TECHNICAL REPORT B

Willingness to pay for the conservation and management of wild geese in Scotland

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1.   Introduction

In past times wild geese were an important resource, providing a source of meat, grease for lubrication and waterproofing, and feathers for bedding and arrow flights. Today, with the sale of goose meat no longer allowed in law, the only current market for geese is commercial shooting of non-endangered species such as the pink-footed goose.

However, there are other benefits associated with geese which are not priced in the market place, but are valued. For example, some people positively value the opportunity to observe geese in the wild (a use-value), while others may take pleasure from simply knowing that they exist (a non-use value). These benefits cannot be provided by conventional markets because it would be prohibitively expensive to exclude people from watching geese and impossible to exclude them from caring about geese.

In recent years a number of techniques such as Contingent Valuation (CV) and Choice Experiments (CE) have been established to establish the monetary values of non-market benefits. These techniques aim to measure the willingness to pay (WTP) of beneficiaries through the establishment of hypothetical markets.

In this study we apply these techniques to estimate the WTP of the public for conserving wild goose stocks in Scotland. Monetary valuation of the non-market benefits of wild geese conservation is important for several reasons:

- To help identify the optimal population of wild goose species by quantifying the marginal benefits of changes in the number of geese
- To help justify public expenditure on goose management schemes in places such as Islay.
- To assist in the selection of appropriate plans and policies for goose conservation

2.   Aims

The overall aim of this study is to estimate WTP for wild goose conservation and management in Scotland.

Specific objectives are to:

- investigate how WTP varies across different stakeholder groups (local residents, visitors and the general public)

- estimate the marginal benefits of changes in the size of the goose population

- investigate how WTP varies across different species of wild geese

- explore how WTP is influenced by attributes of goose management policy such as location and method of control

- explore the factors than influence WTP among the public

The research focuses on two sites: Islay where a compensation scheme exits for the conservation of populations of internationally protected Greenland Barnacle and Greenland White-fronted Geese and Loch of Strathbeg where quarry species such as the Greylag and Pink-footed Geese are found. The study derived estimates of WTP for three stakeholder groups: residents and visitors of the two case-study areas, and the wider Scottish population (general public).

3.   Techniques Used

We apply three techniques to value the non-market benefits of wild goose conservation. Two of these are survey-based: Choice Experiments (CE), and Contingent Valuation (CV). Both techniques involve individuals responding to questions from a professionally trained interviewer either in their own homes or on site (in the case of visitors). The third technique is called the Market Stall (MS), and provides a group setting where WTP for goose management can be discussed and considered in greater detail than is possible in a survey. A brief explanation of each technique is given below.

3.1   Choice Experiments (CE)
Typically individuals are presented with 4 to 8 choice sets, each set containing a base option and two or more policy options and asked to indicate their preferred option in each set. Each option represents a combination of 3 to 6 policy attributes which can vary across several levels. For example, one policy attribute for wild geese conservation might be 'population change' with three levels ('stay the same', 'increase by 10%', 'decrease by 10%').

The base option usually corresponds to the current situation that remains constant across all choice sets. The attributes in the remaining choice sets are then varied to allow the researcher to infer the attributes that significantly influence choice, the implied ranking of attributes, marginal WTP for changes in attribute level, and WTP for a program which changes more than one attribute simultaneously.

CE provides a statistically efficient means of estimating WTP for marginal changes in a range of attributes that are of policy interest such as endangered status, location of reserves, and habitat management.

3.2   Contingent Valuation (CV)
CV is the most established of the three methods to be used in this study. It is also a survey-based approach, but unlike CE it involves asking people directly for their WTP for a specified project or policy, rather than deriving it from choices between policy options.

The technique has been applied to a wide range of non-market resources including water and air quality, habitat and biodiversity losses, and wilderness preservation. CV will be used in this study to provide WTP estimates for four different management plans for wild geese, and to help validate marginal WTP estimates for the attributes used in the CE exercise.

3.3   The Market Stall (MS)
Concerns have been raised that surveys may not provide a suitable social context for eliciting WTP for unfamiliar environmental goods market due to constraints on time and information during an interview which may last less than 15 minutes. The MS is a group based technique that provides participants with more opportunity to gather information and to discuss and consider their WTP than is possible in a survey.

The aim is to create a more realistic market context for the hypothetical transaction by engaging a group of participants (the consumers) in a dialogue with the researcher (vendor). The vendor will answer questions and provide information about the environmental good, and the consumers will have the opportunity to discuss the good with other consumers in the group, before being asked for their WTP. Two weeks after the session, the participants will be given the opportunity to revise their WTP after discussions with family and friends. Participants were also given a diary where they could record anything they thought was relevant to wild geese and the WTP question.

MS is a new technique and it is therefore used in this study at an experimental scale as part of the calibration/validation of the CV survey estimates of WTP.

4. Questionnaire development

All three techniques outlined above rely on a questionnaire to gather data for analysis. Whereever possible, in order to achieve consistency and to avoid biasing WTP estimates, identical formats and questions were used for all techniques. Drawing on the information sets developed for the Focus Groups, and the discussions of these groups, a draft questionnaire was developed. The questionnaire consisted of four sections:

1. General questions about environmental preferences and attitude toward wildlife conservation.
2. Description of the current situation regarding the conservation and management of wild geese
3. Description of the payment method (non-specific tax increase) and the contingent choices/market
4. Validation questions (socio-economic, behavioural and attitudinal).

Due to procedural differences between the techniques the sections differed slightly in content and in structure, but not significantly. The main difference is between CE and CV survey where choice sets in the former are replaced with a WTP question in the latter.

Development and testing of CV/CE questionnaires follow four main stages information gathering, focus groups, selection of CE attributes and CV management scenarios, and finally pre-testing using both one-to-one interviews and piloting.

4.1 Information gathering

Information on all aspects of goose management and conservation was collated and evaluated. Information sources included published reports, academic papers, and key informants in the scientific, conservation and agricultural communities. These experts were able to provide a comprehensive briefing on the main policy and scientific issues including the past and present distribution of the main migratory species, population size, conservation status, feeding behaviour and damage.

4.2 Focus Groups

Focus Groups are an essential prerequisite to questionnaire development in valuation studies. The textual and visual information for each of the four main species of migratory geese (white-fronted, barnacle, greylag and pink-foot) were summarised into four 'Information Sheets' which was used to help guide the focus group discussions (see Technical Report A for further details on the Focus Group research and for copies of the Information Sheets)

The main outcomes of the Focus Group stage included:
- Identification of a range of management scenarios for the CV and MS
- Selection of attributes and attribute levels for the CE
- A clear and unambiguous information set
- A selection of appropriate visual/graphical aids for the questionnaire

- An acceptable and relevant bid vehicle
- A clear understanding of the main factors that influence WTP
- An unambiguous set of questions about attitudes and behaviour toward, and preferences for, geese conservation

4.3   Design of CV and CE scenarios

4.3.1   CV scenarios

Four different CV scenarios were designed, each one corresponding to a potential goose management project. Projects C and D were also repeated in the Market Stall experiment. The four projects are listed below:

Project A: WTP for a non-shooting policy;

Project B: WTP to avoid a 10% fall in population in all species;

Project C: WTP for a 10% rise in the population of endangered migratory species (Greenland Barnacle and Greenland Whitefronted)

Project D: WTP for a 10% rise in the population only all four main migratory species (Pink-footed, Greylag, Greenland Barnacle and Greenland Whitefronted)

WTP was elicited using a poly-chotomous choice approach which allowed individuals to give their response to eight different levels of tax ranging from 50 pence to £280 per annum per household. Four separate payment schedules were used, with tax levels allocated to each schedule randomly from a distribution generated by open-ended data. This was done to check for payment card effects[1].

Five response categories were offered to allow individuals the opportunity to express the degree of certainty they felt about their WTP. The five categories are listed below:

1. Definitely would pay (DWP)
2. Probably would pay (PWP)
3. Not sure (NS)
4. Probably not pay (PNP)
5. Definitely not pay (DNP)

The "bid vehicle" was higher taxes: people were asked to select one of the five responses above for an increase in annual tax payments by their household, over the next 10 years. For each person, we thus obtain, for each scenario, five possible answers to eight payment questions. Prior to the eight payment questions, respondents were reminded that the money raised through the additional taxes would only be spent on goose management; that they should remember their budget constraint; and that additional uses could be found for higher tax revenues.

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[1] To minimise this possibility interviewers were asked to read out the tax levels rather than show the schedule to the respondent. The starting value for each respondent was also rotated so that starting point bias could be investigated.

4.3.2 Choice Experiment Design

The Choice Experiment (CE) was set up in a way which reflects some of the important attributes of the goose management problem. As in any choice experiment, the initial task was to:
- select the attributes (characteristics) of the resource management problem
- select the levels which these attributes could take in the experimental design, and
- decide on the "price tag" which should be attached to each combination of levels and attributes.

The selection of attributes and their levels was influenced by the focus group discussions, relevance to policy, and statistical efficiency. The five attributes finally selected and their respective levels are summarised in Table 4.1.

Table 4.1 Attributes and levels used in the Choice Experiment	
Attribute	Level
Species	Endangered species only
	All species
Location	Special reserves only
	All locations in Scotland
Method of Control	Habitat management only
	Shooting and habitat management
Population Change	Small fall (-10%)
	Stay the same (0%)
	Small rise (+10%)
	Moderate rise (+25%)
	Large rise (+50%)
Tax	£1; £5; £10; £20; £35; £60

This mix of attributes is intended to capture those features of the goose management "problem" that government is able to at least partially influence through policy design, as well as the costs of policy to the taxpayer.

These attributes and levels were then combined into a series of three-way choices (confusingly referred to as choice pairs!). In each pair, the respondent was offered two alternative policy designs (Policy A and Policy B), and asked whether they preferred either to the status quo (which is effectively the "policy-off" situation).

In order to produce these combinations, SPSS Choices was used to generate a fractional factorial design. This means a design whereby an efficient sub-set of the full factorial range of combinations (equal to $(2^3 \times 5^1 \times 6^1) \times (2^3 \times 5^1 \times 6^1)$) is identified, yielding a set of 56 choice cards. An illustrative choice card is presented in Figure 4.1.

Figure 4.1: An Example Choice Experiment	
Please consider the following options:	
Policy A	**Policy B**
Species protected by policy:	Species protected by policy:
Endangered species only	**Endangered species only**
Means of control:	Means of control:
Habitat management & Shooting	**Habitat management & Shooting**
Location:	Location:
Special reserves only	**All sites in Scotland**
Population change over 10 years:	Population change over 10 years:
Stay the same	**Moderate rise (25%)**
Price per year to you over the next ten years in extra taxes: **£10**	Price per year to you over the next ten years in extra taxes: **£60**

Response: I would choose Policy A   _____
            I would choose Policy B   _____
            I would choose neither Policy A nor Policy B   _____

4.4   Testing

4.4.1   One-to-one interviews

Eight interviews were used to assess the overall performance of the questionnaire prior to piloting. This involved observing and recording verbal and visual responses of the individual to each question, followed by de-briefing. In this way problems in terms of bias, clarity and structure were identified and corrected.

4.4.2   Piloting

The questionnaire was piloted among the three target populations prior to implementation of the main CE and CV surveys in order to assess performance under field conditions and to refine recruitment and data capture procedures. A total of 20 interviews from each target population were carried out for the CE survey split evenly between the two sample sites and a further 20 for the CV questionnaire. Non-response and protest response rates were low, and no major problems were encountered during the pilot.

A copy of the questionnaire used in the CV and CE is provided in Annex 1.

5   Sampling and Implementation

5.1   Sampling Frame for CV and CE surveys

One of the aims of the study was to investigate how WTP varied across different stakeholder groups, hence the sampling strategy incorporated separate samples covering local residents and visitors (in each of the case-study areas) and the general public.

The CE and CV surveys were implemented using one-to-one interviews, with individuals selected using a quota sampling system. The numbers of useable responses for each sub-sample is given in Table 5.1. Most of the interviews took place in late Spring and early summer. However, due to problems with visitor numbers in Spring at both case study locations, a second tranche of interviewing took place in October. The CV sample was evenly divided between the four management projects.

Table 5.1 Number of CV and CE interviews			
	Location		
Target Population	Islay	Strathbeg	Scotland
Local Residents (CE)	205	196	-
Visitors (CE)	212	202	-
General Public (CE)	-	-	426
General Public (CV)	-	-	419

5.2   The Market Stall Experiment

A total of 8 Market Stall sessions were undertaken involving a total of 52 participants at the first session, and 43 people in the second (Of those unable to attend all but 1 completed the exercise either by returning their diary in the post and repeating the payment card over the phone). Participants were recruited from the general public by System Three using quota sampling. The location and size of each group meeting is given in Table 5.2.

Table 5.2: Location of MS meetings and number of participants		
Location	Number: Session 1	Number: Session 2
Aberdeen 1	7	7
Aberdeen 2	6	6
Dumfries 1	7	5
Dumfries 2	6	4
Nairn 1	6	6
Nairn 2	8	7
East Kilbride 1	7	4
East Kilbride 2	5	4
Total	**52**	**43**

6.   Contingent Valuation Results

6.1   Representativeness of sample
Table 6.1 gives socio-economic descriptors for each of the four sub-samples, and compares this with national-level data. As may be seen, the only major area where the sample data is consistently unrepresentative of the national population is in terms of the highest household income bracket (>£45,000).

6.2   Attitudes to the environment and to wildlife protection
The questionnaire asked respondents a number of questions investigating their attitudes to the environment in general, and to wildlife protection in particular. In Table 6.2, we see that countryside management is given a low overall priority as a primary objective of government policy (compared with, say, health and education). Table 6.3 shows that, within the broad field of countryside management, protecting wildlife is the 3rd highest-rated objective, coming lower down than providing employment (1st) and producing food (2nd), but higher than providing recreational access opportunities or protecting cultural heritage. Amongst wildlife conservation policies (Table 6.4), protecting wild geese does not score very highly (only re-introducing beaver comes lower), with policy initiatives on native forests, fish stocks and birds of prey all rated as more important. This may relate both to respondents' preferences for geese versus birds of prey (say), but also to how large a risk they currently perceive is attached to geese numbers (and thus the perceived need for government action).

Finally (Table 6.5), it is interesting to note people's views on the relationship between farmers and the environment. Respondents were asked how strongly they agreed or dis-agreed with the following statements:

- The preservation of wildlife is important for the benefit of future generations
- The government should pay farmers to manage countryside and wildlife
- The government should compensate farmers for any damage caused by wildlife
- Farmers should be allowed to kill wildlife that cause damage to crops

The highest level of disagreement were with the last 2 statements, ie that farmers should be compensated for damages, or that they should be allowed to kill wildlife that damage crops. This is an interesting perspective on perceived property rights over wildlife on farmland. Strongest support came for the importance of wildlife for future generations (93% of respondents agreed with this).

Table 6.1 Representativeness of sample data						
			Project A	Project B	Project C	Project D
	National %	All Surveys %	No Shootng %	10% fall in endangered %	10% rise endangered %	10% rise all species %
n		419	108	106	106	99
Gender						
Male	49.1	50.1	48.1	49.1	49.1	54.5
Female	50.9	49.9	51.9	50.9	50.9	45.5
Age						
18-34	31.2	25.3	26.9	23.6	27.4	23.2
35-44	18.1	18.9	22.2	16.0	23.6	13.1
45-54	17.0	17.2	11.1	17.0	16.0	25.3
55-64	12.9	16.2	16.7	17.9	15.1	15.2
65+	20.8	22.4	23.1	25.5	17.9	23.2
Social grade						
A and B	20.8	22.7	30.6	23.6	16.0	20.2
C1	27.8	28.6	23.1	29.2	34.9	27.3
C2	22.2	19.6	24.1	20.8	17.0	16.2
D and E	29.4	29.1	22.2	26.4	32.1	36.4
H/hold income	14	12.9	11.8	15.1	12.3	12.3
<5000	27	33.1	26.3	31.5	38.5	37.0
5000 –	25	22.0	17.1	26.0	20.0	24.7
15000	13	15.0	19.7	11.0	15.4	13.7
15000-25000	8	10.5	18.4	12.3	4.6	5.5
25000-35000	12	6.5	6.5	4.1	9.2	6.9
35000-45000						
>45000						

Notes:

Household income - survey percentages shown here exclude respondents who refused to give their household income. All national data has been derived from the Lifestyle Pocket Book 1998 (AA, 1999) with the exception of household income data which has been interpolated from information found in Regional Trends 1999 (ONS, 1999).

Table 6.2: General priorities for government spending						
	Health	Defence	country-side manage-ment	crime prevention	education	Overseas develop-ment
top priority	68	1	1	8	21	0
Bottom priority	0	15	10	1	1	72

note: figures are % of respondents in each cell

Table 6.3: Opinions on countryside policy						
	preserving trad. land-scapes	protect. cultural heritage	provide recreation opport-unities	protect wildlife	provide jobs	Protect rural comm-unities	produce food
% rating	29	24	25	47	62	35	53

Note: this rating refers to the category : "very high importance"

Table 6.4: Relative importance of wildlife policy objectives						
	protect birds of prey	Re-introduce beavers	protect fish stocks	protect wild geese	ban fox hunting	protect native forests
% rating	42	12	49	17	38	48

Note: this rating refers to the category : "very high importance"

Table 6.5: Opinions on farming and wildlife interactions				
	Preserving wildlife is impt.	Farmers should be paid to manage wildlife	Farmers should be compensated	Farmers allowed to kill wild animals
agree/strongly agree[1]	93	64	42	45

Note: Percentage of respondents in combined category

6.3 Visits to geese sites

Across all samples, very few of the general public reported visits in the last year to either Islay, the RSPB reserve on Islay, the Peterhead area, or to Loch of Strathbeg. Table 6.6 gives details. As expected, visits to Islay and Peterhead outnumber those specifically to the bird sites.

Table 6.6 Visits by respondents to the study areas				
visits in past year	**Islay**	**RPSB reserve on Islay**	**Peterhead area**	**Loch of Strathbeg**
none	406	417	390	416
1-2 times	10	2	22	4
3-6 times	3	-	6	1
7-12 times	-	-	1	

6.4 Level of support for the policy options

Respondents were given information about geese in Scotland, which included information on which species were endangered and on total numbers. They were then read one of the four scenarios described above, before being asked whether they would support the policy described therein. Possible responses were "yes", "no" and "unsure". This yielded the data presented in Table 6.7.

Table 6.7 Level of support for different geese conservation policies				
(% in each category)				
	No shooting	**10% fall in endangered**	**10% rise in endangered**	**10% rise all species**
Yes	66	59	51	53
No	25	20	35	34
Unsure	9	21	14	13

Overall, this shows a high level of support for geese conservation amongst the general public, even when this is costly (note that the *specific* taxpayer cost had not been suggested to people at this point). Greatest support comes for a policy to stop shooting (66% yes), followed by a policy to prevent a 10% fall in endangered species (59% yes). The numbers supporting the policy to prevent a 10% fall was greater than those supporting a 10% rise in endangered species. Overall, a small fraction of people were unsure about their support of the policy options, ranging from 9% (no shooting) to 21% (10% fall in endangered). Even if they were unsure of their preferences, respondents were however allowed to pass onto the next stage of the questionnaire, where they were asked a series of 8 questions relating to a specific payment level. Those who were not willing to support the policy were asked why.

6.5   Willingness to Pay Results

The most obvious means of constructing mean WTP across each sample is to look at the amounts which respondents said they would *definitely* be will willing to pay. This will give a more conservative (lower) estimate of sample mean WTP than using those amounts people would *probably* pay. We also need to consider how to treat "protest bids". A protest bid is a zero bid (that is, people say they would either definitely or probably not pay the amount asked), for some reason other than that the person does not value the policy, or cannot afford to pay for it. For example, people may feel that the payment mechanism being used (taxes) is not the best way to raise the necessary money, or feel that farmers should just be compelled to protect geese with no subsidy payable. Question D.11 in the questionnaire allows these types of response to be identified. Usual CV practice is to (i) identify protest bids and then (ii) exclude them from calculation of sample means. Genuine zero bids (from people who do not care about the project or who cannot afford it) are retained.

Results which exclude protests are given for each project, based on maximum definite WTP responses, on the next page.

The highest-valued policy is that which increases all geese species by 10%. This is more highly valued than a policy which increases endangered species only by this amount. Whilst more people "vote" for scenarios 1 and 2 than these two scenarios just described, their maximum WTP is less, on average. Using multiple comparison tests across means for the 4 scenarios, we find no significant differences between scenarios 1, 2 or 3: however, scenario 4 (increase all geese species by 10%) has a significantly higher average value than either a no shooting policy or a policy to prevent a 10% fall in endangered species. Looking just at trimmed means, we find significant differences between all scenarios, as the trimming procedure results in a large fall in the standard deviation (and thus a shrinking of the confidence intervals)[2].

Median WTP is lower than mean WTP or trimmed mean WTP in all cases: this is very usual in CVM studies. Median WTP amounts are not however significantly different from each other, using a number of different tests.

Protest bids (which included "other" reasons for not being willing to pay) account for 25%, 21%, 35% and 35% of all respondents respectively in the 4 scenarios. If protest bids are included as genuine zeros, then mean WTP clearly falls. This can be illustrated by looking at scenario 1 only (no shooting). Mean WTP falls from £8.32 to £7.91. A similar effect occurs in the other three scenarios.

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[2] Trimmed means are commonly quoted on CV studies, primarily because untrimmed means are considered to be 'too high' or skewed by one or two large values.

_____

Project A: prevent shooting
no of positive bids: 63
no of genuine zeros: 18
no. of protests: 27

	mean	5% trimmed mean	median	95% Conf. Interval
Household WTP, £ per annum	8.32	6.78	3	5.58-11.06

_____

Project B: prevent 10% fall in endangered species
no. of positive bids: 68
no. of genuine zeros: 16
no. of protests: 22

	mean	5% trimmed mean	median	95% Conf. Interval
Household WTP, £ per annum	10.99	7.29	4.50	6.34-15.63

_____

Project C: obtain 10% increase in endangered species
no. of positive bids: 49
no. of genuine zeros: 20
no. of protests: 37

	mean	5% trimmed mean	median	95% Conf. Interval
household WTP, £ per annum	16.28	8.72	5.00	6.30-26.26

_____

Project D: obtain 10% increase in ALL geese species
no. of positive bids: 53
no. of genuine zeros: 11
no. of protests: 35

	mean	5% trimmed mean	median	95% Conf. Interval
Household WTP, £ per annum	20.97	15.04	9.00	10.96-30.98

If instead of using "definitely yes" responses to payment questions we use "probably yes" instead, then mean WTP rises in all four scenarios (Table 6.8). As may be seen, changing from "definitely yes" to "probably yes" responses as the basis for calculating WTP has a big effect, in some cases roughly doubling this measure of value. However, a conservative approach to valuation would advocate using the former, smaller values as the basis for estimating WTP.

Table 6.8: The effects of uncertainty on willingness to pay		
	Trimmed mean wtp, definitely yes, £/annum	Trimmed mean wtp, probably yes, £/annum
No shooting	6.80	14.07
10% fall, endangered	7.30	15.78
10% rise, endangered	8.70	17.36
10% rise, all	15.0	25.01

6.6   Internal validity tests

Two forms of internal validity tests are employed here: a scope test, and a test of construct validity using bid curves. A scope test examines whether WTP varies with the level of supply of the environmental good in question. In this case, the only scope test that can be applied is with respect to the two 10% increase scenarios. The hypothesis is that people will value more highly a scheme which brings about a 10% rise in all geese species than one which brings about the same rise in endangered species only. We cannot reject this hypothesis, since mean WTP for the 10% endangered scenario is significantly lower than mean WTP for the "all species" scenario.

Construct validity (sometimes known as theoretical validity) refers to the extent to which variation in WTP bids can be well-explained statistically, in a manner which is also consistent with economic theory where it can be applied. This test is implemented by estimating "Bid curves", (i.e. regression equations which link WTP amounts to variables thought likely to be of influence). We are interested in the overall significance of the bid curve, the significance of individual variables, and the sign on the estimated parameters.

Since the sample size for each scenario is small, we pool the four samples to create one series of WTP bids. The dependent variable is censored at zero, since people were not allowed to bid negative amounts (the lowest value which could be given is zero). The data is also censored at £250, the highest value on any of the payment cards. The standard Ordinary Least Squares model is therefore inappropriate, and we use a Tobit estimator instead, bounded at the lower limit by zero and in the upper limit by 250. The dependent variable is WTP, defined on maximum definitely yes amounts, with protest bids removed but genuine zeros retained. The right-hand side variables chosen are:

- education
- age
- home location

- income or working status
- rating of "protecting wildlife" (qB2)
- rating of "action to protect wild geese" (qB4)
- whether respondent has seen wild geese (qC2)
- membership of environmental groups (qE2)

Table 6.9 gives full results for the estimation. As may be seen, parameter signs, where significant, are in accord with expectations. The main conclusions are:
- income is positively and significantly (90%) level related to WTP
- how important the respondent thinks protecting wildlife is, relative to other possible objectives of rural policy such as protecting rural communities, producing food and protecting landscapes, is positively and significantly (95%) related to WTP
- whether the respondent has seen wild geese is positively and significantly (90%) related to WTP
- however, where the respondent lives (urban, rural or "in between"); the rating of action of protect wild geese relative to other nature conservation actions; and education and age level of the respondent have no significant impacts on WTP.

Table 6.9 Tobit bid curve for MAXSURE bids (lower bound =0, upper bound = 250)			
	Coefficient.	t-ratio	prob value
Constant	9.19	1.02	0.30
Age	-0.524	-0.36	0.71
Education	-0.285	-0.135	0.89
Income	1.955	1.808	0.07
Impwl	-12.34	-2.42	0.015
Seen	6.62	1.66	0.10
Rural/Urban	1.51	0.33	0.73
Action WG	5.62	1.35	0.17
Member	4.05	0.68	0.49

Notes:
n= 276.
Variable definitions:
Age: age group
Education: level of educational achievement
Income: Income bands. We had to reject all those who refused to give a figure for their income.
Impwl: Importance of protecting wild life. Coded 1 (very high importance) to 5 (very low importance)
Seen: Those who have ever seen wild geese = 1, those who had not = 0.
Rural/Urban: Respondents located in rural areas =1, coded 0 otherwise.

In Table 6.10, we add dummy variables to examine the influence of the project described: as there are four projects, three dummies are used. As may be seen, the model fit improves somewhat. All three dummy variables are negatively signed, which is what we expect since the mean bid in the excluded case (10% rise in all species) exceeded that in the other three

cases. The dummies for the no-shooting and 10% fall in endangered species cases are significant, implying that once differences in the samples controlled for in the regression are taken into account, mean WTP for the no-shooting and a 10% fall in endangered species were *significantly* lower than bids for the 10% rise in all species.

Table 6.10: Bid curve with dummy variables for scenarios included			
	Coefficient	t-ratio	prob value
Constant	16.49	1.75	0.07
Age	-0.468	-0.33	0.73
Education	-0.039	-0.01	0.98
Income	2.13	1.99	0.04
Impwl	-12.22	-2.42	0.01
Seen	8.64	2.05	0.04
Rural/Urban	2.75	0.61	0.53
Action WG	4.98	1.21	0.22
Member	4.88	0.83	0.40
NoShooting	-17.39	-3.08	0.002
Fallendangered	-11.486	-2.059	0.039
Riseendangered	-8.195	-1.39	0.164

Notes:
variables defined as in Table 9, plus:
NoShooting: scenario to prevent shooting
Fallendangered: scenario to prevent 10% fall in endangered species
Riseendangered: scenario to achieve 10% rise in endangered species

6.7   Conclusions from the CV study

- overall, the contingent valuation surveys worked well. Protest bids ranged from 21% to 35% of all responses, which is well within normal findings for wildlife contingent valuation studies in the UK
- few people in this general public sample had visited Islay or Loch of Strathbeg
- responses show a high level of support for geese conservation policies in general: greatest support in terms of the number of yes votes comes for a policy to stop shooting. Lowest support (51%) comes for a 10% rise in endangered species only. All respondents in these questions were aware that support was costly.
- looking at willingness to pay figures, a different ordering of preferences emerges: a 10% increase in *all* geese species is most highly valued, followed in order by a 10% increase in endangered species, preventing a 10% fall in endangered species, and stopping shooting. These figure are based on the most respondents said they were sure they would pay. If we look instead at the most they would probably pay, the absolute value of WTP increases.

- the fact that the ordering of policy options in terms of votes is different to that in terms of WTP is not surprising, since the latter measures both the direction and intensity of preferences, whilst the former measures only their direction.
- the limited scope test we were able to perform provides evidence of sensitivity to scope in the CV responses
- the main determinants of how much people were willing to pay for geese conservation appear to be income, the importance people ascribe to wildlife conservation policy across other government policy objectives, and whether the respondent has ever seen wild geese. However, age, education and home location do not seem to be important.

7 Choice Experiment Results

7.1 Qualitative results: Attitudes to the environment and to wildlife protection

The questionnaire asked respondents a number of questions investigating their attitudes to the environment in general, and to wildlife protection in particular. In the contingent valuation report, we reported descriptive results on attitudes on the part of the general public. In contrast, here we report in Tables 7.1 to 7.4 comparable results for residents and visitors in the two areas studied, namely Islay and Strathbeg (general public attitudes from the choice experiment were very similar to general public attitudes in the contingent valuation).

7.1.1 Residents of Islay and Strathbeg

In Table 7.1, we see that countryside management is again given a low overall priority as a primary objective of government policy (compared with, say, health and education). Table 7.2 shows that, within the broad field of countryside management, protecting wildlife is rated 4th highest objective amongst seven, coming lower down than providing employment (1st) and producing food (2nd) and protecting rural communities (3rd). Amongst wildlife conservation policies (Table 7.3), protecting wild geese does not score very highly (only re-introducing beaver comes lower), with policy initiatives on native forests, fish stocks and birds of prey all rated as more important. This may relate both to respondents' preferences for geese versus birds of prey (say), but also to how large a risk they currently perceive (and thus the perceived need for government action). Finally (Table 7.4), it is again interesting to note people's views on the relationship between farmers and the environment. Respondents were asked how strongly they agreed or dis-agreed with the following statements:

- The preservation of wildlife is important for the benefit of future generations
- The government should pay farmers to manage countryside and wildlife
- The government should compensate farmers for any damage caused by wildlife
- Farmers should be allowed to kill wildlife that cause damage to crops

The highest level of disagreement were with the last 2 statements, *i.e.* that farmers should be compensated for damages, or that they should be allowed to kill wildlife that damage crops. However, there was more support for compensation and being allowed to kill "pests" from residents than from the general public. Strongest support again came for the importance of wildlife for future generations.

A high proportion of residents (63%) reported living for more than 20 years in the area, whilst 58% had visited the relevant RSPB reserve in their area (although not very frequently). Finally, 33% agreed with the statement "On balance, the advantages of having geese in the area outweigh the disadvantages", compared with 14% who felt the disadvantages outweighed the advantages. However, 30% said that the geese issue did not bother or interest them at all.

Table 7.1: General priorities for government spending						
	health	defence	country-side manage-ment	crime prevention	education	overseas develop-ment
Residents						
top priority	62	2	1	10	27	0
Lowest priority	0	18	9	2	1	69
Visitors						
top priority	51	4	4	7	36	1
Lowest priority	1	32	5	1	1	57

note: figures are % of respondents in each cell

Table 7.2: Opinions on countryside policy: % of sample rating different objectives as "of very high importance".						
	preserving trad. land-scapes	protect. cultural heritage	provide recreation opportuniti es	protect wildlife	provide jobs	protect rural commu nities	produce food
Residents	30	31	27	37	72	53	56
Visitors	34	28	21	47	48	40	39

Table 7.3: Relative importance of wildlife policy objectives: % rating different policies as "very important"						
	protect birds of prey	re-introduce beavers	protect fish stocks	Protect wild geese	Ban fox hunting	protect native forests
Residents	44	9	62	13	39	46
Visitors	56	12	60	20	33	56

Table 7.4: Opinions on farming and wildlife interactions: % of respondents strongly agreeing/agreeing with each statement.				
	Preserving wildlife is impt.	Farmers should be paid to manage wildlife	Farmers should be compensated	Farmers allowed to kill wild animals
Residents	92	61	58	49
Visitors	97	71	58	37

7.1.2 Visitors to Islay and Strathbeg

Data on visitor views can be found in the same tables as that for residents described above. Compared with residents, the following differences emerged:

- visitors give a higher ranking to countryside management as a goal of policy
- they also place a higher importance on protecting wildlife as a goal of countryside policy, and a lower importance on providing employment and producing food
- within wildlife policy, visitors have an almost identical ranking to residents. Protecting fish stocks and native forests are ranked top; geese conservation is ranked second from bottom.
- visitors are less willing to support farmers' rights to kill wild animals causing damage, but have similar views to residents on farmers being compensated for damages. They also support the idea of paying farmers to "produce" environmental goods.

Visitors were also asked a series of questions about their reasons for visiting the area, the number of times they visited and their place of origin. A big difference was apparent between Islay and Strathbeg in terms of where visitors came from. On Islay, 91% were non-residents staying at least one night. this figure fell to 27% for Strathbeg. Some 27% of visitors to Strathbeg were locals (3% on Islay), whilst 40% were non-local daytrippers (6% on Islay).

Finally, only 8% of all visitors said that the opportunity to watch geese was "very important" in terms of their reason for visiting the area. For over half (56%), it was "not important at all".

7.2 Choice Experiment results

An important initial investigation was to look at the distribution of answers across the three possible general cases, namely "policy A", "policy B" and "neither". In general, the hope is that not too many people choose the neither option (since otherwise the price tag is dominating responses) ; and that the split between policy A and B is roughly equal, since the allocation of attribute packages to labels is arbitrary. As Table 7.5 shows, the data set performs well on both of these criteria:

Table 7.5: Distribution of responses to choice sets		
Choice:	**N**	**%**
Policy A	*2,036*	*41.0*
Policy B	*1,991*	*40.1*
Neither Policy A nor Policy B	*937*	*18.9*
All	*4,964*	*100*
Notes: Each of the 1,024 individuals were asked 4 choice experiments each (i.e. 1,024 x 4 = 4,964).		

We next needed to estimate the multi-nomial logit models. These models essentially explain the choices respondents make in terms of the attributes and the levels they take, including of course the important cost attribute. Socio-economic factors specific to individuals (such as income) were also included in the models as potentially important. (for a full discussion of the technical issues involved in modelling these kinds of responses, see DETR (2001), chapter 7). The results from these estimations will tell us:

- which policy attributes are statistically significant (and which people thus care about)
- the ordering of these policy attributes in terms of relative importance, and
- the welfare effects of changes in attributes. The simplest way of looking at this is in terms of the "implicit price" of each attribute. This tells us the economic value (in terms of mean willingness to pay) of changes in each attribute. For example, in going from a shooting to a no-shooting policy

We estimated five main models, one for each of the sub-samples of data. That is, separate models were estimated for the general public, Islay residents, Strathbeg residents, Islay visitors and Strathbeg visitors. We are interested in whether there are differences in preferences for geese conservation policy across these groups. Separate models were needed because statistical tests (reported below) showed that the five populations were too different in terms of their preferences for the data to be pooled across populations (ie by analysing the choice data as one big data set including residents, visitors and the general public).

Besides the policy attributes, the models also include a number of co-variates as potentially important in conditioning peoples' responses to the choice questions. Where possible, these were chosen to mirror the co-variates used in the contingent valuation study bid curves. The co-variates used included variables such as income, age , education, the importance ascribed to protecting wildlife, and whether the respondent had ever seen wild geese. A full list of co-variates is given in Table 7.6, and their means in Table 7.7. A dummy variable was also included to test for whether the timing of the survey (October or April) had a significant effect on responses.

In Table 7.8, the five multi-nomial logit model results are given. We now proceed to a brief description of the key findings.

7.2.1 The general public

As in all of the models, the price of the package is strongly significant and negatively signed. This means that people significantly prefer cheaper policy options to more expensive ones, other things being equal. Means of control has a significant impact on choices, with shooting causing a loss in utility. There is a weakly-significant (prob = 88%) preference for conservation policy which impacts on all sites in Scotland, rather than special reserves alone. However, which geese species are conserved does not seem important. Finally, there is no strong evidence in favour of policies which produce increases in geese numbers.

Variable	Mnemonic	Definition
		Table 7.6 Definitions of Included Covariates
Variable	**Mnemonic**	**Definition**
Age	*AGE45*	A dummy variable coded "1" if the respondent is older than or equal to age 45 and coded "0" if less than age 45.
Education	*UNIV*	A dummy variable coded "1" if the respondent has university education and coded "0" if not.
Place of residence	*URBHOME*	A dummy variable coded "1" if the respondent's usual place of residence is in an urban or semi-urban area and coded "0" if otherwise.
Household income	*INCOME*	The total income of the respondent's household (£).
Non-missing income	*MISSINC*	A dummy variables coded "1" if the respondent reported a positive household income and coded "0" if missing or zero.
Employment status	*WORKING*	A dummy variable coded "1" if the respondent's is employed (part-time or full-time) and coded "0" if not employed.
Importance of protecting wild life	*ATTITUDE1*	The respondent's view of the "importance of protecting wildlife": 1 = "Very high importance" 2 = " High importance" 3 = Neither high nor low importance" 4 = "Low importance" 5 = "Very low importance"
Importance of protecting wild geese	*ATTITUDE2*	The respondent's view of the "importance of protecting wild geese": 1 = "Very high importance" 2 = " High importance" 3 = Neither high nor low importance" 4 = "Low importance" 5 = "Very low importance"
Ever seen wild geese	*SEENGESE*	A dummy variable coded "1" if the respondent reported having seen wild geese and coded "0" if not.
Member of environmental group	*ENGROUP*	A dummy variable coded "1" if the respondent reported being a member of "any environmental, heritage or charity" groups and coded "0" if not.
Round of survey	*ROUND*	A dummy variable coded "1" if the respondent was interviewed in the 2nd round of surveying and coded "0" if interviewed in the 1st round of surveying.

Table 7.7
Means of Covariates Included in Choice Experiment Models

Variable	Mnemonic	Mean				
		General Popu-lation	Islay residents	Strathbeg residents	Islay visitors	Strathbeg visitors
Age	*AGE45*	*55.4%*	*58.5%*	*52.0%*	*58.2%*	*55.0%*
Education	*UNIV*	*18.3%*	*16.1%*	*10.2%*	*52.8*	*53.0%*
Place of residence	*URBHOME*	*65.7%*	*11.2%*	*20.4%*	*36.3%*	*48.5%*
Household income	*INCOME*	*£21,731*	*£16,871*	*£25,238*	*£34,443*	*£28,313*
Non-missing income	*MISSINC*	*61.1%*	*81.5%*	*64.3%*	*69.8%*	*79.2%*
Employment status	*WORKING*	*53.0%*	*57.0%*	*62.0%*	*73.0%*	*69.0%*
Importance of protecting wild life	*ATTITUDE1*	*1.98*	*2.09*	*1.97*	*1.82*	*1.66*
Importance of protecting wild geese	*ATTITUDE2*	*2.58*	*3.09*	*2.52*	*2.48*	*2.17*
Ever seen wild geese	*SEENGEESE*	*57.0%*	*NA[2]*	*NA[2]*	*NA[2]*	*NA[2]*
Member of environmental group	*ENGROUP*	*18.8%*	*16.1%*	*17.4%*	*51.4%*	*64.4%*
Round of survey	*ROUND*	*NA[1]*	*41.0%*	*44.9%*	*63.7%*	*67.8%*

Notes: 1) Question not relevant.
2) Question not asked.

Table 7.8. Multi-nomial logit model results for the choice experiments					
	(1)	(2)	(3)	(4)	(5)
Attribute	General population	Islay residents	Strathbeg residents	Islay visitors	Strathbeg visitors
Species	0.0004	0.186	0.055	0.217	0.095
	[0.01]	[3.6]	[1.0]	[4.3]	[1.8]
Control	-0.233	-0.011	-0.055	-0.089	-0.237
	[6.2]	[0.2]	[1.0]	[1.7]	[4.5]
Location	0.059	0.011	0.023	0.089	0.060
	[1.5]	[0.2]	[0.4]	[1.7]	[1.1]
Stay the same	-0.085	0.378	0.105	0.108	0.065
	[1.2]	[3.9]	[1.0]	[1.2]	[0.7]
Plus10%	0.034	-0.027	-0.098	-0.024	0.158
	[0.5]	[0.3]	[0.9]	[0.2]	[1.5]
Plus25%	0.115	0.068	0.010	0.203	0.066
	[1.3]	[0.5]	[0.8]	[1.7]	[0.5]
Plus50%	0.037	-0.449	-0.024	-0.187	0.154
	[1.3]	[3.4]	[0.2]	[1.5]	[1.2]
Price	-0.025	-0.015	-0.019	-0.013	-0.0122
	[11.5]	[5.4]	[6.3]	[4.9]	[4.5]
α_A	1.823	3.230	-0.358	2.858	2.088
	[6.1]	[5.5]	[0.7]	[4.3]	[2.9]
α_B	1.900	3.610	-0.657	2.884	1.771
	[6.4]	[6.0]	[1.3]	[4.4]	[2.5]
-2*lnL	3,251	1,531	1,533	1,590	1,531
Pseudo-R^2 (%)	11.0	9.4	9.2	4.6	5.5
N of individuals	426	205	196	212	202
N of choice sets	1,704	820	784	848	808

Notes: the pseudo-R^2 is not interpreted as a standard R^2. T-stats in brackets. The terms α_A and α_B are "alternative specific constants". They reflect the differences in utilities for each alternative relative to the base when all attributes are equal, since they are equal to the means of the differences in the random component of the utility function over choices.

7.2.2 Islay Residents

The most noticeable feature about the Islay residents results is that a 50% increase in geese numbers is significantly and negatively related to choices, indicating a strong preference against such a large increase. In contrast, a significant and positive effect is found for maintaining geese numbers at the current level. Unlike the general public, Islay residents do not care whether geese are controlled by shooting or not. They also have a significant preference for geese conservation being focussed on endangered species only, not on all geese.

7.2.3 Strathbeg Residents

The model performed disappointedly for this group. The only significant effect on choices came from the price term, with Strathbeg residents preferring cheaper policy options to more expensive ones. Means of control, location, species and population were all insignificant determinants of choice.

7.2.4 Islay Visitors

Islay visitors have a positive and significant preference for conservation policy which is aimed at endangered species rather than all geese. They also significantly prefer policies which avoid shooting as a means of control, and which target conservation at all sites in Scotland, rather than in special areas only (logical, since they probably do not live in these special areas!). Finally, whilst they have a significant and positive preference for a 25% increase in geese numbers, they have a negative preference for a 50% increase. Thus, even this most pro-geese group are against large increases in population.

7.2.5 Strathbeg Visitors

Strathbeg visitors have rather similar preferences to Islay visitors, although attribute effects are, in general, less marked. Thus, Strathbeg visitors significantly prefer a policy which avoids shooting, and which focusses on endangered species rather than all species. Location is not significant for this sample, however. Whilst these individuals would suffer a loss in welfare should geese numbers decline, there is no significant evidence of willingness to pay for increases in geese numbers.

The population change attribute was "effect coded" in the models reported above. This essentially means creating (n-1) dummy variables for the attribute, where n is the number of levels. Each dummy variable shows the utility change in moving from the excluded case (10% fall). As noted above, population change did not seem to have much influence on choices and therefore preferences when modelled in this way. We thus tried including population change as a continuous variable. However, this did not produce significant effects either. The conclusion must therefore be that there is no strong evidence overall that people in our sample were willing to pay for increases in geese numbers. The main exceptions are visitors to Islay, who are willing to pay significant amounts for a 25% rise in geese; and Islay residents, who are willing to pay to *prevent* a 50% rise in geese, and a significant amount to maintain the current population instead.

Finally, for the cases of all residents and visitors, we note that the dummy variable included to represent when the response was collected (ie whether in the spring or autumn surveys) was *not* statistically significant. There is thus no "timing effect" present in the results.

7.3   Implicit Prices

One of the most useful outputs from a choice experiment is the calculation of implicit prices. For any attribute *v*, the implicit price is given by:

$$\beta_v / \beta_p$$

where β_v is the estimated coefficient for attribute v from the multi-nomial logit model, and β_p is the estimated coefficient on the price (tax) term.

The implicit price is interpreted as the mean sample willingness to pay for a "marginal" change in an attribute. For our CE, most of the policy attributes are set at one of two levels, ie:

Which species are protected.
                              All geese species
                              Endangered species only
Means of control
                              Habitat management
                              Habitat management plus shooting
Location
                              Special reserves only
                              All sites in Scotland

In these cases, the implicit price shows for each case the mean willingness to pay to move from one case to the other, eg to move from habitat management only to habitat management plus shooting. If this amount is negative, it shows how much people are willing to pay to avoid a policy which involves shooting. For the population attribute, the model was run by effect coding, as noted above. In this case, the implicit price for each level (eg 10% increase) shows the mean WTP to move to this from the excluded or base case, a 10% fall. The mean WTP for the excluded case of 10% fall is then given by the negative sum of implicit prices on the other levels.

Table 7.9 gives results for the full set of implicit prices. These follow directly from the multi-nomial model results reported above. Just looking at significant effects from the multi-nomial model, it can be seen that:

- Members of the general public are WTP £9.23 per household per year for a policy which stops the shooting of geese. Visitors to Islay are also WTP to prevent shooting,

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Table 7.9 **Implicit Prices (£) Based on Multi-nomial Logit Models** **General Population, Residents and Visitors**							
Group:	**General** **Population**		**Residents**			**Visitors**	
		Islay	**Strathbeg**	**All**	**Islay**	**Strathbeg**	**All**
Attribute							
Species:							
All geese species vs.							
Endangered species only	*£0.01*	*£12.26**	*£2.83*	*£7.55**	*£16.50**	*£7.72**	*£12.13**
Means of control:							
Habitat management vs.							
Habitat management & shooting	***-£9.23****	*-£0.74*	*-£2.84*	*-£1.90*	*-£6.74**	*-£19.28**	*-£12.24**
Location:							
Special reserves only vs.							
All sites in Scotland	*£2.35*	*£0.71*	*£1.19*	*£0.90*	*£6.73**	*£4.92*	*£6.03**
Population change:							
Low fall (10%)	*-£4.04*	*£2.00*	*-£4.29*	*-£1.97*	*-£7.57*	*-£36.05*	*-£20.60*
Stay the same	*-£3.36*	*£24.98**	*£5.45*	*£13.86**	*£8.21*	*£5.25*	*£6.31*
Low rise (10%)	*£1.36*	*-£1.82*	*-£5.17*	*-£3.68*	*-£1.86*	*£12.88*	*£5.33*
Moderate rise (25%)	*£4.58*	*£4.50*	*£5.17*	*£5.10*	*£15.39**	*£5.35*	*£10.95*
High rise (50%)	*£1.46*	*-£29.67**	*-£1.26*	*-£13.32**	*-£14.18*	*£12.56*	*-£1.99*
Number of individuals (choice sets)	*426* *(1,704)*	*205* *(820)*	*196* *(784)*	*401* *(1,604)*	*212* *(848)*	*202* *(808)*	*414* *(1,656)*
note: (*) = figures are derived from parameters significant at 90% or greater							

- to the value of £6.74 on average, whilst visitors to Strathbeg are willing to pay an even higher amount, namely £19.28/household/year.
- In terms of which types of geese are targetted for conservation, a positive willingness to pay exists amongst several groups for targetting policy at endangered species only, rather than at all geese. This mean value ranges from £16.50 (Islay visitors) to £7.72 (Strathbeg visitors). Islay residents would also be willing to pay for this change, to the value of £12.26.
- Visitors to Islay are WTP for a policy which changes the focus of conservation from special reserves only to all sites in Scotland, to the amount of £6.73/household/year.
- In terms of population change, Islay residents would need to be compensated by £29.67 if population rose by 50%. They would be willing to pay £24.98 however, to avoid a 10% fall and have geese numbers stay at current levels. Visitors to Islay, in contrast, are WTP to see geese numbers rise by 25% to the amount of £15.39/household/yr on average.
- Although not significant, all samples would suffer a loss in welfare if geese numbers fell. Taken together, all residents and all vistors would also suffer a welfare loss if geese numbers rose by the highest amount (50%), although this is not true for the general public

Table 7.10
Likelihood Ratio Test for Group Differences

	Group A	versus Group B	χ^2 (df=28)	p-value
1	General population	All residents	98.1	0.00
2	General population	All residents	119.5	0.00
3	General population	Islay residents	156.0	0.00
4	General population	Strathbeg residents	82.2	0.00
5	General population	Islay visitors	99.8	0.00
6	General population	Strathbeg visitors	81.0	0.00
7	Islay residents	Strathbeg residents	149.1	0.00
8	Islay visitors	Strathbeg visitors	39.7	0.07
8	Islay residents	Islay visitors	59.0	0.00
10	Strathbeg residents	Strathbeg visitors	74.1	0.00

7.4 Are the samples different?

As noted above, there are many apparent differences in the five groups of people studied, in terms of which attributes are important and how they value them. A more formal test of differences in preferences is, however, possible. We use a likelihood

ratio test to examine whether the null hypothesis that the parameters of the five models reported in Table 7.8 are equivalent, versus the alternative that they are different. As may be seen from Table 7.10, all samples prove to be statistically distinguishable on this basis: the preferences of the general public, Islay residents, Islay visitors, Strathbeg residents and Strathbeg visitors are all different to each other. Again, this is hardly surprising.

7.5 Conclusions from the choice experiment

- the experimental design seemed to work well, in that a small proportion of the sample chose the "neither" option in the choice sets, and equal fractions of people chose option A and B.
- in terms of comparing across samples, we found that residents, visitors and the general public all have different preferences towards geese conservation. The Islay samples have different preferences to the Strathbeg samples
- geese conservation does not seem to be an important issue relative to other nature conservation issues
- for our visitors, geese were not a very important reason for their trips when they were sampled
- in terms of policy attributes, means of control (shooting versus no shooting) was important for the general public, and for both samples of visitors. However, it was unimportant for both samples of residents
- all visitors, and Islay residents, would prefer to see policy targetted at endangered species than at all geese species. However, the general public did not distinguish between the two
- only visitors to Islay were significantly influenced in their choices about *where* geese are conserved, preferring them to be conserved throughout Scotland rather than at special sites
- the population change attribute did not have much of a significant impact on choices. Broad conclusions are that there is evidence for welfare losses associated with large (50%) increases in populations, but welfare gains from maintaining the current population. It may be that the way in which this policy variable was presented to respondents was confusing; or that people feel that we currently have "enough" geese. Only Islay visitors had a significant willingness to pay for moderate (25%) increases.

8.   Validation

How can we tell how valid these CV and CE estimates of economic benefits based on hypothetical payments are? One way would be to compare results for WTP for wild geese conservation from this study with those from other studies. Unfortunately, this cannot be done since this is the first UK study of this type. Another option is to compare the way in which the surveys were carried out relative to best practice guidelines. As may be found by referring to DETR (2001), the CV and CE studies do indeed adhere to these guidelines. Given the hypothetical nature of the CV and CE WTP data several other forms of validation were attempted.

8.1   Internal validation

In Section 6.6 we examined the internal validity of the WTP responses by statistically relating these responses to variables thought likely to influence WTP. We found that that the resultant statistical relationships accorded with our prior expectations, for example:

- income: richer people are WTP more for conservation
- how important the respondent thinks protecting wildlife is, relative to other goals of rural policy
- whether the respondent has seen wild geese
- which policy scenario the respondent was being questioned about

8.2   Comparison between CV and CE estimates

A second option is to compare WTP estimates from the CE and CV surveys. As the CV study was done on members of the general public only, we restrict attention here to CE results from this sample. The only comparison which it is strictly correct to make is which the estimates for WTP for a policy to stop shooting, as this was the only relevant attribute in the CE general public sample. Comparing the two sets of results shows the following:

- CV mean WTP: £8.32/household/year.
- CE mean WTP: £9.23/ household/year.

The CE estimate lies within the 95% confidence interval of the CV mean estimate. This implies that the two estimates are not different statistically at the 95% level of confidence. This is also a re-assuring finding.

8.3   Feedback from survey participants

Feed-back sessions were included in the methodological design of this research as a mechanism for validating the survey responses. These sessions took the form of focus group discussions where participants were asked to discuss critically the valuation exercise they had completed and to assess the reliability and accuracy of their responses. In addition they also provided useful information that added depth to the quantitative data recorded in the visitor, locals and general public surveys.

Focus groups are a qualitative research method involving a group discussion focused around questions raised by a moderator. They are frequently used as a means of interpreting quantitative data and as a mechanism for validating the survey approach.

System 3 were responsible for recruiting participants for four feedback sessions. A 'visitor' and a 'local resident' group were convened in May 2000 and recruitment for two general public feedback sessions took place in August 2000. The 'visitor' group comprised six people who lived in the North-East of Scotland who had visited the Loch of Strathbeg reserve in April 2000. All members of this group had a degree of interest in bird watching and at least a working knowledge of wild geese and the problems they can cause. The 'local resident' group comprised five Islay residents and met in May 2000. Again all the members of this group were reasonably knowledgeable about wild geese.

Following the completion of the CV general public questionnaire, in which people from across Scotland were surveyed, it was intended to hold two feedback sessions. System 3 were initially asked to recruit a group of 6 –8 people from the Aberdeen and Edinburgh area samples. Unfortunately it proved impossible to recruit enough people, and an attempt to recruit from the Glasgow sample was also unsuccessful[3].

In order to obtain some validation feedback from the general public, five telephone interviews were conducted with people from the Aberdeen and Glasgow samples. Telephone interviews are no substitute for a focus group discussion. A face-to-face discussion would have stimulated interactive debate about the Contingent Valuation exercise. Nevertheless the interviews did provide some useful material although the small sample means that the findings must be interpreted with some caution.

8.3.1 'Locals' and 'visitors' feedback sessions
'Locals' on Islay and 'visitors' to the Loch of Strathbeg were surveyed in April 2000 and completed a Choice Experiment exercise. The focus group discussions, with six visitors to the Loch of Strathbeg and six 'locals' in Islay, were held in May 2000. The participants in these two sessions were all conversant with issues associated with wild geese. A willingness to pay for goose conservation had not been identified by any participants as a component of the questionnaire they had completed, although they were aware that they had been questioned about conservation issues in general and wild geese in particular.

When prompted, the 'local' and 'visitor' group members remembered that they had been asked to make a number of goose management policy selections, but none could remember the detailed contents of any of the choice sets they had been presented with. When given a copy of their choice sets few participants could remember which options they had chosen. When questioned, no group member indicated that they had experienced conceptual difficulties in responding to the choice sets. However, when asked to complete the exercise again a difficulty emerged. Participants wanted to 'pick and mix' their own policy combination rather than deal with the choice sets in the requested manner.

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[3] The main problem appeared to be the scattered distribution of participants in the general public sample: it was difficult to find a central location within easy travel distance.

Out of the 12 people who repeated the CE exercise in the feedback sessions, only one picked the same choices he did in the original survey. Most of the other participants made the same choice in 2 or 3 out of four occasions.

Having completed the Choice Experiment again, Loch of Strathbeg 'visitors' did not think that one particular attribute in the choice sets had influenced their choice. Further discussion suggested that this might not have been the case. The group indicated that they thought protection measures should only apply to endangered species of wild geese. All were in favour of managed and regulated shooting, thus the presence of shooting in the choice sets had not led to the rejection of particular policy options. They all knew what habitat management could involve, but wanted more details about what was on offer regarding habitat management in the policy options.

On Islay, 'locals' were able to say which attributes of the choice set most influenced their choice but no common influence was identified. For some it was shooting, for other locational policy or species. In common with the 'visitor' group, 'locals' were of the opinion that protection measures should be targeted at endangered species only. Interestingly, no one from Islay mentioned taxation as having influenced their selection of policy options.

8.3.2. General public feedback sessions

Five telephone interviews were conducted during the first week of September 2000 with people from Glasgow and the Aberdeen area who had completed the CV general public survey. Although each interviewee recalled slightly different rationales being behind the survey they had completed, they all recalled that it had been about wildlife. The focus on wild geese had been clear to them. Although three interviewees recalled details about the policy option they had been asked to consider, the details they remembered were incorrect. The remaining two interviewees could not recall any details about the policy option discussed when they completed the survey. This suggests that a high proportion of people who complete a willingness to pay exercise do not recall details about their participation after the event. This could be because the topic they were questioned about was not of particular importance to them.

The telephone interviewees thought it was important that the views of the public are canvassed regarding conservation issues. They thought that public opinion should be taken on board when conservation and wildlife management policies are being devised, although the role of experts was not disputed. No interviewee was knowledgeable about wild geese before taking part in this research and there were conflicting opinions expressed regarding the level of information deemed necessary to make an informed choice in the willingness to pay exercise.

Several respondents expressed disquiet about the time they had to digest the information and to discuss it. For example, one woman was interviewed just after returning home from dinner with friends, and did not concentrate because her friends were waiting on her. Another said she would have been more confidence about her responses had she had the chance to think and ponder: she explained that she had answered in the survey that she had never seen wild geese before but later realised she had seen them flying overhead.

The payment choices completed in the survey were completed again during the telephone interviews. The telephone was not an ideal format for running through this exercise. It was evident that the interviewees had experienced conceptual problems with this approach. Three respondents suggested their own payment ceiling half way through the administration of the payment card. They did not feel that the taxation levels presented to them matched with their willingness or ability to pay and they wanted to state a personal tax level. Does the use of traditional payment cards confuse participants? Would people give a more accurate reflection of their willingness to pay if it was routine for a personal payment ceiling to be recorded?

There was some concern that the additional tax payment might not go to the cause it was intended for (despite assurances that the money would be ring fenced). The extent to which this could influence an individual's willingness to pay is unclear but it suggests that great care must be taken in ensuring that participants in such exercises are aware of exactly what their payment could and could not be used for. However, it was apparent that personal financial circumstances as well as level of commitment to the project, was an influential determinant of the payment choices.

It was unclear from responses to the telephone interviews whether or not taxation level choices elicited a true reflection of the respondents willingness to pay for the conservation issue they were asked to consider. Some interviewees objected to the use of the taxation system as a means of raising revenue for a conservation project. Even if they supported the project their willingness to pay may have been influenced by their opposition to raising funds via taxation.

8.3.3 Conclusions
Overall the feedback groups provided mixed evidence about the reliability of the survey results. The main conclusions are:

- Most respondents thought it was important that the views of the public are canvassed regarding conservation issues and supported the idea of WTP surveys in the context of government policy for conservation and wildlife management. (Although the role of experts was not disputed).

- Although respondents recalled details about the policy option they had been asked to consider, the details they remembered were often incorrect. Also when given the chance to repeat the CE only one participant chose the same policy options as he had done in the original survey. This raises some doubts about the validity of the survey responses.

- A number of respondents complained about the lack of time to think about the issues and some wanted more information about geese. People with a working knowledge of geese wanted more information before making their willingness to pay decisions. Such people were also more likely to question the detail of the policy options whereas people with little or no previous knowledge about wild geese appeared to take the willingness to pay choices at face value.

- A more positive conclusion for hypothetical valuation approaches was that tax level was an important factor in the decision of almost all participants.

9   The Market Stall Experiment

9.1   Background

Earlier in this report the results of CV survey are described. The study was implemented using in-person interviews carried out by professionally trained staff as this is the recommended approach (NOAA, 1993). Typically, each interview lasted about 15-30 minutes, with interviews taking place in the family home, 'on site' or on the ferry (in the case of Islay visitors).

During this interview the respondent is required to assimilate information about the goose issue, search their memory for other pertinent information, integrate this into a judgement about their WTP based on their preferences and income, and communicate this judgement to the interviewer (Hanneman, 1994). For decisions involving unfamiliar projects such as the conservation of migratory wild geese, this task is by no means easy and a potential problem for valuation surveys is that respondents, if questioned without warning about a topic they know little about, may not record a true, considered reflection of their opinions.

In the feed-back sessions of the main CV survey several respondents expressed some disquiet about the time they had to digest the information and to discuss it, and there was evidence that people had not given a lot of thought to their decision.   The CV Market Stall (MS) is an alternative approach that involves participants in two informal group meetings approximately a week apart and hence provides a completely different decision-making environment than surveys. The main potential advantages of the MS are that it provides participants with:

- more time and information to determine their WTP
- the opportunity to discuss their WTP decision with the moderator and other group members
- the opportunity, during the week-long interval between the two meetings also provides for participants to re-evaluate their WTP following further thought, information searching, and perhaps crucially for household economic decisions, discussions with family members and friends.

This section of the report compares CV WTP for wild geese conservation in Scotland using both the 'Market Stall' and the in-person survey results reported earlier. Comparisons are made in terms of
(i)   mean WTP;
(ii)   scope effects (i.e. is WTP sensitive to the scope of the environmental project)
(iii)   internal validity (i.e. to what extent is recorded WTP affected by individual attributes we would expect to influence WTP such as income and support for environmental causes).
(iv)   levels of protesting.

Due to the relatively small sample sizes involved in the MS experiment, only two out of the four management scenarios were compared:

- Project C: which describes a plan to enhance the population of endangered species by 10% over the next 10 years through improved habitat management and stricter controls on shooting
- Project D which was identical to C, except that the populations of all four species of wild goose were to be increased by 10%.

9.2   Methods

As in the main survey, WTP in the MS was elicited using a multiple-bid poly-chotomous choice approach. This required interviewees to indicate the degree of certainty they placed on being prepared to pay 8 different tax payment levels. Five responses to each payment level were possible: Definitely Would Pay (DWP); Probably Would Pay (PWP); Not Sure (NS); Probably Would Not Pay (PWNP); and Definitely Would Not Pay (DWNP). To avoid payment card effects only payment Card D was employed.

Meeting 1 was primarily concerned with the presentation of relevant information described in an 'Information Folder' about the proposed project, and a detailed explanation of the contingent market and payment vehicle. The information given in the folder was carefully designed to be understandable but was more detailed than would be possible in a survey context. Participants were given the opportunity to discuss any aspect of the project and to question the moderator. A 'Question and Answer Sheet' at the back of the folder was also provided to help clarify issues.

Meeting 1 concluded with WTP being elicited using the same question format described for the survey, with one procedural difference: respondents were asked to write down their WTP on the payment card and place their answers in a sealed envelope rather than respond verbally. This was done to provide members of the group some feeling of confidentiality. In addition, respondents were are also asked to complete the same set of basic questions about socio-economic status and attitudes to various environmental issues that appeared in the in-person CV survey.

During the week-long interval between Meetings 1 and 2 participants had the opportunity if they so wished to re-read the Information Folder, supplement their knowledge of geese, to discuss the issue with relatives and friends, and to re-evaluate their WTP. In order to record their thoughts and activities related to the valuation issue participants were asked to complete a daily diary.

At Meeting 2 participants were given the opportunity to ask further questions and to discuss any unresolved issues concerning the project. After the WTP question was repeated a de-briefing exercise was carried out to establish what influenced their decision.

9.3   Results

A total of 52 people attended the first set of meetings, with 43 returning for the second meeting. Of those who did not return, all except one individual who had left the area on business, completed the diary and second payment card over the phone, or by returning it in the mail.

Analysis of diary entries for the intervening period between the two meetings revealed that participants had engaged in a wide range of actions that were of potential relevance to the issue of goose conservation and their WTP for the project. These included watching TV programmes, visiting local bird reserves, reading books and newspapers, and for most people discussing the project with colleagues, friends and family. A number of respondents noted questions they had about the management option such as uncertainty over project effects, and about the total cost of the project. A small number of people did not make any entries into their diary either because they were not really interested in the issue and/or had already made up their mind.

Statistical analysis of socio-economic data (income, household size etc) revealed no significant differences between the sample populations between the MS groups and the survey. However, analysis of payment choices did reveal significant differences in the degree of certainty about individual WTP between MS1, MS2 and the main survey.

Table 9.1 describes mean WTP for MS 1, MS 2 and the survey for the definitely would pay category[4] averaged across both management scenarios. Although, 37% of participants changed their WTP amount between MS1 and MS2 (20% upwards; 17% downwards), mean WTP was not significantly different, rising from £3.67 to £4.49. Comparison with the survey group reveals that WTP is significantly lower in both the MS groups, with a mean WTP from the survey of £15.90.

Table 9.1 Mean WTP (£/household/year)			
	MS 1	MS 2	Main Survey
Definitely would pay			
Mean	3.673**	4.490##	15.290** ##
se	(0.852)	(1.215)	(4.817)
n	49	50	51

Notes:

Sig. differences between MS1 and MS2 denoted as follows: 1%$^{\xi\xi\xi}$; 5%$^{\xi\xi}$; 10%$^{\xi}$; between MS1 and Survey as: 1%***; 5%**; 10%*; and between MS2 and Survey as 1%### ; 5%## ; 10%# .

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Table 9.2 provides estimates of mean WTP for Projects C and D. WTP for Project D was higher in MS1, MS2 and the main survey. This was expected *a priori* as Project D protected all four species, whereas Project C protects only the two endangered species. However, the only significant difference arises in MS2. This is interesting as it suggests that participants by the end of MS 2 were better able to differentiate between the two policies.

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[4] This is the same category used in the results section of the CV study (Section 6)

Table 9.2: Mean WTP in £/household/year for Project C and D						
	MS 1		MS 2		Main Survey	
Intention to pay….	Project		Project		Project	
	C	D	C	D	C	D
Definitely would pay						
Mean	3.120	4.250	2.290*	6.781*	14.340	17.652
Se	(1.042)	(1.372)	(0.982)	(2.180)	(4.389)	(9.396)
N	25	24	25	25	26	25

Notes:
Significant difference between scenarios: ** 5% level; * 1% level.

Another test of validity is to establish whether WTP estimates can be predicted from socio-economic and attitudinal variables in regression analysis. The results of both a TOBIT and an OLS analysis confirm that MS WTP, just as in the main survey, was significantly correlated with variables we would expect to influence WTP. For example, participants who were on higher incomes *(income),* were members of environmental groups *(member)* and ranked wildlife protection *(wildlife)* and goose conservation *(goose)* higher as a priorities had higher WTP. The dummy variable for the management project (C or D) was also found to be significant, confirming that, once differences in the samples controlled for in the regression have been taken into account, mean bids for Project C were *significantly* lower than bids for Project D.

An interesting finding was that the adjusted R^2 value, which measures the degree to which the variability in individual bids can be explained by the independant variables, was much higher for the MS2 data (adj. R^2 = 0.34) than for the survey data (adj. R^2 = 0.18). This supports the argument that mean WTP estimates derived from the MS are more reliable than those derived from the survey.

The MS also performed well in relation to protesting. Only 4% of MS participants were classified as Protesters compared to around 30% in the survey. One explanation for this could be that the discussions within the MS groups helped to counter notions that might lead to protesting (for example negative views about taxation could be reduced by explaining that tax was the only way to pay). In a survey there is less opportunity to persuade respondents of the case for using taxation. Another possibility is that 'protesting' is viewed as an easier option than having to consider the details of the project itself by respondents anxious to escape from an interview situation.

9.4 Conclusions on the Market Stall

Compared to the main in-person survey, the MS approach:
- generated mean WTP estimates some 3.5 times lower than the main survey (This is to be welcomed in some respects as lower mean values for WTP would go some way to answering the criticism that CV values are simply to big to be believed).
- Generated far fewer protest responses (high protest responses suggest problems with aspects of the contingent market)
- established a significant scope effects between Project C and D
- produced much higher R^2 values for the WTP model

Taken together these findings suggest that the MS may be a more reliable approach to estimating WTP for unfamiliar environmental goods than in-person surveys. This is not surprising given that respondents are given more time and information than is possible under normal survey conditions, and perhaps most importantly the opportunity to discuss their valuation with other household members involved in family decision-making.

10 Aggregation of project benefits

In all applications of environmental cost-benefit analysis, we are interested in trying to make informed guesses about what the economic benefits to the population as a whole of a policy or project are, based on the information gained on values held by those people whose preferences we have sampled. In the context of this study, the most relevant question to ask would seem to be what the likely benefits are to the Scottish population as a whole, since the geese payments scheme comes from the Scottish Executive budget.

Taking into account the fact that estimates of WTP from CV surveys often over-state the amount people really would pay by a considerable margin (Macmillan, 1999) and the findings of the MS experiment it was decided to calibrate WTP estimates from the main CV survey downwards by dividing by 3.5. Using the most recent figure of 2,186,500 households in Scotland, the annual, aggregate benefits of the four projects are given in Table 10.1.

Table 10.1: Aggregate benefit estimates for Projects A-D			
Project	Mean WTP From CV Survey (£/household/year)	Calibrated Mean WTP (£/household/year)	Total Benefits (year)
A: no shooting	8.32	2.38	5,203,870
B: avoid 10% fall	10.99	3.14	6,865,610
C: obtain 10% rise endangered species	16.28	4.65	10,167,225
D: obtain 10% rise all species	20.97	5.99	13,097,135

The difference between Projects C and D (£2.9 million) represents the value of increasing the population of non-endangered species only by 10%. Clearly, these are very large numbers, but this is inevitable given the assumed size of the relevant population. Multiplying even a small per-household value by over two million will give a very big value.

It is clear that the non-market benefits of conserving wild geese outweigh the economic costs to farmers, especially where endangered species are concerned. For example, the monetary benefits of Project C to increase the population of endangered species by 10% is around £10 million per annum and would result in costs of around £70-80 000[5] (a benefit: cost ratio of over 1000:1). The equivalent benefits and costs of a 10% increase in non-endangered species only are £2.9 million and around £360 000 respectively (a benefit: cost ratio of around 8:1).

While this analysis supports the case for investing in small increases in endangered species especially, the case for large increases is not supported by evidence from the CE where there was evidence of welfare losses associated with increases of up to 50%.

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[5] This calculation based on the average cost of damage per goose given in Technical Report C multiplied by the increase in goose numbers implied by a 10% increase in the relevant species

11   Conclusions and Recommendations for Further Research

What conclusions can be drawn from the benefits study? First, in terms of general attitudes, we found that people rate wildlife protection as a relatively important component of rural policy. Wild geese conservation is rated a less important than most other conservation issues raised with the public. Despite this, there was clear majority support for geese conservation policy, even when this is costly.

In the contingent valuation (CV) study, all four policy options were positively valued. These centred around shooting versus non shooting, small changes in endangered species (+/- 10%) and small changes in all species (+10%). Taken together, this implies a significant economic value associated with both stopping geese numbers from falling, and from allowing small (10%) increases.

In the choice experiment (CE), we found that the various attributes of goose conservation policy are valued differently by the various groups studied. For instance, the general public and visitors were both WTP for a policy to stop shooting: this was not true for residents. Which species are conserved, and where they are conserved, also had different effects on preferences. Finally, whilst no evidence could be found for economic benefits from big increases in geese numbers, results suggested that small increases (or at least no losses) would be positively valued.

Although there was some good validatory evidence that the CE and CV surveys performed well in relation to current standards, results from the feedback research suggests that the survey approach is not entirely satisfactory when valuing unfamiliar environmental issues such as wild goose conservation. There is evidence from the MS experiment that WTP can be more reliably obtained when respondents are given more time and information, and the opportunity to discuss the valuation question with other household members. It would be very useful to extend this research to a more representative sample of respondents (e.g. local residents) and to attempt a similar exercise with the CE technique.

Further investigation of the marginal benefits of increasing the wild goose population is also merited. The CE provided some interesting insights into this issue but failed to establish consistent or significant WTP estimates. Also, no attempt was made to estimate WTA compensation of people who had negative views toward the conservation and management of wild geese. Although the majority of people supported the policies investigated in this study, a minority of respondents, particularly in the case–study areas were opposed. Incorporating their WTA compensation could substantially reduce the net benefits of wild goose conservation in Scotland.

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ANNEX 1

Questionnaire used in the CV and CE Surveys

Annex 2

For each payment level that is read out to you below, please indicate (by a tick) which statement best describes your response. Before answering please consider what you can afford. Also please assume that all tax revenue will be spent on only on this project.

	Tax Level 1	Tax Level 2	Tax Level 3	Tax Level 4	Tax Level 5	Tax Level 6	Tax Level 7	Tax Level 8
Definitely would pay this amount								
Probably would pay this amount								
Not sure								
Probably would not pay this amount								
Definitely would not pay this amount								

Use the space below to describe what influenced your decision

What is the maximum amount your household would definitely be willing to pay per year? _____