Cheltenham, UK, Northampton, MA, USA.

Goodman S.L., Seabrooke W., Daniel H.M., Jaffry S.A. and James H. (1993), "Results of a Contingent Valuation Study of Non-use Values of Coastal Resources", *Research Report to MAFF Flood and Coastal Defence Division,* Centre for Coastal Zone Management, University of Portsmouth.

Goodman S.L., Daniel H.M., Seabrooke W., Jaffry S.A. (1996), "Using Public Surveys to Estimate the Total Economic Value of Natural Coastal Resources", *Partnership in Coastal Zone Management*, Taussik J. and Mitchell J. (eds), Samara Publishing Limited, Cardigan.

Hanemann W.M. (1999), "The Economic Theory of WTP and WTA", in Bateman I.J., Willis K.G., *Valuing Environmental Preferences: Theory and Practice of the Contingent Valuation Method in the US, EU and Developing Countries*, Oxford University Press, Oxford.

Hausman J.A. (ed.) (1993), *Contingent Valuation. A Critical Asse*ssment, North Holland, Amsterdam.

King O.H.(1995), "Estimating the value of marine resources: a marine recreation case", *Ocean and Coastal management,* vol.27, No. 1-2, pp. 129-41.

Krutilla J. W. (1967), "Conservation Reconsidered", *The American Economic Review*, vol. LVII, No.4, pp. 777-86.

Larson D.M. (1993), "On Measuring Existence Value", *Land Economics*, vol. 69, n. 4, pp. 377-88.

Lindsay C.M. (1969), "Option Demand and Consumer Surplus", *Quarterly Journal of Economics*, vol. 83, pp. 344-6.

Macdougall Z. (1996), "The management and Protection of Internationally Famous Coastlines: The Case of the Venice Lagoon, North Italy, in J. Taussik and Mitchell J. (eds.), *Partnership in Coastal Zone Management*, Samara Publishing Limited, Cardigan, ISBN, pp.589-594.

Madariaga B., K.E. McConnel (1987) "Exploring Existence Value", *Water Resources Research*, vol. 23, n. 5, pp. 936-942.

Mitchell R.C. and Carson R.T. (1989), "Using Surveys to Value Public Goods: the Contingent Valuation Method", Resources for the Future, Washington, D.C.

P.Palomè, A. van der Veen, S. Marzetti (2001), DELOS, WP 1.3, Final Report July 2, *Literature Review for Statistical Analysis,* http://www.delos.unibo.it/, pp. 23-24.

Pavasovic A. (1996), "The Mediterranean Action Plan Phase II and the Revised Barcelona Convention: New Prospective for Integrated Coastal Management in the Mediterranean Region", *Ocean and Coastal Management*, vol. 31, n. 2-3, pp. 133-182.

Riganti P. and Scarpa R. (1998), "Categorial Nesting and Information Effects on WTP Estimates for the Conservation of Cultural Heritage in Campi Flegrei", in Bishop R.C. and D. Romano (1998), *Environmental Resource Valuation. Applications of the Contingent Valuation Method in Italy*, Kluwer Academic Publishers, Boston.

Samuelson P. (1954), "The pure Theory of Public Expenditure", *Review of Economics and Statistics*, vol. 36, pp. 387-9.

Scarpa R., Sirchia G. and Bravi M. (1998), "Kernel vs. Logit Modelling of Single Bounded CV Responses: Valuing Access to Architectural and Visual Arts Heritage in Italy", in Bishop R.C. and D. Romano (1998), *Environmental Resource Valuation. Applications of the Contingent Valuation Method in Italy*, Kluwer Academic Publishers, Boston.

Schmalensee R. (1972), "Option demand and Consumer's Surplus: Valuing Price Changes under Uncertainty", *The American Economic Review*, vol. LXII, No. 5, pp. 813-24.

Shechter M., Reiser B. and Zaitsev N. (1998), "Measuring Passive Use Value", *Environmental and Resources Economics*, Vol. 12, pp.457-78.

Silberman J., Gerlowski D.A. and Williams N.A. (1992), "Estimating Existence Value for Users and Nonusers of New Jersey Beaches", *Land Economics*, vol. 68, n.2, pp. 225-36.

Sugden R.(1999), "Public Goods and Contingent Valuation", in Bateman I.J., Willis K.G., *Valuing Environmental Preferences: Theory and Practice of the Contingent Valuation Method in the US, EU and Developing Countries*, Oxford University Press, Oxford.

Turner R.K. (1999), "Integrating Natural and Socio-Economic Science in Coastal Management", *Journal of Marine System*, vol. 25, pp. 447-60.

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D28/B-II

CASE STUDIES ON MONETARY VALUATION OF
ENVIRONMENTAL CHANGES

Final Report on the Dutch case study:

Contingent Valuation of a Restored Coastal Natural Area

PHILIPPE POLOME', ANNE VAN DER VEEN, PETER GEURTS

Abstract. In this report, we value a restored natural area called Normerven and situated in the Dutch Waddenzee. For a long time, Normerven was a semi-natural mudflat located on the outer side of the dyke running along the Waddenzee coast. It was intentionally destroyed about 20 years ago; then restored using a system of Low Crested Structures. After a first failed attempt, the restoration appears to work well as revealed by a dramatic increase in the number of breeding birds over the last 5 years of data.

Access is forbidden to Normerven (to avoid disturbing the nesting birds or trample the vegetation) and the site is in a relatively remote area of the Netherlands; the greatest part of the value of the site should be non-use. Normerven was actually cheap to build, yet significant for some bird species in the South Waddenzee, and a question of public choice naturally arises: Is it worth to build more sites similar to Normerven in that region of the Waddenzee?

To address this issue, we have designed a contingent valuation survey. After describing Normerven in details, with visual aids, the respondents were introduced to a hypothetical scenario of valuation in which Normerven could be replicated 1 to 10 times at various locations in the South Waddenzee (indicated on a map). Three dichotomous format valuation questions (the respondent answers Yes or No to a proposed bid) were asked in sequence, with a different bid and a different number of sites each time. The objective was to obtain a value function depending on the number of sites that would be replicated; the value of the original Normerven site could be estimated by extrapolation. The questionnaire made clear that none of the would-be sites could be visited, thus we consider that we have elicited purely non-use values.

We have also investigated a methodological issue that seemed important in this case. The literature on contingent valuation recommends to mimic a referendum for its incentive properties. However in a country where referenda are exceptional and the population is used to consensus in public decisions, such a decision context could seem strange to the respondents, and in this way affect their values. To investigate this issue, we have introduced five "decision contexts", each on one fifth of the sample; one of them was the referendum.

Our results indicate that there is a significant value for such a restored natural area, and therefore, implicitly, for the Low Crested Structure that maintains it, but the social context does indeed significantly affect the stated values. Another important result is that the value of a replication of the natural area is less that the original one, and can even be negative. This phenomenon may be caused by a form of congestion and implies that the transfer of coastal defence benefits should take such a congestion into account if it claims to be reliable.

1. Introduction

We first present a description of the site and its history, then a series of features that condition the economic valuation of such a site. Thirdly, we present the design and administration of the survey, and then descriptive statistics of the results. The regression model is introduced next; then the welfare measurement model.
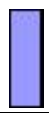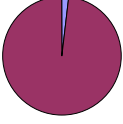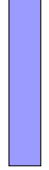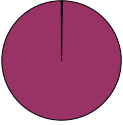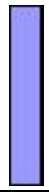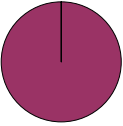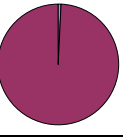
The following picture shows the study site from the sky.

Picture 1. The Normerven site
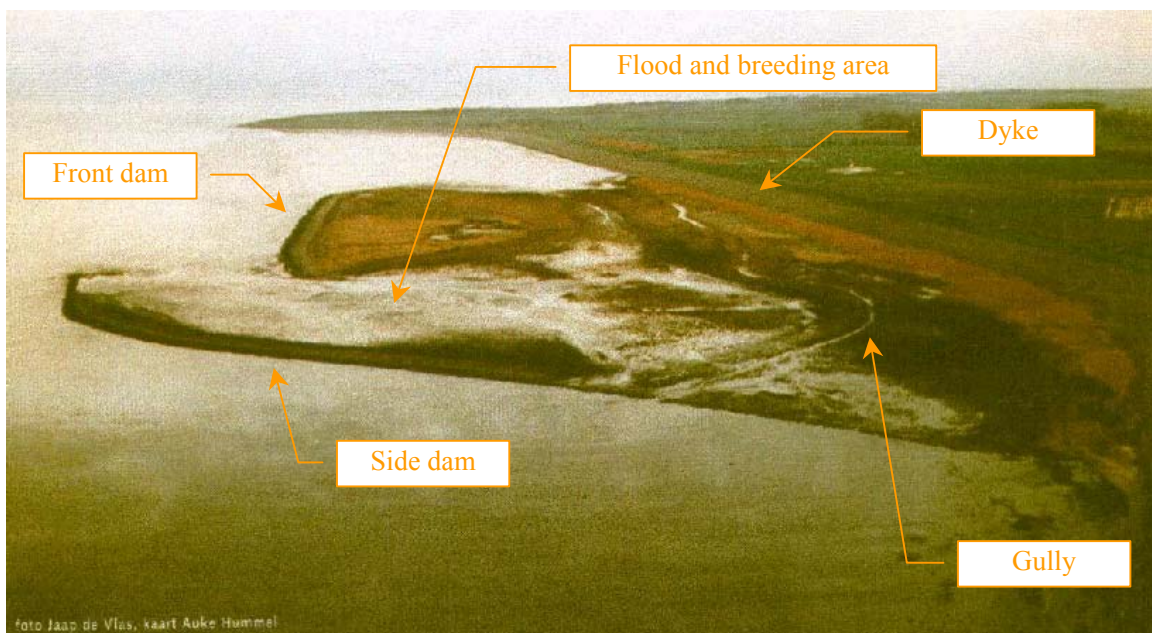
Normerven is Located in South Waddenzee. In that area, the sea is shallow and has small tides (1/2 to 1 m.). Normerven was historically a wider area. It has been destroyed by the Dutch Water authority, then restored in 1986, and then again in 1996. It seems stable since then, with very low maintenance costs. It is now an artificial tidal mudflat of less than 2 ha that is overtopped on some high winter tides. This is done on purpose to maintain a mudflat that is adequate for bird breeding. This is the primary purpose of Normerven. The following table presents the impact on the environment. Biologists participating in the DELOS project (Delft Hydraulics) consider that the impact of Normerven is essentially on bird populations, the impact on other fauna or flora is likely negligible.

Table 1. The main bird species of Normerven

Species	Nesting pairs in		Nesting pairs in Waddenzee in 1999	Picture
	1 994	2 000		
Common tern	193	520	14 000	© Yolanda Krijnen
Avocet	151	240	12 138	
Black-headed gull	12	1 500	128 882	
Plover	7	3	1 378	
Oyster-catcher	13	4	39 133	
Total (all species, approximately)	370	2 280	300 to 350 000	

For these species, the Waddenzee is an important or very important habitat in North-Western Europe in the classification system developed by Riks (see www.riks.nl).

2. Valuation background

Access is forbidden to Normerven: there is virtually no recreation/tourist value. There is a large dyke along this coast (see the picture in the introduction), thus Normerven has no value as a protective device (at most it may reduce the maintenance cost of the dyke but in such a small scale that it can be considered negligible).
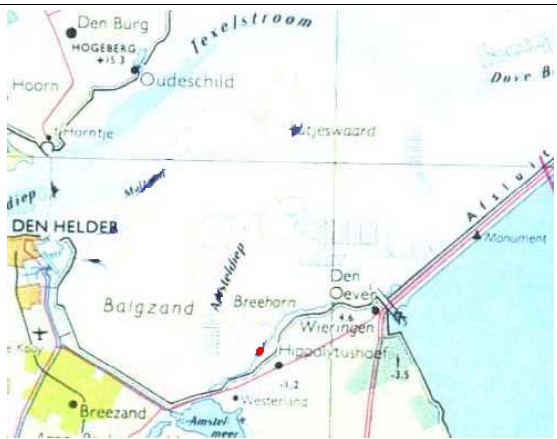
There could however be the classical non-use motives for value: altruism, care for future generations, perception of duty towards the environment, ... Given this context, the economic questions that we want to answer in this study are the following: What is the economic value of such a site? Is there a social demand for sites such as Normerven? How much public money could we spend on them?
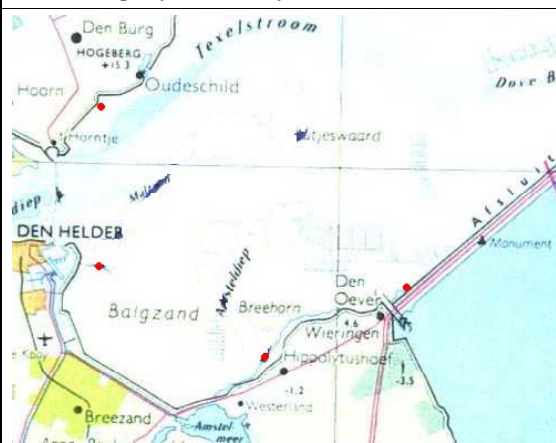
Since building Normerven has had no market impact, only "stated preferences" methods of valuation could be used. That means designing a survey, and in particular a valuation scenario. This is explained in the next chapter.

3. Survey design and administration

The essential valuation scenario is that the survey respondents are told that the government of the province may plan to build 1 to 10 new sites similar to Normerven (the province is the relevant decisional body for that level of environment in the Netherlands).

The easiest way to present the survey design is probably to show an actual valuation situation. In this survey, value was elicited through a dichotomous choice question. The respondents were asked to choose between an alternative plan (1 to 10 new sites at a certain cost) and the classical "do-nothing" plan, that is not building any more site (that has a cost of zero). Each respondent was shown 1 out of 14 possible alternatives and had to choose between this alternative and the classical "do-nothing" option, that is 2 cards. Below such a choice situation is reproduced. The respondents were also explicitly offered the choice of refusing to choose (see the NOAA panel recommendations, 1993). Before arriving to that question, the respondents were thoroughly described the site of Normerven and its history.

Alternative "Only Normerven"	
Cost for a household like yours	0 € because it is already paid for (by Rijkswaterstaat)
total for the Region	0 €
Area: Normerven (the red dot) **Size**: 1.87 ha = about 2000 to 3000 nesting birds (Waddenzee: 300 to 350 000)	

Alternative : 3 new sites + Normerven	
Cost for a household like yours	12 € per year for 10 years = 120 €
total for the Region	840 000 € per year for 10 years = 8 400 000 €
Area: 4 sites including Normerven itself (the red dots) **Size**: each site has same size as Normerven = about 6 – 10 ha = about 8000 to 12 000 nesting birds (Waddenzee: 300 to 350 000)	

Picture 2. A typical choice situation

As can be seen in the picture, the respondent were indicated the cost of each alternative, as well as the geographical location of each site and the expected number of breeding pairs of birds. The latter is actually somewhat optimistic, but biologists in the DELOS project deemed it was not unreasonable. Members of Delft Hydraulics participating in the DELOS project considered that it was possible to replicate Normerven at each location on the map.

Picture 1 is only an example of a situation of choice. There were 13 other such choice situations in which the number of new sites could be 1, 3, 5 or 10, and the cost could range from 6 Euros per year to 150. The "cost" of building more sites is called the bid in this context because the

interest is to find out the respondents' value for the alternative shown, as if the interviewer was "selling" it. In other words, the bid bears no relationship to the actual cost of constructing the sites.

The choice situation was repeated 3 times in total to increase the available information per respondent. Each choice situation was between "do-nothing" and one out of 14 alternatives. The respondents believed there were only 3 possible alternatives, they were told so in advance, but they were not told exactly which ones. Therefore, the choices were sequential and not simultaneous. At any moment when they were choosing, the respondents only had 2 cards in front of them: the "do-nothing" alternative card describing Normerven (as reproduced above) and a card representing another alternative. It is important to avoid showing "dominated alternatives" to the respondents. An example of dominated alternatives would be, e.g., a choice between "do-nothing" and 5 new sites at a cost of 12 Euros followed by a choice between "do-nothing" and 3 new sites at a cost of 12 Euros. That would not have been credible.

After these 3 choices, the respondents were asked to rank-order the 4 alternatives that they had been shown ("do-nothing" + 3 "do-something" alternatives). This rank-order can be used in a variety of way, among others, as an evidence of value (using the models of the choice experiment literature), or as a consistency check (whether the dichotomous choices are consistent with the rank-order).

Other important aspects of the survey design, especially for credibility reasons, are described below.

The payment vehicle must be feasible. We chose the real estate tax for essentially two reasons. First it is paid by every household in the Netherlands since it affects both owned and rented property. Second, it is one of the very few taxes that could conceivably be modified at the local level (assuming that the provincial government would agree with the regional government).

Following the NOAA panel (from here on referred to as the Panel) recommendations (1993), in a contingent valuation, one should always use a referendum context for credibility. A referendum context means that the respondents should be told explicitly to imagine that there is a referendum being organised on the subject of choice being described in the survey. In other words, in our case, that there is a referendum on whether or not to build new sites similar to Normerven. The motivations of the Panel were clearly that explicit reference to a referendum would minimize strategic behaviour. Such a behaviour has to be understood as any answer not corresponding to a truthful revelation of preferences, for whatever reason the respondent may see fit. Since then, it has indeed been demonstrated that the incentive properties of a hypothetical survey referendum with two options were identical to those of a real-world, full-scale, referendum provided certain minimal

conditions were met (see Carson, Groves, Machina, 2000). Therefore, from the respondent's point of view, it is optimal to answer truthfully in such a situation.

However, this is a theoretical result, and the recommendation seemed strange for European countries in which referenda are exceptional (i.e. joining the EU) or even illegal, especially compared to the US, were referenda are very common (i.e. determining the local school budget). We therefore feared that explicit reference to a referendum could distort the image of the good to value.

To answer this concern thoroughly, we split our sample in 5 and each subsample was given a different context: Referendum, Opinion poll, Consultative referendum, Donation, and No context. In each case, the wording of the whole survey was identical but for a few sentence that described the context. In the "No context" situation, the valuation questions were asked without reference to any context. In the "Donation" situation, instead of a change in the real estate tax, we suggested that the Province could not raise enough money but was encouraging Environmental organisations to take up the project, that would then be financed through donations. In the "Opinion poll" situation, we suggested that the Province was organising an opinion poll but without committing to its results. Finally, the "Consultative referendum" (or Consultation) was described as similar to an opinion poll, but for which it was more difficult for the Province not to follow the results. To sum up, leaving aside the Donation context, one could think of each context in term of 2 dimensions, as described in the following table.

Table 2. Decision contexts

Context	Government commitment	Credibility
Referendum	Complete	Very low
Consultative referendum	High	Low
Opinion poll	Medium	Medium
No context	Low	High

Each valuation choice was followed by an open-ended question in which the respondent were invited to indicate the motives of their choice.

Both before and after the choice valuation questions, the survey contained socio-economic questions. We also asked a series of attitude and belief questions following the Ajzen-Fishbein theory (see Ajzen et al. 1996, for the application in contingent valuation surveys). In these questions, the respondents are prompted to answer according to a scale of 5 steps from "strongly agree" to "strongly disagree". Some examples are: "Being able to see wildlife is important", "Farming activities are a threat to fish, plants and birds on the South Waddenzee coast", "The

seabird populations in this Region should be increased substantially", or "Scientists should decide on whether to build more sites like Normerven, not the people". One of the purposes of these questions is to test the respondents' answers consistency across themselves.

The last type of questions refers to the interviewer's appraisal of the quality of the respondent's answers, and are filled in by the interviewer after completion of the survey.

4. Survey administration

We first ran several focus groups to test the survey understanding. Budget constrained us to use undergraduate students as interviewers. They were properly briefed on the survey and had some training.

The sample was selected randomly from the census file of the North region of the North-Holland province. Each potential respondent received a letter informing them that an interviewer from the University of Twente would pay them a visit about a survey on the environment of this region. When the interviewers did not find anybody at home, they would leave a note in the mail stating what day and time they would show up again. If the person was still unavailable, the interviewer intended to conclude an appointment. In some cases, the respondents manifested their desire to know about the results of the survey (about 15%). They were told a report would be sent after completion (that has been done). Sometimes, in a single household, another person would express her desire to answer the survey. That was normally granted, but the decision context was changed. Whenever possible, the interviewer would intend to interview a man rather than a woman to try to overcome the well-known bias that women are more often present at home than men.

The actual survey was run sequentially to find the best bids, that is the survey was administered in rounds of about 100 questionnaires (see e.g. Hanemann and Kanninen, 1999, for a survey). After each round, a brief analysis of the answers to the bids made it possible to update them. Only one bid update occurred, between the 2nd and 3rd rounds, from a bid vector of 6, 12, 24, 50, 80 to 6, 18, 40, 80, 150.

We obtained 600 observations, out of which some 73 have some problems for the valuation questions. The most typical problem is that the interviewer made some mistake in the alternatives that had to be shown to the respondents, resulting in dominated alternatives. Out of these 73 observations with errors, it is still possible to extract some information: the first valuation question is always proper (because the valuation questions were asked sequentially), and sometimes the 2nd valuation is also proper (this is the case when there is no domination between the 1st and the 2nd

valuation questions). Out of the remaining 527 observations, 85 have CV answers that are inconsistent with the rank order answers. There remains 442 observations, and since each such observation has 3 valuation choices, this is 1311 lines of data.

5. Descriptive statistics

First, we present a series of descriptive statistics on the whole sample of 600 observations.

Table 3. Socio-economic data by categories.

Category	Household size over age 18	# of children	Education level	# of cars owned
0	-	408	-	103
1	111	70	75	378
2	407	84	253	106
3	52	27	144	8
4	25	8	128	3
5	3	3	-	0
6	1	0	-	2
7	1	0	-	0

The table shows that the typical household in the sample is composed of 2 members without children. Regarding education levels, level 1 can be considered the lowest, 4 the highest. We intended the number of owned cars as an income proxy.

Table 4. Socio-economic dichotomous variables

	No	Yes
Belong to a bird viewing organisation	571	29
Belong to an environmental organisation	365	235
Belong to a political party	551	49
Watch nature documentaries on television at least once a week	199	401
Participate to recycling	77	523
Own the place they live in	218	382
Work part- or full-time	295	305
At least a "large" part of leisure spent outdoors	323	277
Spent some time viewing or photographing birds or wildlife in the Netherlands during the last 12 months	329	271

These statistics show that even if most respondents do not belong to a bird viewing organisation or a political party, nearly 40% belong to an environmental organisation and about 2/3

watch nature documentaries at least once a week. Most participate to some level of recycling; 2/3 own their house, about one half has a paid job; the same proportion spends at least a large part (more than one half) of their leisure time outdoors, and spent some time viewing birds during the last 12 months.

Table 5. Distribution of household income across the sample.

Categories (€ per month, net of tax)	#
Not communicated	92
Les than 700	11
701-999	39
1,000-1,199	46
1,200-1,499	65
1,500-1,699	49
1,700-1,999	63
2,000-2,199	45
2,200-2,499	67
2,500-3,499	60
More than 3,500	63

The income categories are the usual ones in the Netherlands. Only about 15% of the sample refused to state any income.

Table 6. Interviewer's post-interview impressions

	Yes	No	Other
Understood all questions	520	43	37
Answered all questions sincerely	553	11	36
Answered globally very well or well	196	315	89
In the valuation question, the respondents thought carefully or were confident	539	14	47
There was a third person present at some point of the interview	299	261	40

The "Other" category is most often that there is no information because the interviewer forgot to fill it in. The table shows a level of interviewer's confidence in the respondents' answer, especially regarding the valuation questions, even though there are some imperfections.

The next table presents a summary of the Attitude and Belief questions from the Ajzen-Fishbein theory of planned behaviour. We have grouped them in 4 indices. Each index is the sum of a number of dichotomous variables. Each dichotomous variable takes the value 1 for each "Agree" or "Strongly agree" attitude and belief question.

Table 7. Ajzen-Fishbein variables summary indices

Index value	# of threats to the environment	# of aspects on which we should help the environment	Aspects of the role of citizen in society	Recreational aspects of the environment
-3	-	2	-	-
-2	-	3	-	-
-1	-	5	-	-
0	2	16	29	15
1	8	17	97	113
2	22	20	181	332
3	50	47	293	140
4	94	67	-	-
5	129	74	-	-
6	113	97	-	-
7	98	85	-	-
8	62	99	-	-
9	22	56	-	-
10	-	12	-	-
# dichotomous variables	9	15 (some count as negative)	3	3

In the sequel, we focus on descriptive statistics about the valuation choices. We first start with the motives for valuing.

Table 8. The motives for valuing

		Competing uses	Enough environment	Expensive	Leave nature alone	Mistrust	No use = no value	Others should decide	Others should pay	Unimportant	Too many sites	Care environment	Cheapest of 3	Future	General good cause	Other	No motive
Alternative 1	% Yes											77.9	0.3	12.7	23.4	2.3	4.3
	% No	4.8	9.6	52.2	7.9	10.5	2.2	1.8	25.9	2.6	3.1					3.1	4.4
Alternative 2	% Yes											71.3	0.0	9.5	28.0	3.3	6.2
	% No	3.2	8.7	53.2	6.3	11.1	2.8	0.8	21.0	3.2	3.6					2.8	5.2
Alternative 3	% Yes											65.0	0.4	8.2	29.2	1.9	9.7
	% No	3.3	7.0	52.6	7.8	8.5	1.5	1.5	20.4	2.6	5.9					4.1	7.8
All alternatives	% Yes											71.7	0.2	10.2	26.7	2.5	6.6
	% No	3.7	8.4	52.7	7.3	10.0	2.1	1.3	22.3	2.8	4.3					3.3	5.9

Table 3 is based on the valid valuation choices (527 observations, see previous chapter) shows the percentages of each motive in the group of "Yes" or of "No" answer. The motive

questions were open-ended; the interviewers categorised the answers in 32 classes, which have been grouped here. Few people (5 to 7 %) gave no motive for their valuation choices. Some respondents gave more than one motives, thus the row of table 3 sum to more than 100%. There were only about 3% of the motives that did not belong to any category.

The main motive (52.5 %) for a No answer (that is: "do not build more sites such as Normerven") is the cost, that is the category "Expensive" in Table 3 above. Next (22.8) is a motive that others should pay, such as the government, the minister of public work, environmental organisations, …. Then, with 10.2 %, the respondents have some level of mistrust either in the survey, in the government or in the tax system. There is already enough environment (8.6%) occupies the 4th rank and the last of the "main" motives for a No answer is that the people should leave nature alone. The remaining motives are below 5%.

The motives for a Yes answer, that is, build more sites similar to Normerven, are first (71.2%) a more or less specific feeling of care for the environment, through for example a love for birds, the belief that nature should be given more space, or that we should restore our environment. The second motive (26.9%) is an unspecified "good cause", and then (10.1%) a concern for the future.

In the next table, we examine the distribution of Yes answers to the valuation questions accordingly with the number of sites and the bid. This table is based on the 442 observations that are both valid and consistent as defined in the previous section, but the figures without removing the inconsistent observations are quite similar.

Table 9. The valuation choices

Relative frequencies of Yes					
Bid	# extra sites				# Observations
	1	3	5	10	
6	0.72	0.76			292
12	0.57	0.68	0.56		77
18	0.62	0.64	0.72		184
24	0.40	0.57	0.42	0.40	86
40	0.57	0.56	0.53	0.29	204
50		0.50	0.45	0.39	75
80		0.53	0.45	0.33	243
150			0.43	0.24	165

Table 9 indicates e.g. that for a bid of 6 Euros, there is a 72% of yes answers when the alternative is about a single additional site and 76% when the alternative has 3 additional sites. The empty cells are empty by design, e.g. if we had an alternative with 5 extra sites with a bid of 6, then in a set 3 alternatives, at least one would have to be dominated in the sense defined before. The

column on the right shows the number of respondents for each bid category. The figure in red are counter-intuitive: when the bid increases, at a given number of sites, the proportion of yes answers should decrease. In general that is quite true, and a more formal analysis will show a very significant effect of the bid in that direction.

One might also expect that when the number of sites increases, the proportion of yes should also increase. That could be the general economic intuition for private goods, or for public goods not susceptible to congestion, but that is not true in general. In the case of a natural area, when it becomes bigger, it starts competing with other uses, or in our case, birds may become invasive. It is also possible that a large increase in the number of sites be perceived as risky in the sense that it may induce some ecological imbalance. Therefore, it is indeed possible that the utility of 10 additional sites is actually lower than that of 5 new sites. In other words, the last 5 sites have a negative utility. That seems to be the case with our data since one can see clearly an increase of the proportion of yes from 1 additional site to 5 additional sites, but a decrease from 5 to 10 additional sites.

This phenomenon should not be confused with a scope effect: when a valuation shows a lack of scope effect, it means that value is insensitive to size of the public goods (e.g. 2000 additional birds has the same value as 200 000). There is a strong scope effect in our data.

However, given this profile of the proportion of yes in our sample, one could wonder if the respondents are not simply aiming for the centre of the interval of sites. Our survey was not designed to spot such behaviour: all the respondents were told that the number of new sites would be 1 to 10. To find reasons to reject that kind of behaviour, one can look at a variety of statistics in our data. First, there is a large proportion of individuals who motivate their answers (aiming for the central number of sites would not be motivated). Second, there are actually 16% of the No answers that have motives related to the congestion phenomenon described above (see table 3: motives "Competing uses", "Enough environment", "Too many sites"). Further arguments on whether the respondents have actual preferences on the number of sites are presented in the next table.

Table 10. Preferences and the number of sites

Preferences across the number of sites		Ranking according to efficiency	
# extra sites	% of all the choices	% of respondents	Type of rank
0	0.30	0.06	Rank according to efficiency
1	0.13	0.07	Most efficient, then "do-nothing"
3	0.25	0.16	"Do-nothing", then most efficient
5	0.20	0.15	"Do-nothing", then not most efficient
10	0.12	0.57	Choose a different type of ranking
	1.00	1.00	

The left-hand side of table 10 indicates that, apart from the "do-nothing" option, 3 extra sites is the best preferred alternative over all costs and decision contexts (alternative 5 would correspond better to the centre of the interval of 1 to 10 possible sites). However that statistic does not account for the correlation between the number of sites and the bid (about 70%). The right-hand side of table 10 addresses the issue that the respondents may not have real preferences across the number of sites indirectly through the cost of the alternatives. Because we have seen that the respondents do hold preferences over the cost of the extra alternatives, if they did not have an actual preferences across the number of sites, they would choose the most efficient alternative, that is the one with the lowest per site cost. In other words, if the respondents had no preferences over the number of sites, they would compute the cost of an extra site in each alternative and rank first the one with the least cost, then accordingly with this efficiency criterion. The "do-nothing" alternative could be ranked anywhere among the other alternatives, indicating a "do-something" threshold.

The right-hand side of table 10 indicates that roughly one third of the respondents may behave in this way (the first 3 categories of the table), while the remaining 2/3 choose differently. Therefore it appears that most respondents hold true preferences over the number of sites, that is, that the number of sites is a relevant dimension of the choice in this survey, even when one accounts for the correlation between the number of sites and the bid.

To conclude this section on the description of the data, the following table shows the effect of the decision contexts on the observed proportions of yes answers.

Table 11. Effect of the decision context

Social context	No context	Opinion poll	Consultation	Referendum	Donation
Proportion of Yes	0.40	0.59	0.63	0.55	0.46
# of observations	270	276	297	273	210

Even without any more formal analysis, it is very clear that there are significant differences across contexts. The lowest proportion of yes is attained when no context is specified, the highest when the opinion poll or consultation contexts are used. A donation produces a surprisingly low proportion of yes. It is surprising because the general feeling in the literature is that respondents tend to be over-generous in their stated donations (although all the evidence comes from outside the Netherlands). The referendum context produces a proportion of yes which is median.

6. Regression model

In this section, we present the results of the econometric analysis. The types of models that have been investigated are the following.

"One response is one observation" models, that is models that considers that each answer is independent of the other. Panel data models in which it is explicitly taken into account that each respondent gives 3 valuation choices. Markov chain models in which it is assumed that each respondent's valuation choice is correlated to his previous choice. The results indicate that the Markov chain models are inappropriate, that is, there is no correlation between valuation choices; and the panel data models produces results similar to the "one response one observation" models. These are surprising results since they indicate that we can treat each observation as independent from the others.

Regarding the stochastic distributions, we have used the Logistic, Log-Logistic, Normal, Log-Normal, and Weibul as is usual in the contingent valuation literature (see Hanemann and Kanninen, 1999). The preferred distribution is the log-normal.

The criteria for model selection are the replication of the observed proportions of Yes answers and the likelihood of the models. The regressors have been selected using t-tests and likelihood ratio tests.

The regression model that was finally selected is the following.

$$\Pr\{No\} = \Phi\left(\alpha + \alpha_1\left(Site - 7\right)^2 + \sum_j \alpha_j Context_j + \sum_k \alpha_k X_k + \beta \ln\left(Bid\right)\right) \qquad (1)$$

Income is a special regressor in this report because of the missing values. To be brief, with the current data set it is not possible to convincingly predict the missing income. Therefore, either we use a smaller sample and income can be used as regressor, or we use a larger sample but exclude income from the regressor. It turns out that the results are not qualitatively very different, as shown in the next table.

Table 12. Empirical estimates of the coefficients of equation (1)

Regressors	Coefficient	P-value	Coefficient	P-value
Constant	-0.510	0.053	-0.353	0.217
ln(bid)	-0.354	0.000	-0.387	0.000
# sites - 7	-0.069	0.000	-0.063	0.001
(# sites - 7)²	-0.008	0.067	-0.008	0.072
Context	Reference: No context and Donation			
Opinion poll dummy	0.323	0.001	0.355	0.001
Consultation dummy	0.471	0.000	0.487	0.000
Referendum dummy	0.232	0.018	0.325	0.002
Socio economics variables (See Tables 3, 4, 5)				
Member of an environmental organisation	0.224	0.002	0.223	0.005
Number of owned cars	-0.127	0.011	-0.135	0.018
Has a paid job	0.274	0.000	0.183	0.028
Spends a large part of leisure time outdoors	0.195	0.007	0.186	0.018
Income	Not applicable		0.000101	0.041
Ajzen-Fishbein variables summary indices (see Table 7)				
Threat	0.055	0.009	Not significant	
Help	0.175	0.000	0.198	0.000
n	1581		1350	
LogLikelihood	-866.86		-728.31	
Restricted LogLikelihood	-1093.79		-931.26	

The effect of the bid is very significant and in the expected direction. There is a very significant effect of the normalised number of sites and a weakly significant effect of the squared number of sites. Jointly, these two variables imply that there can be "too many new sites", that is, when the normalised number of sites is close to the zero the probability of a Yes answer is maximal. Regarding the decision contexts, there is no significant difference between the donation context and the absence of a context. Likelihood ratio tests can be used to show that the three other contexts can be pooled together without significant difference, but that they cannot be dropped from the regression, neither individually nor jointly. Therefore, globally the contexts are very significant, but there is in fact only 2 groups: No context and Donation on the one side, Opinion poll, Consultation and Referendum on the other.

The interpretation of the remaining regressors is more straightforward. Members of environmental organisations tend to be more likely to answer Yes, as are people who work, part or full time, people who spend a large part of their leisure outdoors, and people with a higher income. More surprising maybe is that the more cars owned the less likely to answer Yes. This variable was originally only intended as an income proxy, but it seems to capture something different, maybe a kind of disregard toward the environment.

The Ajzen-Fishbein variables summary indices have the expected sign. The variable "threats" is composed of the respondent's opinion of what constitutes a threats for the environment. Thus a positive sign indicates that the more perceived threats, the more likely a Yes answer. The variable "help" is constructed similarly, but instead if threats, it is composed of aspects on which the environment should be "helped", e.g. "we should give more room to Nature", "the conditions for seabirds are bad in this region", … Since this variable has a positive sign, it shows that respondents who think that many aspects of the environment should be "helped (protected or generally intervened) are more likely to answer Yes.

As mentioned in the end of section 4, after the contingent valuation (CV) questions, the respondents were asked to rank-order the alternatives. In the sample of 527 respondents that has been used up to here, there are 85 for whom the CV answers are not consistent with the rank-order. It turns out that there is no significant difference if we exclude observations that are inconsistent.

With the previous discussion in mind, it is interesting to examine the regressors that have turned out to be insignificant. The square of bid is insignificant, indicating there is no quadratic effect of the bid. Are also insignificant, the logarithm of the number of sites, measures of "efficiency" as referred to earlier in this report, multiplicative effects between context, bid, and sites. In the socio-economics variables, Education, Household size, Number of children, Membership to a political party, House ownership, Watching nature documentaries, and whether the respondent has spent some time watching bird during the past 12 months, are insignificant. Finally, the interview month is also insignificant.

8. Welfare measurement

The model that has been defined above is a RUM (Random Utility Model). It is compatible with economic theory and can be used to extract a welfare measure as shown by Hanemann (1984). The relevant welfare measure in this case is the willingness to pay (WTP) because the survey depicts a situation in which the respondents do not own the additional natural areas and may (collectively) decide whether to acquire them or not. The way to compute the welfare is summarized below. We are only interested in estimating the individual WTP. A further step in a cost-benefit analysis would be to compute the total value for the Province (since in our case the financing institution is the Province) and compare it with the cost.

Pr{Yes|Bid}=Pr{WTP>Bid}

Let WTP be a random variable with E(WTP)=μ and var(WTP)=σ

Pr{Yes|Bid}=Pr{(WTP-μ)/σ>(Bid-μ)/σ}

Assume (WTP-μ)/σ ~ std normal

Then E(WTP)=Median(WTP)= -μ/σ

The Median(WTP) is the Amount such that Prob(Yes)=.5. This is a more robust statistic than E(WTP). For computing welfare measures in the case of an asymmetric distribution such as the one we have used, the estimated expected WTP is often very large. This is because the tail of the distribution is skewed to right, where there is no data to fit it. Therefore, the empirical model can have a very fat tail without any penalty on any goodness of fit measures. It is possible to use truncated models, but the choice of the truncation point is often arbitrary. Instead, one can use the median WTP.

Our model is asymmetric because we use Pr{Yes|Bid}=Pr{WTP>ln(Bid)}, the logarithm induces the asymmetry. When we assume that ln(bid) is normal, then the Median WTP = Exp(-μ/σ).

This is however a non-linear function of μ and σ, and thus computing it at the sample average is usually quite different as first computing the welfare for each individual in the sample and then taking the average. What we did was to compute the median WTP for each individual in the sample for each decision context and for 0, 1, 3, 5 and 10 new sites on top of Normerven. Then we took the median over the sample. The results, with and without the income variable, are presented in the next two pictures.

Picture 2. Median WTP over the sample, excluding income (see Table 12)

44
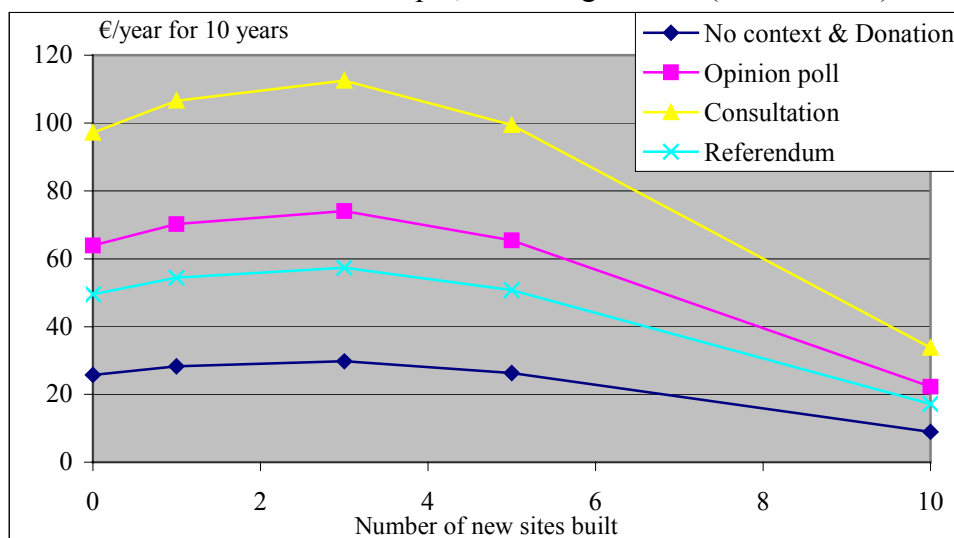
Picture 3. Median WTP over the sample, including income (see Table 12)
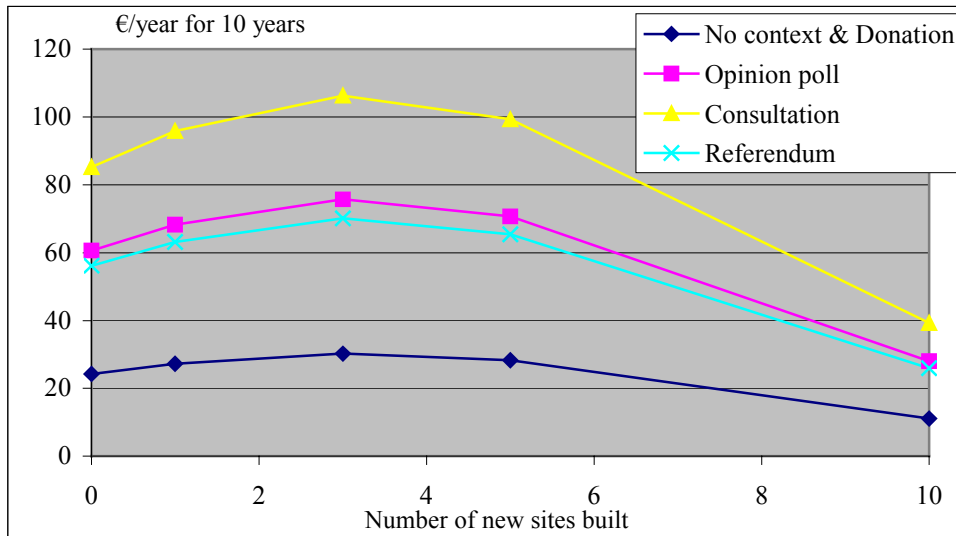
The pictures are quite similar and are in line with the regression analysis: the decision contexts which had the largest positive coefficients coincide with the largest value. The respondents do not distinguish between no context and donation. Although this is not apparent from the pictures, there is no significant differences between the Opinion poll, Consultation and Referendum contexts, even though the likelihood that the respondent's votes be taken into account is not the same in all three contexts. Therefore there is essentially only two groups of contexts: with and without government intervention, with welfare being higher in the former case. Also, quite in contrast to the NOAA Panel expectation, the referendum context does not produce the most conservative welfare estimate.

The value of the original Normerven itself can be extrapolated as shown in the pictures. It is apparent that it was this first site that generated most value. From there, the WTP follows a quadratic curve that culminates at 3 new sites than starts decreasing (5 sites are still worth more than one site). We will come back on these points in the next chapter.

9. Conclusion

Increasing the number of "Normerven sites" is positively valued up to a point only. As discussed already after Table 9, one should not be surprised of this phenomenon: Space is competing with other uses and non-uses, thus there can be too many bird areas similar to Normerven.

The decision context causes significant differences in stated values. As argued in the previous chapter, the key seems to be whether there is explicit government intervention in the

decision to provide the new areas. When there is, the stated WTP is higher. Is that due to strategic behaviour or to genuine differences, that is are there different values in different social contexts?

Strategic behaviour would be that when the respondent's answers are more likely to influence the outcome, the value is lower. In other words, when the respondent is unlikely to influence the outcome, he has a "moral free lunch" and says yes to any good cause. That option is not easy to exclude because the incentive properties of an opinion poll and of a referendum are quite similar (see Carson, Groves and Machina, 2000) provided the respondent has "some" chance to influence the decision of whether or not to build more sites. The incentive properties of a donation are however quite different. Even though one may think that stating that one would donate is close to a moral free lunch, one should remember that nearly 40% of the sample belongs to an environmental organisation and that charities are very active in the Netherlands. Since the respondent was actually identified (he had been contacted by mail), we cannot reject the hypothesis that the respondents who were submitted to the donation context thought they would actually be asked to pay what they stated. The abundance of charities in the Netherlands may also explain why the absence of context produces the same results as the donation context.

On the other hand, it may also be that respondents care about the way in which the public good is provided: not only the end, but also the mean. That would be a genuine difference. To explain our results in that sense, one could consider that the respondents value more highly a public good when it is provided in a more participatory approach. Higher value due to participation has bee shown in Pouta et al. (2002). In our case, one could say the Opinion poll, the Consultation and the Referendum contexts are the most participatory because both the government and the respondents are intervening in the decision process. A donation is a private provision of a public good, so it is quite less participatory. The absence of context could be interpreted as worst possibly because no other actor in the decision process is mentioned.

Given this set of data, none of the these two stories can be rejected; it may even be that the results are caused by a mixture of the two. Whatever the reason, if a contingent valuation survey aims at finding the most conservative estimate of value for a public good, then, at least in the Netherlands, it does not seem a good idea to follow the NOAA Panel recommendation about the referendum format since it leads to a significantly higher estimate than e.g. a donation context, or not mentioning a context at all. Of course, that recommendation has been designed for the US, so it is not questioned here. What is cast into doubt is their universality as a guidelines for designing contingent valuation surveys in different countries.

Regarding the DELOS project, this study has shown several things that may be important in the design of coastal defence in general and of Low Crested Structure in particular. First it has been shown that it is possible to value Low Crested Structures even when they do not have any market impact. Second, that the context in which a defence is provided is important. Third, that there can be "too much of a good thing", that is, it is not because one defence site has been highly valued that replication of it will have the same value. It is even possible that excess defence causes congestion and that adding more defence sites decreases the value of the whole. The latter is of course a critical argument against the transfer of benefit for constructions such as a coastal defence.

10. References

Ajzen, I, Brown, T. C., Rosenthal, L. H., 1996. Information Bias in Contingent Valuation: Effects of Personal Relevance, Quality of Information, and Motivational Orientation. *Journal of Environmental Economics and Management* 30 (1996) 53-57.

Carson, R. T., Groves, T. and Machina, M. J., 2000. Incentive and Informational Properties of Preference Questions. Department of Economics, University of California at San Diego, draft available at weber.ucsd.edu/~rcarson.

Hanemann, W. M., and B. Kanninen. "The Statistical Analysis of Discrete-Response CV Data." *Valuing Environmental Preferences: Theory and Practice of the CVM in the US, EU and Developing Countries* I. Bateman, and K. Willis eds. Oxford University Press, 2001.

Hanemann, W. Michael. 1984. "Welfare Evaluations in Contingent Valuation Experiments with Discrete Responses." *American Journal of Agricultural Economics*. 66:332-341.

NOAA Panel (Arrow, K., Solow, R., Portney, P. R., Leamer, E. E., Radner, R. and Schuman, H.), 1993. Report of the NOAA Panel on Contingent Valuation. Federal Register, 58, 4602-14.

Pouta, E., Rekola, M., Kuuluvainen, J., Li,C., and Tahvonen, O., 2002. Willingness to pay in different policy-planning methods: insights into respondents' decision-making processes. *Ecological Economics* 40 (2002) 295–311.