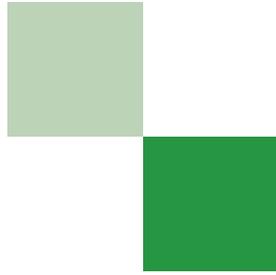




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Valuing Wilderness Preservation in Iceland Using WTP and WTA: An Investigation Into Data Collection Modes

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**Valuing Wilderness Preservation in Iceland Using
WTP and WTA: An Investigation Into Data
Collection Modes**

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MSc in Environmental Management (Aberdeen)

A thesis presented for the degree of Doctor of Philosophy at the
University of Aberdeen

September 2004

DECLARATION

I confirm that the thesis submitted is my own and that it has not been accepted in any previous application for a degree. All quoted material is clearly distinguished with quotation marks and information material is referenced.

September 2004

.....
Nele Lienhoop

SUMMARY

Wilderness in Iceland is threatened by proposals to harness glacial rivers for hydropower generation, which have created intense debates between environmentalists and people in favour of industrial development. The overall aim of this study is therefore to estimate the non-market costs and benefits of hydro schemes according to public preferences using the Contingent Valuation method (CV).

Despite intensive research and improvements to CV in the past 30 years, concerns still remain regarding its validity. Essentially, criticism is directed at poor explanatory power of willingness to pay (WTP) and willingness to accept (WTA) estimates, high non-response rates to the payment question and strategic bidding. An explanation for these flaws can be found in the way CV surveys are carried out: CV interviews are commonly employed on site, in the street or in the respondent's home, and without forewarning, little time and a standardised information set, respondents are asked to state their preferences in monetary terms. Generally, respondents are unfamiliar with the environmental good under investigation and have no experience with a trade-off of this kind, especially when the WTA measure is used. The possibility of a link between the data collection mode and data quality has hardly received any attention in the CV literature, but psychologists suggest that deliberative approaches might attenuate some of the above criticisms.

This research concentrates on the implementation of a novel group-based approach, called Market Stall (MS), and compares results with an in-person interview control group. MS offers a more realistic decision-making environment because respondents have more time to read and think about the information given, they have the opportunity to discuss the issue inside and outside the group, and they have the chance to gather more information and revise their bid in a second elicitation after a week.

The findings from this study have implications on CV methodology as well as decisions regarding the future management of wilderness.

From a methodological point of view MS has some advantages: estimates have more explanatory power, the non-response rate to the payment/compensation question is lower and respondents are more engaged according to a novel approach to participant observation. The findings suggest that some of the features provided in MS are essential for preference construction about complex environmental changes. Furthermore, the research found that MS and interview respondents had no problems with the WTA measure and strategic behaviour was hardly observed. Hence, concerns about high cognitive demands and protest rates to the WTA question are not confirmed in this study. A further finding suggests that information requirements differ among respondents, and standardised information sets may therefore not be suitable in CV research.

As to the future use of the wilderness area, the results show that the general public has strong preferences for the status quo, and hydro schemes are less desired with regards to public preferences. The non-market costs of hydro schemes, as measured by WTA, greatly outweigh their non-market benefits, as measured by WTP.

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ABBREVIATIONS

ANOVA	Analysis of Variance
CBA	Cost-benefit analysis
CE	Choice Experiment
CJ	Citizen's Jury
CS	Compensating surplus
CS	Consumer surplus
CV	Contingent Valuation
CV	Compensating variation
EIA	Environmental Impact Assessment
ES	Equivalent surplus
EV	Equivalent variation
HP	Hedonic Pricing
ISK	Icelandic krona (1000 Icelandic krona are equivalent to £7.5)
MS	Market Stall
NOAA	National Oceanic and Atmospheric Administration
OE	Open-ended
PC	Payment card
TCM	Travel Cost Method
TEV	Total economic value
VAT	Value Added Tax
VW	Valuation Workshop
WTP	Willingness to pay
WTA	Willingness to accept

2 BACKGROUND TO THE STUDY

This chapter describes the local context of the study in Iceland. Initially, the demands on wilderness in terms of hydropower generation are explained. Then, the environmental assets in the wilderness area in East Iceland, as well as predicted impacts from the proposed hydro scheme developments, are described. The chapter then discusses how decisions regarding hydro schemes in Iceland have been made in the past, and finishes with a brief review of studies from elsewhere that have attempted to determine the value of wilderness and the non-market costs of hydro schemes for decision-making.

2.1 Iceland's natural resources

Iceland is an island in the North Atlantic Ocean with a population of approximately 280,000. Whereas about two thirds of the population live in the capital area (Reykjavík), the remainder lives in villages and farms scattered along the coast. As a consequence, the mountainous interior, counting for about half of the island's total area, is uninhabited. The highland area forms a desert-like highland plateau covered with glacial deposits or lava field and with several isolated volcanoes and glaciers. Continuous vegetation is therefore patchy and accounts for only 10% of the interior. Biologically, most mountainous plants are common and there are only few rare varieties, such as some moss and lichen species. However, a number of vegetation types in the highlands, such as moss covered lava fields, palsa mires, and productive riverine fens, are unique in their composition. Whereas the interior only harbours two major mammals (the Arctic fox and wild reindeer), bird life is rich, and wetland areas are of international importance, in particular for pink-footed geese. The interior comprises a high level of geodiversity, with a large range of geological features formed by glacial rivers, glaciers, volcanic eruptions and wind erosion (Ólafsson, 2000).

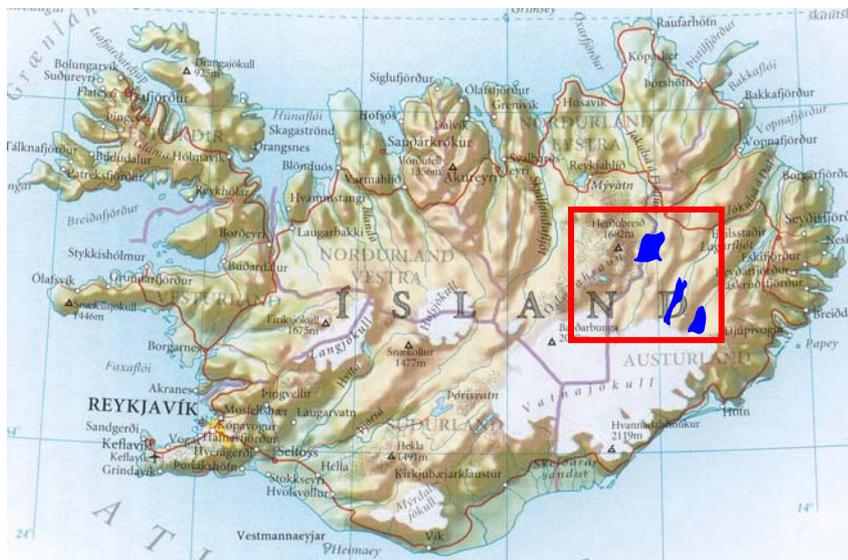
According to Icelandic legislation, the mountainous interior is classified as wilderness, which is defined as *'an area of at least 25km² or such that solitude and nature may be enjoyed without disturbance from man-made structures or motorised traffic, lies at a distance of at least 5km from man-made structures*

including power lines, power stations, reservoirs and roads, and where a direct influence of man is absent and nature may develop without stress imposed by human activity' (Nature Conservation Act, 140/2001, Web source: The Nature Conservation Agency). Despite the worldwide decline of wilderness resources, wilderness has no protection status in Iceland.

Iceland's most important natural resource is the fish stocks off the coast. As a result, fisheries are the dominant industries in Iceland and the economy is to a large extent based on them. Past experience shows that a collapse of fish stocks can have severe consequences on a small nation's economy that is nearly totally dependent on fisheries. Crises like this crystallise the need for Icelanders to diversify their economy. In addition to rich fishing grounds, Iceland enjoys an abundance of two other resources: Firstly, untouched nature, such as wilderness, which attracts increasing numbers of tourists to Iceland and secondly, renewable energy resources in form of glacial rivers, geothermal activity, wind and waves.

Government policy focuses on hydro and geothermal reserves that have already been successfully utilised to make the country self-sufficient in all sectors apart from transport. Most hydro schemes have been created explicitly to provide energy for aluminium production, and the government has marketed an attractive environment for foreign investors that are interested in purchasing cheap and renewable energy for power-intensive industrial projects. For Iceland, this provides an excellent opportunity to diversify its economy, and government policy, influenced by pressures from peripheral areas lacking economic development, has shaped plans to harness rivers in Iceland's interior. Current plans target three rivers in a wilderness area north of Vatnajökull Glacier in the East highlands (see Figure 2.1).

Figure 2.1: Hydro scheme proposals in a wilderness area in East Iceland



Since most glacial rivers originate in the interior, hydro schemes in Iceland normally involve large storage reservoirs in the highlands, capturing the fall down to the lowlands. Due to the plateau-like nature of the highlands, reservoirs tend to be located in shallow, vegetated valleys, and are therefore very large. Apart from reservoirs the proposed hydro schemes would include dams ranging from 30 to 190 m height, a new road network in the wilderness area, diversion canals and tunnels, powerhouses and power-lines (Web source: The National Power Company).

The constructions are favoured by a number of Icelanders, because the associated aluminium smelter, to be constructed in a remote fishing village in East Iceland, is hoped to counter the decline of the East Icelandic population caused by out-migration to the capital, as a result of new employment opportunities. Furthermore, the development aims to strengthen the local and national economy, and is considered to be ‘environmentally friendly’ given the renewable nature of hydropower generation. Apart from this, hydro schemes are expected to create a range of recreational opportunities, such as angling in dammed rivers, reservoir-related activities, easy access to the highlands on new roads, and new paths around the reservoirs and over dams for recreational walking.

Despite the range of potential advantages, environmentalists have raised concerns about the detrimental and irreversible impacts the developments would have on environmental assets in the area. The following section describes the wilderness area in more detail and explains the expected environmental impacts of hydro scheme developments.

2.2 Description of wilderness assets and hydro scheme impacts

2.2.1 Wildlife

The wilderness area targeted by energy authorities comprises a diverse fauna with a variety of breeding bird species, mammals and insects. The area is of international importance for pink-footed geese, as it provides suitable breeding grounds and the world's largest moulting site for this species. The environmental conditions for the moulting period, in which geese are flightless, are ideal in the area due to an abundance of ponds and lakes, long-sightedness, so geese can spot predators, sufficient grazing grounds, as well as remoteness and quiet. Current hydro scheme proposals would inundate these rare breeding and moulting sites and the Icelandic stock size would be reduced considerably. Although the global population of pink-footed geese would not be at risk of extinction, the impacts of hydro schemes would be large on a regional scale (Skarphéðinsson, 1998).

Approximately half of Iceland's introduced reindeer population spends the summer in the area north of Vatnajökull Glacier, where vegetation areas serve as their main grazing, calving and breeding grounds. Reindeer only exist in East Iceland, due to favourable microclimatic conditions in some shallow valleys, in which the snow melts earlier in the summer than elsewhere. The main grazing and calving grounds have been considered as the most important sanctuary for reindeer and enjoy protection as a reserve in accordance to the nature conservation law since 1975 (Guttormsson, 1998, Þórisson, 1998 and Orkustofnun, 1983). The materialisation of current hydro scheme plans would, however, submerge large parts of this nature reserve. Flooding of main habitats and migration routes, new roads and disturbance from traffic during and after the construction period are also likely to greatly diminish the Icelandic stock size.

Apart from mammals, the area contains a number of rare invertebrates, such as flies, moths, and spiders, some of which have only recently been discovered and are new to the sciences. Other species have populations that spread over Greenland to Canada, with Iceland being the only European country, in which these species exist. Species that only occur in Iceland may be at risk of extinction if the hydro schemes go ahead.

2.2.2 Vegetation and flora

The wilderness area comprises a desert like plateau with sparse vegetation. However, as compared to other wilderness areas in Iceland, it contains one of the largest vegetation and wetland areas in the highlands with luxuriant vegetation in shallow valleys. These vegetation areas provide habitat for several flowering plants, lichen and moss species. Whereas most of the flowering species are common elsewhere in Iceland, recent research has discovered two moss species that are very rare on a national scale and are therefore listed in the endangered species catalogue, and one species that has not been found anywhere else in the world. A number of lichen varieties also seem to exclusively exist in Iceland, five of which are listed in the endangered species catalogue. Since the reservoirs would be located in vegetated valleys, a considerable amount of vegetation and important wetland areas would disappear, as well as habitats for small plants and animals such as reindeer and geese. While flowering plants would not be at risk of extinction, some rare moss and lichen species might vanish (Ólafsson, 2000 and RALA, 1997).

2.2.3 Geology

The wilderness area comprises a large diversity of geological features formed by glacial surges, volcanoes, pre-historic glacial lagoons, permafrost and rivers. Ridges of soil pushed up by the glacier called 'Hraukar', show the furthest advance of the glacier since the Ice Age in 1890. These ridges contain luxurious vegetation with a unique diversity of plant communities and hence attract geese and reindeer. Since 'Hraukar' has only one counterpart on the northern hemisphere, it has a high scientific value on a worldwide scale. The reservoirs

would destroy parts of 'Hraukar' and its scientific and educational value would be seriously diminished.

Other unique features include Iceland's longest and deepest gorge, and banks consisting of layers of sediment, which previously filled a lagoon towards the end of the Ice Age. These sediments contain information on historic climate change in the Northatlantic region and are considered to be of international importance. The banks are located within one of the proposed reservoir sites and further scientific research would be impossible.

Furthermore, four volcanoes and geothermal areas are under protection due to spectacular landscape features, including ice caves. While these would not be directly affected by the developments, the landscape would change.

2.2.4 Cultural heritage

The wilderness area also contains a number of archaeological remains, such as farmhouse mounds from the colonisation period during the Viking Age, cairns marking ancient horse trails, aerial ropeways that were used to haul materials over rivers, ruins of outlaw lairs and cabins with traditional turf and stone walls. Most of these relics are common throughout Iceland's interior, but the outlaw lairs have a historical value and are under protection. Some ancient farming sites, aerial ropeways, cabins and cairns would be lost as a result of the hydro scheme developments, but outlaw huts would remain unaffected.

Another important feature that is often overlooked is hidden people, such as elves and trolls. Since elves tend to stay near settlements, it is likely that numbers are few and their actual distribution in the wilderness area is unknown. Trolls, however, have their domiciles in boulders, caves and lava fields in the mountains. According to Ólafsson (2000) highland trolls are friendly but lazy. They are nocturnal and their only occupation is fishing in lakes. The hydro schemes may damage or destroy parts of troll and elf habitat. Although their behaviour is unpredictable, it is known that elves become easily angered and take revenge; hence there is a lot of uncertainty about the consequences of the proposed hydro scheme developments.

2.3 Decision-making related to wilderness and hydro schemes in Iceland

The number of hydro scheme impacts calls for decision-making methods that take account of the environmental and cultural assets. Until recently, project appraisals for hydro schemes in Iceland have been based on cost estimations that merely include expenditures and returns. Past attempts to obtain operating permissions are characterised by political failure and ignorance of environmental impacts.

For example, a wetland area, listed as site of special interest in the Nature Conservation Register¹ and various international environmental agreements Iceland has signed, have not influenced the parliament's bill confirming the construction of a hydro power plant. The decision to go ahead with the development was based on a consensus achieved between the government, the National Power Company and nature conservation authorities, and involved a trade-off between the affected wetland area for the protection of another wetland area that was previously targeted for hydropower generation (Web source: The National Power Company). This decision was not guided by any official environmental assessments.

For the same hydro scheme, actions to build access roads, diversion channels and work camps commenced prior to receiving operation permission, let alone an environmental assessment. It was not prior to 1993 that the Icelandic parliament adopted the first legislation on Environmental Impact Assessment (EIA) (Skipulag ríkisins, 1995), but so far this has not led to a full consideration of environmental damage in decisions regarding hydro scheme licensing. For example, the National Power Company itself implemented an EIA on a hydro scheme proposal just after negotiations between the government and investors over the construction of an aluminium smelter had been finalised. Hence, the EIA statement deemed to be irrelevant, as the decision to go ahead with the hydro scheme had already been made (INCA, 2000 and Landsvirkjun, 1999). In a recent case, a new road was built to a potential hydro scheme site to enable preliminary geological research and to enable scientists to access the area to prepare an EIA. Even though helicopter transfer would have been less damaging, it was clear that

¹According to the Nature Conservation Agency the register lists areas that are 'important for their natural phenomenon, geological formations, scientific interest, beauty [...], biological value, special or endangered species, habitats, ecosystems and [...] recreational use' (Náttúruverndarráð, 1996).

the licence for the hydro scheme would be granted regardless of EIA results and therefore a road that would take heavy machinery to the site was built even before impacts on the wilderness area were assessed.

Even though at present, environmental impacts are assessed prior to decision-making, EIA reports are spun by the developers and biased to an extent that ensures that the decision to go ahead with developments is not influenced. Even though biologists do not recognise their own contribution in the final output of EIA reports, and despite protests and legal action on behalf of environmental groups, the government has not hesitated to grant operations licences.

According to legislation, EIA reports are submitted to the Planning Agency for assessment and consultation with unattached consultants. The Planning Agency delivers a reasoned ruling over the EIA report, and decides whether the proposed project is accepted, or rejected due to significant environmental impacts. After the Planning Agency's decision the general public has the right to appeal the verdict to the Minister of Environment. The ruling of the Minister is the final administrative ruling (Ministry of Environment, 2000). Even though the Planning Agency has rejected one of the most detrimental hydro scheme proposals in Europe's history, the Minister of Environment has abolished the verdict in order to allow for construction to go ahead. Clearly, these incidents serve as an illustration of shortcomings in decision-making regarding hydropower projects in Iceland.

Past experience has shown that EIAs do not seem to provide a neutral and fair tool for environmental decision-making. Firstly, there is a risk that scientists are carefully selected by developers to assure desired results. Secondly, it is difficult to integrate the outcomes of an EIA report in a decision, which is merely based on cost estimations. Since conventional decision-making tools are based on numbers and EIA on textual information, the two different measures are impossible to combine. Thirdly, the outrage of sections of the general public shows that people have views and value the loss of wilderness, but EIA does not allow for public participation and instead the decision is merely taken by experts or by the Minister of Environment. Fourthly, environmental assets have an economic value. This fact is often overlooked by decision-makers and is not reflected in EIA, even

though developers and the government frequently state that economic aspects of hydro schemes have priority in the decision.

The Planning Agency rejected the planning application for a hydro scheme and explicitly pointed at the lack of the monetary assessment of socio-economic impacts: *The planning agency feels that there is [...] need for monetary valuation of environmental assets, which would be damaged or destroyed as a result of the development, and this should play a key role in the assessment of the national economic impact of the project* (Skipulagsstofnun, p. 275). Clearly, economic valuation of the environment would solve some of the problems related to hydro scheme decisions in Iceland. However, as compared to the US, UK or Scandinavia environmental economics, in particular economic valuation, has neither gained academic nor political recognition in Iceland. The importance of environmental valuation for decisions regarding hydro schemes or wilderness management issues has been acknowledged in the literature since the 1980's. The following section briefly reviews the literature on the valuation of wilderness benefits and hydro scheme costs.

2.4 CV studies for wilderness

According to the literature Contingent Valuation is the most popular method to value wilderness in economic terms and assist wilderness management decisions. While the majority of studies is concerned with wilderness areas in the US and Canada, CV has also been applied to wilderness or natural environments in New Zealand, Scotland and Portugal. The aim of these studies is mainly to estimate the economic value of wilderness preservation or the value of reclaiming wilderness areas. Some CV surveys have also aimed at investigating the most desired size of wilderness that should be protected by asking for people's willingness to pay for a range of proposals with varying sizes. A few studies were implemented to determine the most desired option for the management of wilderness area, for example a natural park designation with recreational facilities or pure wilderness versus multiple use. The wilderness valuation literature focuses on different value categories, ranging from the elicitation of existence values of remote wilderness

areas to collecting data on direct use values, such as increased visibility or wild water canoeing. While most studies target wilderness advocates, only one study takes account of opponents who prefer multiple use of wilderness. Table 2.1 provides a list of CV studies undertaken to value wilderness.

Table 2.1: Wilderness values obtained from CV studies

Author	Location	Context	Mean Value
Walsh, <i>et al.</i> (1984)	Colorado, US	WTP for wilderness preservation	\$28.5-93.2 per year depending on size
Pope and Jones (1990)	Utah, US	Investigate how much wilderness to protect	\$53 for 5%, \$64 for 10%, \$75 for 15% and \$92 for 30% of Utah (per year).
Barrick and Beazley (1990)	Wyoming, US	WTP to avoid all production	Wilderness visitors: \$54 Urban respondents: \$11 Rural respondents: \$8 (per year)
Crocker and Shogren (1991)	Oregon, US	Visibility in wilderness area	\$4 per day
Hanley and Craig (1991)	Scotland	WTP to protect 'Flow country' in Northern Scotland	£17 per year
Ekanayake and Abeygunawardena (1994)	Sri Lanka	WTP for conservation of wilderness	Urban community: RS 852.27 Peripheral community: RS 269.80 (per year)
McFadden (1994)	US	Values preservation of 57 wilderness areas	\$70 per year
Loewen and Kulshreshtha (1995)	Canada	WTP for current level of preservation in Saskatchewan	Aboriginal households: \$81, Other households: \$61 (per year)

Reid, <i>et al.</i> (1995)	Canada	Enlarge wilderness areas	Doubling designated wilderness: \$108-\$130 Tripling designated wilderness: \$149-\$156 (per year)
Richer (1995)	California, US	Increased desert protection in Death Valley	\$84-101 per year
Keith, <i>et al.</i> (1996)	Utah, US	WTP for wilderness preservation and multiple use of wilderness	Preservation: \$729 Multiple use: \$2514 (per year)
Mortimer, <i>et al.</i> (1996)	New Zealand	WTP for conservation of offshore islands	Conservation value: \$37 per year
Champ, <i>et al.</i> (1997)	Grand Canyon, US	WTP for removal of roads near the Grand Canyon.	\$12-52 per year
Rollins and Lyke (1998)	Canada	Existence value of remote wilderness parks	\$105-192 per year
Adamowicz, <i>et al.</i> (1998)	Canada	Increase in caribou population in wilderness	\$143 per year
Nunes (2002)	Portugal	WTP for wilderness areas and recreational area programmes in a natural park	PE 9,800 per year
Boxall, <i>et al.</i> (2003)	Canada	WTP for canoeing in wilderness parks over and above expenses	\$303-515 per trip

A total of six studies were detected that used CV in the context of hydro scheme developments in the US, Turkey, Austria and Norway (see Table 2.2). Four of these are ex ante valuation studies to determine the environmental costs of hydro schemes in order to ensure that these are taken into account in the decision. The studies either focus on the overall environmental impacts of hydro schemes or more specifically look at the value of rivers that would be affected. Two studies are concerned with already existing hydro schemes, one values the water flow over a scenic waterfall that should be taken into account in the re-licensing

decision of a hydro scheme and the other investigates people's WTP for the removal of dams and the restoration of rivers to their natural state. Again, all studies are concerned with the elicitation of preferences from hydro scheme opponents, whereas those benefiting from the hydro schemes, for example from reservoir-related recreation, were not taken into account.

Table 2.2: Contingent valuation studies related to hydro schemes

Author	Location	Context	Mean Value
Sanders, <i>et al.</i> (1990)	Colorado, US	WTP for river protection threatened by dams or agricultural pollution	\$18 for 11 rivers (per year)
Carlsen <i>et al.</i> (1993)	Norway	WTP to avoid the impacts of hydroelectric development on a range of environmental attributes	\$0.004 - 0.04 per kilowatt hour
Loomis and Feldman (1995)	US	Water flow changes over a scenic waterfall	\$0.52 - 0.54 per day
Loomis (1996)	Washington State, US	Removal of dams and restoring the Elwha river to its natural state	Washington citizens: \$78, Rest of US: \$68 (per year)
Kosz (1996)	Austria	Compares value of a National Park with a National Park including a hydro scheme	National Park: 920 Shilling NP with hydro scheme: 690-695 Shilling (per year)
Biro (1998)	Turkey	Values the environmental costs of a hydro scheme by asking WTP for restoration of environmental impacts	\$300 per year

2.5 Summary

Despite the advantages of hydro schemes in terms of economic development, they are likely to have severe impacts on a range of wilderness assets in East Iceland. Environmental Impact Assessments are not sufficient to ensure equal

consideration of marketed and non-market values in the decision-making process; hence, environmental impacts tend to be disregarded.

However, the literature demonstrates that wilderness is valuable and that costs associated with hydropower developments are high. If these values were neglected, it would be difficult to justify wilderness protection, and the failure to integrate the environmental costs of hydro schemes in the decision-making process might lead to decisions that are biased towards development. The review of studies clearly underlines the importance of applying economic valuation techniques, such as CV, to decisions regarding the future management of the wilderness area in East Iceland, and to investigate whether hydro schemes are a welfare improving option.

The next chapter looks at the theoretical background of environmental valuation, reviews the valuation methods available and selects a method for the valuation of non-market costs and benefits of the proposed hydro scheme developments in Iceland.

1 INTRODUCTION

1.1 Introduction and aims

This study attempts to quantify the non-market costs and benefits of proposed hydro scheme developments in an Icelandic wilderness area using a novel deliberative approach, called Market Stall (MS), and a control group based on conventional in-person interviews. The study aims at investigating the quality of responses given by individuals and provides a design to elicit thoughtful and informed values from a small number of people rather than engaging in a conventional exercise with large samples. This is in line with Whitehead, *et al.* (1995) who postulate that future research should assess the accuracy of WTP for environmental changes that are unfamiliar and complex. Hence, the intention is not to aggregate value estimates for inclusion in a cost-benefit analysis but to carefully uncover valid WTP and WTA estimates.

Iceland has one of the last remaining wilderness areas in Europe. Currently the island faces its greatest environmental dispute in history regarding the future use of a large wilderness area in East Iceland. Plans to develop hydro schemes have resulted in intense debates between environmentalists that are concerned about the irreversible environmental impacts of these developments, and industrialists who point at the benefits of diversifying the island's economy. Despite this, Icelandic government policy aims at utilising renewable energy sources for large-scale industry. Current plans envisage to harness up to three rivers in an area containing unique flora, fauna and landscape features ranging from deserts to oases with rich ecosystems.

Wilderness represents a critical natural capital that provides a variety of goods and services for society. According to definitions, such resources cannot be replaced or substituted by man-made capital (OECD, 1995). Yet this non-renewable and irreplaceable resource is rapidly declining due to human impact with only very few wilderness areas remaining in Europe (Mather and Chapman, 1995). The

goods and services provided by wilderness meet two necessary conditions for generating economic value. First, they are relatively scarce. Second, they contribute to people's satisfaction and enhance their welfare (Loomis, 2000).

Although wilderness provides society with multiple benefits ranging from recreation to providing habitat to wildlife, its value is still debated, and its preservation value often seems to be overlooked in decisions regarding the future use of wilderness areas. The fact that wilderness is declining is explained by market failure with regard to wilderness benefits, and as a consequence, benefits of developing wilderness areas are perceived to be larger than benefits of preservation. As a result, the market gives wrong signals and incorrect management decisions are made, even though wilderness preservation may be socially more desirable (Morton, 1999). Since the value of Icelandic wilderness area is potentially high, a careful assessment of its benefits is an essential component in the decision over the future use of highland areas. In order to assure equal consideration with marketed costs and benefits, it is necessary to translate these non-market values into monetary units. Decision-making processes that involve monetisation of environmental impacts are unfamiliar in Iceland, but hydro scheme opponents and the Planning Agency are anxious that the wilderness loss is valued equally with financial outcomes of the proposed hydro schemes (Skipulagsstofnun, 2001 and Web source: Icelandic Parliament).

The contingent valuation method (CV) is an increasingly recommended method for valuing non-market costs and benefits. Essentially, it uses surveys to elicit people's preferences in terms of their willingness to pay (WTP) to obtain a positive environmental change or their willingness to accept in compensation (WTA) for a negative environmental change. These estimates can then be averaged and aggregated to the population to obtain the economic value of the environmental good in question. Finally, the aggregate estimate can be used to either support or counter decisions or be integrated in a cost-benefit analysis (CBA) for a project proposal. The thesis describes an application of the Contingent Valuation method (CV) to estimate these non-market costs and

benefits of the hydro scheme development in the wilderness area, and investigates a number of CV related issues in this context.

In order to obtain preference estimates from both hydro scheme opponents and advocates two different welfare measures are used in this study: WTA in compensation to relinquish wilderness assets and WTP to obtain the benefits associated with the hydro schemes. Although the WTA measure proves difficult for CV participants, it is the correct welfare measure if property rights of the wilderness lie with the general public. The first aim is to investigate perceived property rights and design CV in a way that takes account of losers and gainers.

Although the CV methodology has been greatly improved since its first application in 1963, there are still concerns regarding the validity of WTP and WTA estimates, especially when the environmental change to be valued is complex, unfamiliar and uncertain (Gregory, *et al.*, 1993). The valuation of non-market costs and benefits of hydro schemes is complicated due to the complexity of the expected environmental change and a lack of detailed knowledge among the general public. Since the task of a CV exercise is to provide 'an unbiased and transparent vehicle, which gives respondents the best possible chance to deliberate about their preferences' (DTLR, 2002, p. 78), the valuation of wilderness based on a conventional survey method may not be suitable. Instead, a more elaborate approach that gives people the opportunity to give well-informed and thoughtful WTA or WTP responses may be useful. This requires consideration of the appropriate amount of information and time individuals need to give well-considered preference statements, and social context.

The environmental valuation literature is dominated by new ways of econometrical analysis and data modelling in an attempt to mitigate these methodological flaws, whereas there is an evident lack of research looking at a possible source of these problems, the data collection mode. Conventional survey methods in form of in-person or telephone interviews or mail shots have obvious disadvantages in countering these challenges of CV. The second aim of this study is to compare a new deliberative group approach to CV, called Market Stall (MS), with conventional in-person interviews. The specific objectives of this aim are to:

- review the literature to detect the benefits of deliberative approaches from a preference construction point of view.
- assess the validity of WTP/WTA derived from Market Stall and the in-person control group using statistical tests.
- investigate respondents' perceived views towards the two data collection modes and observe participant behaviour during the exercise to understand problems related to decision-making environments.
- explore the influence of 'disengaged' participant behaviour on mean estimates and validity of results.
- investigate the effects of additional time and information on re-evaluated WTP and WTA estimates.

1.2 Structure of the thesis

The thesis is organised as follows. The *background to the study*, including the situation in Iceland and a review of CV studies for wilderness and hydro scheme valuation, will be explained in Chapter 2. Chapter 3 introduces the *theoretical background* underlying environmental economics and contingent valuation. Entitlement structures in the wilderness area are pinpointed in order to select the correct welfare measure for the valuation study and challenges related to CV are identified. Furthermore, this chapter is concerned with the theories explaining these challenges by reviewing psychological, economical and consumer research literature on preference construction and motivational issues. The *research methods* for contingent valuation and their suitability in terms tackling the challenges of CV are discussed in chapter 4. Chapter 5 describes the development of the CV questionnaire, information folder and hypothetical scenario, as well as sampling issues. This chapter also includes details of the Market Stall design and participant observation during the Market Stall meetings and in-person interviews. The *results* are presented in chapter 6, including quantitative and qualitative comparisons of the two approaches regarding validity and participant behaviour, as well as suggestions to identify invalid bids. Chapter 7 and 8 *discuss* the implications of this research and draw *conclusions* on the decision-making

environment and overall performance of Market Stall as compared to conventional interviews.

3 THEORETICAL BACKGROUND

3.1 Economic valuation of the environment

The fundamental assumption of environmental economics is that there is an interrelationship between economics and the environment. This relationship arises because economic activities affect the environment, but also because environmental quality impacts on the performance of the economy. The environment serves three basic functions: it provides people with services such as recreation, it supplies resources and it assimilates waste products. A balance between these three functions is required in order to achieve economic, environmental and social sustainability. However, this balance is often not achieved when environmental assets are public goods and when externalities are present. Public goods and externalities comprise the two main sources of market failure. A public good is non-exclusive and is non-rival in consumption; that means, it is not efficient to exclude people, and the use of it by one individual does not diminish its availability to others. Wilderness is a good example of a public good, as anyone can use it for recreational activities, such as bird-watching without reducing the opportunity of others to do so. Also, it is not realistic to exclude people, for example, by erecting a fence. Unlike private goods, markets for public goods often do not exist. Hence, public goods have no market price, and are often considered to be for free, and are therefore at risk to be over-used or destroyed. Externalities exist when the effects of someone's activities (e.g. the hydro scheme developers) have an impact on the welfare of others (the habitat of a rare geese species may be inundated with water, which has a negative external effect on birdwatchers). The market fails to take account of such side-effects since the use of public goods is for free, and there is therefore no incentive for individuals or firms to internalise externalities arising from their activities. Thus, unsustainable use of the environment can be traced to absent markets, since non-existing prices do not reflect the true costs of resource use (Hanley, *et al.*, 2001 and Turner *et al.*, 1994).

One of the central themes of environmental economics is to place monetary values on public goods and services provided by the environment, in order to assure that

they are properly allocated, and that a balanced interaction between the economy and the environment is achieved. Monetary estimates of environmental goods are pivotal in the following contexts:

- Environmental management: e.g. for the management of a national park, the monetary value of assets and services helps to determine whether species are valued more than recreational facilities or vice versa, and thus helps make decisions over the management structure of the national park.
- Environmental damage assessment: establish liability and sue firms responsible for damaging the environment, and to determine a budget for ecosystem restoration.
- Setting environmental taxes: to justify and determine the level of taxes, such as the landfill tax or aggregate levy.
- Policy and project appraisal: establish the monetary value of non-market costs and benefits of projects and policies, in order to assist the government to make sound and socially desirable decisions over whether to go ahead with projects or policies or not (Hanley, 2001 and OECD, 1995).

Clearly, the monetary valuation of the environment is an important task. In the context of policy and project appraisal, the environment can only be integrated if it is given a price, and only then sound economic decisions can be made. Cost-benefit analysis (CBA) is a method that is increasingly used to make decisions over the feasibility of activities that make use of the environment. It aims to define whether the benefits of a project or a policy outweigh the costs, in which case the project should go ahead; or whether the costs outweigh the benefits, in which case it should not proceed. In order to derive a correct decision, all non-market costs and benefits have to be given a monetary value and included in the CBA (Turner, *et al.*, 1994 and Sloman, 1999).

Virtually all projects and policies involve gainers and losers. The criterion used by welfare economics to decide whether a project or a policy is welfare improving is the Pareto criterion. According to the Pareto principle, an activity is only desirable, if at least one individual is made better and no one is made worse off. This means, it is only socially worthwhile to go ahead with a project if the gainers compensate the losers, and after which the gainers are still better off. In reality, compensation to losers of projects is rarely paid, and therefore Hicks and

Kaldor suggested the so-called potential Pareto improvement in 1939, which suggests that in theory gainers have to compensate losers and still be better off. The potential Pareto criterion provides the foundation of CBA, and can be expressed as:

$$\sum_i [B_i - C_i] > 0$$

If the benefits (B_i) of a project are greater than the costs (C_i), then in principle losers could be fully compensated with some net benefits left over. In reality, however, some people will always be worse off, as they do not receive compensation payments (Sloman, 1999 and Roadway and Bruce, 1984).

3.2 The concept of total economic value (TEV)

So far it has been discussed that public goods and their services are not traded in the conventional market, and therefore have no price. Before reviewing the methods used to assign a price to public goods, this section will describe the concept of total economic value (TEV), especially with regards to wilderness.

The total economic value of environmental goods and services has a number of different components, because people value the environment for various reasons. Wilderness may be valued because people appreciate the scenic landscape, the uniqueness or because they have concerns for wild reindeer or other wildlife. For many people wilderness areas also have a recreational value because they are interested in hill-walking, hunting or scenic driving, and others want wilderness to exist so that future generations have the opportunity to enjoy it. TEV can be divided into two categories: use values and non-use values.

3.2.1 Use values

Use values derive from all the direct and indirect ways in which people make physical use of the environment. Birdwatchers and hill walkers, for instance, directly use the environment and benefit from it. These are direct use values. The use value class also has an indirect dimension, created when a certain environmental asset provides further benefits. A woodland resource, for instance, may prevent erosion, act as a carbon sink or control floods. Indirect use values

also arise when people enjoy reading books or watch TV programmes about a certain environmental good, for example, the Antarctic or whales, and so value its preservation (Hanink, 1995 and Perrings, 1995).

Weisbrod (1964) first discussed what is now known as option value: even though people may not use the goods and services provided by wilderness now, they may wish to keep an option open to enjoy it sometime in the future. Option values of natural environments are frequently cited as important to their maintenance. For example, yet undiscovered medical plants in a tropical forest may be crucial to people's health, so relying on present use values alone may not be sufficient for making correct land use decision (Hanink, 1995, Mortimer, *et al.*, 1995 and Willis, 1989). Also, information about highly valuable aspects of an environmental asset may not be revealed until a later date, and hence it is not known what the costs of irreversible impacts are today, or how much would be gained in the future due to the preservation of an environmental asset. Thus, the significance of option value is enormous and implies that current use values are likely to underestimate the future economic value of wilderness (Willis, 1989).

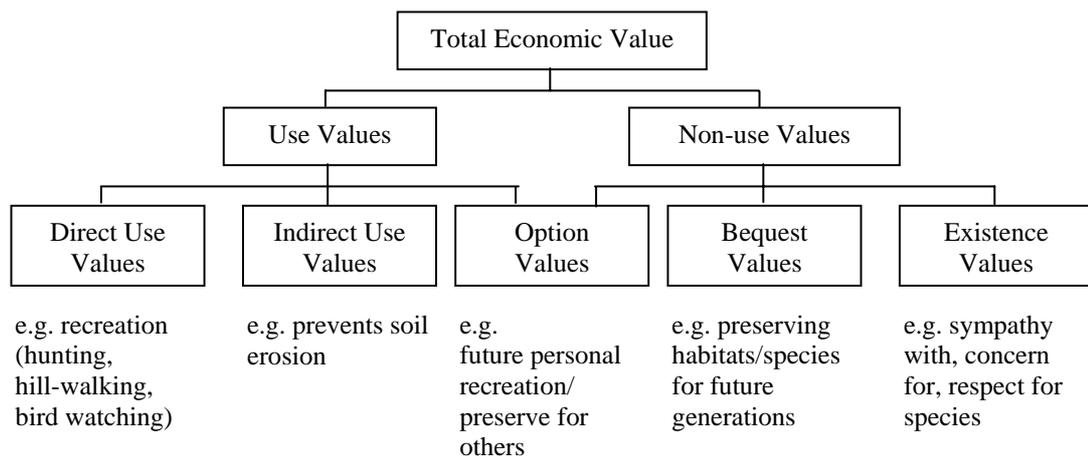
3.2.2 Non-use values

Non-use values make up a large part of TEV of certain environmental assets such as wilderness areas that are unique, irreplaceable and threatened with irreversible changes. People derive benefits from the preservation or improvement of some public goods, even though they do not obtain direct or indirect use from them. These benefits fall under two categories, vicarious consumption and stewardship, and exist due to both altruistic and selfish motives (OECD, 1995 and Turner, 1999).

Vicarious consumption represents the non-use side of option value because utility may also be gained from knowing that others benefit from using an environmental good. Some people support the preservation of an environmental asset because they feel obligated to provide the good for others (Mitchell and Carson, 1989 and Pearce, *et al.*, 1989). People hold stewardship values because they think environmental assets should be used in a responsible manner and because they want future generations to gain from them. There are two types of stewardship

values: First, existence values include people’s concern for, sympathy with and respect for rare environmental assets, such as wild reindeer. This concept was first introduced by Krutilla in 1967, when he suggested that non-users may be satisfied by knowing that natural environments exist and are protected, regardless of whether they will ever make use of them. Thus, an individual does not have to visit a wilderness area to gain utility from its maintenance or improvement. Second, bequest value is a similar phenomenon, with the only difference being the desire to preserve the environment and bequeath it to one’s descendants. The motive for bequest value is a potential use or non-use value for future generations (Mitchell and Carson, 1989, Reed and Merigliano, 1990 and Loomis and Walsh, 1991). Figure 3.1 illustrates the different types of values wilderness may possess.

Figure 3.1: Categories of total economic value for wilderness



(Source: OECD, 1995)

3.3 Wilderness Values

Wilderness produces a wide range of non-marketed goods and services that provide people with pleasure and are therefore of value to society (Morton, 1999 and Wilderness Act, 1964).

Wilderness provides a number of benefits attributed to recreation and is therefore valuable to outdoor recreationalists (see Hackett, 2000, Driver, *et al.*, 1999 and Bennett, 1996). Typical recreational activities in Iceland's wilderness

areas include hill-walking, backpacking, mountaineering, horseback riding, bird-watching and hunting. The main benefits derived from these activities include adventure, excitement, fun, physical exercise, to be with friends and family, escape from stress, experience nature, as well as quiet and solitude (Guðmundsson, 2000 and Sæþórsdóttir, 1998).

Moreover, Iceland's wilderness is important for its scientific value. Natural environments are valuable as they help to understand natural processes and ecosystem functioning. This information provides a benchmark that can be used to compare against developed areas with degraded environments. Human impacts on wilderness are often evaluated, in order to efficiently manage wilderness areas (Reed and Merigliano, 1990). Wilderness in Iceland also serves as a laboratory that provides scientists with archaeological and paleontological resources and information on flora, fauna, habitats and life cycles. Some geological features and plants are rich in historical information on climatic change and may be of importance for the prediction of future climate developments (Harðardóttir, *et al.*, 2001 and Einarsson, 1994).

Wilderness is also indispensable for educational use. A number of overseas and domestic institutions, agencies and organisations visit Iceland's interior for educational purposes. Fieldtrips to wilderness areas are frequently undertaken, as they provide unmodified environments that help geology and ecology students to learn about geomorphology, evolution, native plant communities, wildlife distribution and natural abundance. Inhospitable places, such as deserts and glaciers are an important training base for mountain rescue teams since they provide an ideal setting for learning skills, such as navigation and survival.

Iceland's wilderness has a relatively low level of biological diversity. Nevertheless, it serves a variety of different functions due to the presence of oases and wetland areas with lush vegetation, rare plants, animals and micro-organisms. People may either directly or indirectly benefit from such ecological values. Wetland areas, for example, are a sanctuary for numerous birds and are ideal for bird-watching or hunting geese, but they do also filter and cleanse water supplies, and may provide protection from storms and floods (Turner, *et al.*, 1994).

Although non-use values of Icelandic wilderness have not been examined, studies have shown that these values are important given the remoteness of most

wilderness areas. Even though the majority of people may not visit a wilderness area, they may value its existence and the option to provide it for others and future generations (Morton, 1999 and Barrick and Beazley, 1990).

3.4 Valuation methods

Wilderness benefits are a vital component in the decision-making process over the future land use of Icelandic wilderness areas, and it is necessary to evaluate these benefits in monetary terms. This section describes non-market valuation methods and examines their applicability for the valuation of wilderness. The approaches can be divided into two broad categories: revealed preference techniques and stated preference techniques.

3.4.1 Revealed Preference Techniques

Revealed preference methods elicit people's preferences and thus the utility they derive from an environmental good indirectly by exploring their purchasing behaviour in markets that are linked to the environment (Garrod and Willis, 1999). The two main techniques are the Hedonic Pricing (HP) and the Travel Cost Method (TCM).

3.4.1.1 Hedonic Pricing (HP)

Hedonic Pricing attempts to value environmental goods and services that directly affect certain market prices. Property values, for instance, may depend on a number of factors, such as distance to workplace, number of rooms, size of garden, air quality, scenery, and whether there are opportunities for outdoor recreation in the vicinity. In order to apply Hedonic Pricing, information regarding all the factors that determine house prices must be collected. As different locations have different environmental attributes, these variations will result in differences in property values. Hedonic Pricing attempts to identify how much of a property differential is due to a particular environmental difference between properties, and infers how much people are willing to pay for an

improvement in environmental quality. The relationship of a given environmental variable with house prices can be identified and reflects the implicit price for that variable. This price is a proxy for the value of an environmental attribute (Garrod and Willis, 1999 and Palmquist, 1988).

Hedonic Pricing requires a market through which individuals express their preferences for an environmental good. For Icelandic wilderness no such related market exists, and Hedonic Pricing is therefore not applicable. Also, as discussed above, wilderness is to a large extent composed of non-use values, but Hedonic Pricing can solely measure use values.

3.4.1.2 The Travel Cost Method (TCM)

The Travel Cost Method estimates demand curves for recreational sites, such as nature reserves or wilderness. Visitors are asked how often they visit the site per year and from where they have travelled. With this information on travel costs (e.g. mileage) and number of visits per year it is possible to derive a demand curve, which is used to obtain the total recreational value for certain environmental goods (Turner, *et al.*, 1994).

In practice there are several problems with this technique: First, in order to reflect the true recreational value of a site, a value of time should be added to the travel cost. Time is valuable because time spent during a car journey cannot be spent doing something else. However, it is difficult to put a monetary value on time, and ignoring time costs therefore leads to an underestimate of the recreational benefit people obtain from visiting a site. Second, people might visit several places in one day and may have incurred high travel costs, although only a part of these costs reflect the value of the recreational site in question. Such multi-purpose trips tend to overestimate the recreational value. Third, those who most value a recreational site might move closer to the site, which would induce relatively low travel costs and thus bias the average recreational value (Garrod and Willis, 1999, Endres and Holm-Müller, 1998 and Turner, *et al.*, 1994). However, some of these problems can be circumvented: In Willis (1990) travel time was calculated by estimating the value of non-working time, and the percentage of enjoyment attributed to visiting the site under investigation helped to ameliorate the multi-purpose trip problem.

For the evaluation of the wilderness area in East Iceland, TCM is of limited interest in that it can only estimate recreational use values. As most visitors visit different places in the highlands, the travel costs would not reflect the recreational benefit of the specific wilderness area. Due to the remoteness of the wilderness area, it is likely that benefits derived from the site are mainly non-use benefits. TCM does not estimate all the benefits of wilderness, as it does not capture the utility non-users obtain from its existence (Endres and Holm-Müller, 1998 and Willis, 1990).

3.4.2 Stated Preference Techniques

Since many goods and services provided by wilderness are neither traded in markets, nor closely related to marketed commodities, their value cannot be explored through people's behaviour on the market. Stated preference methods overcome this problem by asking people to express their value in a hypothetical market context.

3.4.2.1 The Contingent Valuation Method (CV)

CV is a survey-based method that elicits people's preference directly by using one of the following measures: willingness to pay (WTP) to obtain an environmental improvement or to avoid an environmental deterioration, or willingness to accept (WTA) compensation for relinquishing an environmental deterioration or to forgo an environmental improvement. The method bypasses the need of market for environmental assets by presenting individuals with a hypothetical market in which they have the opportunity to buy (WTP) or sell (WTA) the environmental good in question. People's actions are contingent on the hypothetical situation described to them, and elicited WTP and WTA bids are close to the value that would be revealed if an actual market existed (Garrod and Willis, 1999 and Mitchell and Carson, 1989).

In order to obtain reliable and valid economic values of environmental goods or changes, CV surveys contain of three parts: Firstly, a detailed description of the environmental asset or change being valued and the hypothetical market.

Secondly, questions that elicit people's WTP and/or WTA amounts. Thirdly, questions about people's socio-economic characteristics, such as income, and their preferences regarding the environment and the environmental change under investigation for validity testing (Mitchell and Carson, 1989). Once WTP/WTA bids have been obtained, the total value estimate of the environmental good or change is derived by the calculation of mean WTP/WTA and its aggregation to the total population. The last stage of a CV study involves a validity assessment of WTP/WTA estimates (Garrod and Willis, 1999).

CV has been applied to a range of environmental issues, both involving public goods, and goods and services sold to individuals. These include improvement of air quality and water quality in rivers, hunting licences, preservation of wildlife and landscape, reduction in noise pollution, sewerage sold to households and improved water supply (Endres and Holm-Müller, 1998 and OECD, 1995). The increasing use of CV implies that the method has several advantages over other valuation methods:

- Market data is not required, as opposed to revealed preference methods.
- CV is capable of measuring both use values and all categories of non-use values.
- It can value goods that are currently not available.
- It allows both ex ante and ex post judgements.
- It allows a certain extent of public participation.
- It allows people to make their own trade-off in terms of money.
- It is able to obtain detailed distributional information on people's WTP or WTA (Willis, *et al.*, 1995 and Mitchell and Carson, 1989).

3.4.2.2 The Choice Experiment (CE)

Instead of eliciting preferences for a given scenario, CE is capable of determining preferences for specific attributes of an environmental change simultaneously by measuring WTP for changes in the level of attributes. The advantage of CE over CV is, that it is more flexible as it facilitates the valuation of both individual attributes and the whole scenario, and hence collects a greater amount of data that can be useful for designing an optimal environmental policy or project. In a

survey, respondents are asked to choose their favourite project or policy option out of a set of choices based on their preferences.

One of the key tasks of researchers is to identify the attributes of the environmental change in question and determine the level of each attribute. For example, an environmental policy aiming at managing and protecting wild geese in Scotland was described with five attributes (species, means of control, location, population change and tax cost of the policy to each household per year) and each attribute had two or more levels: For example, the policy would either focus on all geese species or only endangered species, birds would be controlled using habitat management or habitat management and shooting, birds would be protected on special sites or all over Scotland and so on (Hanley, *et al.*, 2003). The attributes and their levels used in CE normally result in hundreds of different combinations, and, in order to keep mental effort required from participants at a minimum, a large sample is required to reduce the number of choice sets to an acceptable number per respondent. Once data has been obtained, the value of the whole scenario and of each attribute can be estimated and aggregated over the relevant population (Garrod and Willis, 1999).

The choice alternatives are similar to consumer purchasing decisions in the real market (e.g. making a choice among washing machines) and are therefore consistent with utility theory. Choice Experiments have been applied to a range of environmental project and policy contexts ranging from wind power generation in Scotland, to estimating the benefits of clean beaches and access to climbing routes in Scottish mountains. However, Choice Experiments have not been used to value wilderness, possibly due to its complex nature and unlimited number of attributes.

One of the criticisms of Choice Experiments is that motivation may diminish because respondents are usually asked to respond to several choice sets. Moreover, the complexity of CE may influence the consistency of choices and aggregated estimates (Lusk and Schroeder, 2004). Furthermore, it would be difficult to describe wilderness with a limited set of attributes. While these may be carefully selected by the researcher, they may not necessarily reflect what each individual perceives as important.

3.4.3 Why choose CV?

As mentioned above the wilderness area has no related market in terms of travel costs or property prices that could be used as a reliable proxy for wilderness values. Given that the wilderness area is very remote, and inaccessible during most of the year, it is likely that its economic value is to a significant extent composed of non-use values. For example, Barrick and Beazley (1990) found that non-users contribute the greatest total value of the Walshakie wilderness in Wyoming. Although the average value to non-users is small per capita, they collectively account for most of the value of wilderness, simply because there are so many of them compared to recreationalists (Barrick, *pers. com.*, 2001 and Garrod and Willis, 1999). According to Barrick and Beazley's study, the demand for the Walshakie wilderness includes vicarious value holders living as far as 3060 km away from the area. Morton (1999) states that recreation is less than 50% of the total economic value of wilderness, hence ignoring non-use values would lead to a severe underestimation of wilderness benefits and the environmental cost caused by hydro schemes. Revealed preference methods are therefore inappropriate for the estimation of these values.

CV and CE are considered to be the most feasible option for this study for the following reasons.

- They are the only methods that are independent of markets and capable of translating non-use values into monetary terms.
- One aim of this study is to value the non-market benefits of the hydro schemes (see Chapter 5). Even though these benefits are yet not available, CV and CE allow to quantify them *ex ante*.
- They are the only methods that are capable of directly obtaining Hicksian measures and do not rely on Marshallian consumer surplus (see Section 3.5.1), as opposed to revealed preference methods, which merely rely on the estimation of a demand curve (Mitchell and Carson, 1989). This also means that HP and TCM cannot estimate the correct welfare measure for environmental losses in terms of compensation claims. CV and CE, however, can obtain these estimates in terms of WTA (Gregory and McDaniels, 1987).

Although CE has several favourable features that CV lacks, it does not seem to be well suited for this specific wilderness valuation context for a number of reasons: Firstly, the environmental change is already pre-defined (detailed hydro scheme proposals exist) and valuing different attribute levels, for example the amount of wilderness inundated, is not relevant given that changes to current plans seem unlikely. Hence, eliciting values for different attributes is unnecessary, as these will not be taken into account in the proposal. Secondly, wilderness is characterised by a number of attributes and it would be difficult to reduce these to the most important attributes and levels. Also, there is a possibility that the key attributes differ among individuals. Thirdly, a large number of choice options would require a large sample size, which in turn is impracticable for some survey methods, such as group-based approaches. Also, one of the aims in this study is to investigate individual changes in WTA/WTP between two elicitations, and CE is incapable of comparing individual estimates. Lastly, if the aim is to include both gainers and losers, two choice experiments would need to be designed, and large sample sizes would be required. Hence, despite the advantages of CE, CV seems to be more applicable for this study.

3.5 Theoretical background of CV

The amount of money people are prepared to pay reflects the satisfaction or utility they derive from a change in the level of environmental quality. The ability of CV to obtain this information is underpinned by assumptions from neo-classical economic theory, which assumes that people have a coherent set of preferences and reveal them through their choices (Sudgen, 1999 and 2003). Thus, when faced with a choice between two commodities, consumers choose based on their preferences and budget constraint. Economic theory also assumes that these preferences are complete (that is an individual either prefers option A to option B or options B to option A or is indifferent between the two options) and transitive (that is an individual prefers option A to option B and option B to option C and therefore option A to C), as well as invariant and stable (Shapansky, *et al.*, 2003 Sudgen, 2003 and Gravelle and Rees, 1993). In the CV context this means that respondents are sensitive to scope, that is, they are willing to pay more for a

higher level of provision of a certain good than for a lower level, and that preferences should not differ when options are described in different but equivalent ways or when different but equivalent elicitation methods are used. Furthermore, consumers are considered to be perfectly informed as to their preferences. Hence, they are fully aware of the existence of all goods available in the market, as well as their qualities, attributes and price (Chiplin and Sturgess, 1981, Ferguson, 1972 and Debreu, 1959). These axioms of economic theory are a prerequisite to preference measurement and welfare maximisation (Payne, *et al.*, 1992, Slovic, 1995 and Shapansky, *et al.*, 2003). When faced with a decision, consumers always choose the most desirable option in order to maximise their personal level of satisfaction (Kopp and Smith, 1997 and Feldman, 1980). Although these assumption apply to markets, people also have preferences for things, such as environmental amenities, and hence determine what, and how much, should be provided (Penz, 1986). CV is consistent with the assumptions of neo-classical economics, as it allows preference revelation for commodities that are not bought and sold on the market (Mitchell and Carson, 1989).

3.5.1 Welfare measures and property rights

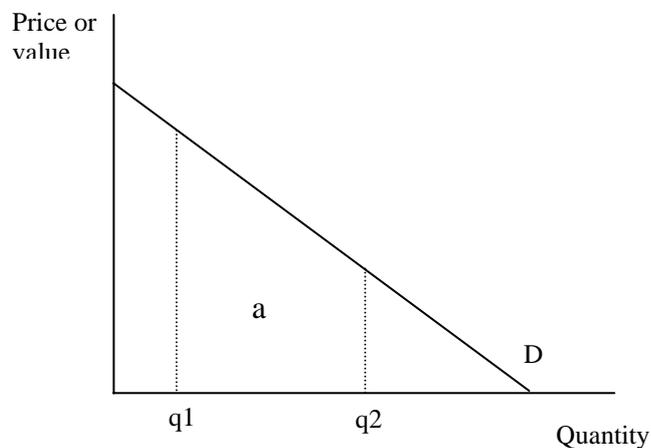
Even though welfare cannot be directly measured, it is possible to measure a consumer's welfare change indirectly by his or her monetary valuation of the change. The three common measures of consumer welfare include consumer surplus (CS), compensating variation/surplus and equivalent variation/surplus.

What is now regarded as the concept of economic value was first explained by Dupuit in 1844. According to him, consumers' utility is reflected by the difference between the actual price of a good and the amount of money the consumer would be prepared to pay for it. This surplus WTP for a certain commodity diminishes as more of the same good is acquired, simply because the utility gained from the first unit is not equivalent to the utility derived when the x th unit of the good purchased. This is what Dupuit called the marginal utility of demand (Sloman, 1999 and Hanley and Spash, 1993).

In 1879 Marshall formulated a similar idea. He suggested that the economic measure of satisfaction is what someone would just be willing to pay for a commodity rather than to go without it. Marshall also pointed out that the

satisfaction received from a purchased commodity generally exceeds the satisfaction which a person gives up in paying the price for the commodity, so that he or she derives a surplus of satisfaction from the purchase. The excess of price, which the consumer is willing to pay for a commodity rather than go without it, over that which he or she actually pays, is the economic measure of surplus satisfaction, which Marshall called consumer surplus in 1898 (Reddaway, *et al.*, 1971). For marketed commodities, WTP (the economic value) is equivalent to the expenditure plus the consumer surplus. For non-marketed environmental goods, however, for which no price exists, consumer surplus is the only determinant of value (the area under the demand curve in Figure 3.2). Hence, the concept of consumer surplus is very relevant in the context of trade-offs involving non-marketed goods. The Marshallian demand curve in Figure 3.2 describes how the change in the quality or quantity of a public good affects consumer surplus (Johansson, 1987).

Figure 3.2: Marshall's consumer surplus for the change in quantity of a public good



D: Demand curve

a: Marshall's consumer surplus

(Source: Mitchell and Carson, 1989)

However, the main drawback of Marshall's measure of consumer benefits is that the demand curve does not hold the level of utility constant and instead assumes

that income is constant (Mitchell and Carson, 1989). These assumptions cause problems, as for most goods the quantity consumed changes with changes in income, and hence income elasticity cannot be assumed to be zero (Hanley and Spash, 1993).

Hicks re-interpreted Marshall's welfare measure in 1941, and suggested four monetary measures of the improvement or deterioration of a consumer's utility level, holding utility constant at either the initial level or at an alternative level. These include Compensating Variation (CV), Equivalent Variation (EV), Compensating Surplus (CS), and Equivalent Surplus (ES) (Panel 3.1).

Panel 3.1: Hick's welfare measures.

Compensating Variation is the compensating payment that leaves an individual as well off as before a certain environmental change, if he or she is free to determine the amount of the good to be purchased. The individual is entitled to his or her current level of utility (property rights of the status quo are assumed).

Compensating Surplus is the compensating payment that leaves an individual as well off as before a certain environmental change, if he is forced to buy a given amount of the good. The CS measure is used when the individual holds the property rights of the status quo.

Equivalent Variation is the compensating payment that an individual would claim if an economic change did not happen, to make him or her as well off as if it did happen. The consumer is free to determine the amount of the good to be purchased. The individual is entitled to an alternative utility level (no property rights of the status quo assumed).

Equivalent Surplus is the compensating payment that an individual would claim if an economic change did not happen, to make him or her as well off as if it did happen. As the quantity of the good consumed by all individuals is the same, the consumer is forced to buy a given amount. It is assumed that the individual does

not hold the property rights (Mitchell and Carson, 1989 and Reddaway, *et al.*, 1971).

From these definitions, the compensating measures can be equated to WTP to obtain an environmental improvement and WTA in compensation for an environmental loss, whereas the equivalent measures are equivalent to WTA to forego an environmental improvement and to WTP to avoid an environmental loss (see Table 3.1) (Clinch and Murphy, 2001 and Bockstael, *et al.*, 1980).

For the valuation of public goods, surplus measures are recommended, as consumers are restricted to a transaction involving a predetermined amount (Mitchell and Carson, 1989). The loss of wilderness as a result of hydro scheme developments, for instance, forces people to make a compensation claim for a predetermined reduction of wilderness, as opposed to choosing the amount of wilderness loss they would accept.

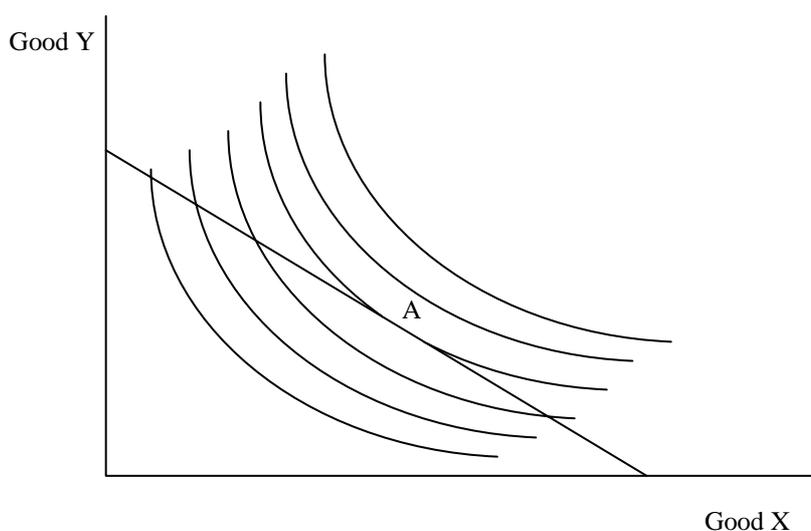
Table 3.1: Welfare measures for gains and losses

Welfare measure	Environmental improvement	Environmental deterioration
CS	WTP	WTA
ES	WTA	WTP

(Source: Mitchell and Carson, 1989)

According to Hicks, consumers always aim to maximise their utility but are constrained by their income. A consumer's utility can be presented by indifference curves, which show how a consumer chooses between goods X and Y (see Figure 3.3). Each indifference curve shows a set of different bundles of X and Y that yield the consumer the same amount of utility. Indifference curves further out present sets of combinations that give the consumer higher utility, whereas those further to the left make him less well off. A rational consumer maximises his consumption of X and Y until he reaches a point at which he cannot afford to buy more. This is at point A, where the indifference curve is tangent to the consumer's budget line (Figure 3.3) (Sloman, 1999).

Figure 3.3: Indifference curves and the budget constraint

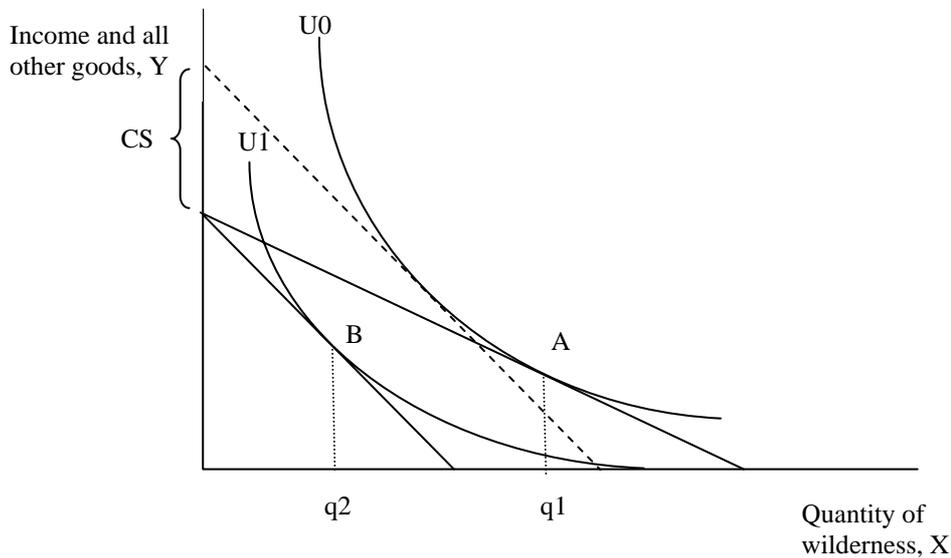


The choice between two goods varies if there is a change in the consumer's income or if the price of goods X or/and Y changes. Hence, following a change in income the budget line shifts to the right (increase in income) or to the left (decrease in income). Accordingly, the consumer now purchases more or less of goods X and Y (Sloman, 1999). The effect of a change in income on the budget line is represented by the broken line in Figure 3.4 A (showing an increase in income due to WTA) and in Figure 3.4 B (showing a decrease in income due to WTP). The change of the price of either X or Y results in a change of the slope of the budget line. Thus, if the price of X increases, the budget line will move towards the left on the X axis (see Figure 3.4 A), and if there is a decrease in the price the budget line moves towards the right (see Figure 3.4 B) (Sloman, 1999).

Figure 3.4 A illustrates Compensating Surplus for a decrease of the quantity of a public good. In the context of this study, the deterioration of a public good could be the adverse impacts of hydro scheme developments on wilderness. Prior to the environmental change, the consumer's utility level was at point A on U_0 , at which he or she consumed quantity q_1 of wilderness. As wilderness becomes scarcer the consumer is forced to consume less of it. Hence, the budget line shifts towards the left on the X axis, and the consumer now moves onto a lower indifference curve (U_1) with his new utility level at point B, and the amount of wilderness consumed being q_2 . CS measures the amount of money the consumer should receive (WTA) to endure the loss caused by hydro schemes, in order to maintain

the original utility level (Hanley, *et al.*, 1997, Johansson, 1993 and Reddaway, *et al.*, 1971).

Figure 3.4 A: Compensating Surplus for wilderness deterioration

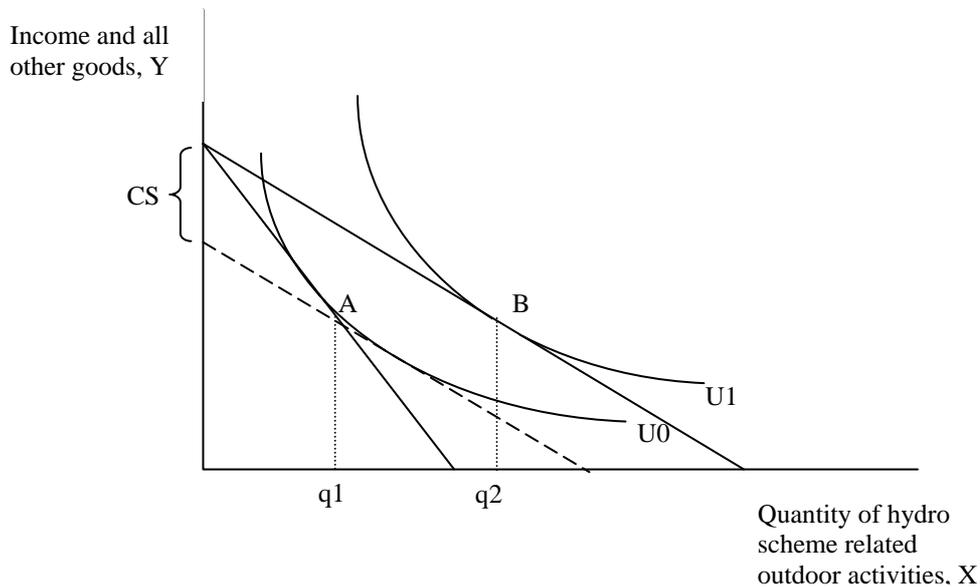


Those in favour of hydro power generation¹ would be prepared to give up the amount of money (WTP) represented by CS in Figure 3.4 B, in order to secure the development of hydro schemes, and to leave them as well off as previously. At point A, hydro scheme gainers are to a limited extent engaged in outdoor activities, such as water sports or angling². Since hydro schemes would increase the supply of such outdoor opportunities the budget line shifts to the right. The consumer moves to a higher utility curve and now consumes q_2 at point B. By paying the amount represented by CS, individuals remain on their original utility level.

¹ People in favour of hydro schemes will be referred to as 'hydro scheme gainers' and those opposing the hydro schemes will be referred to as 'hydro scheme losers'.

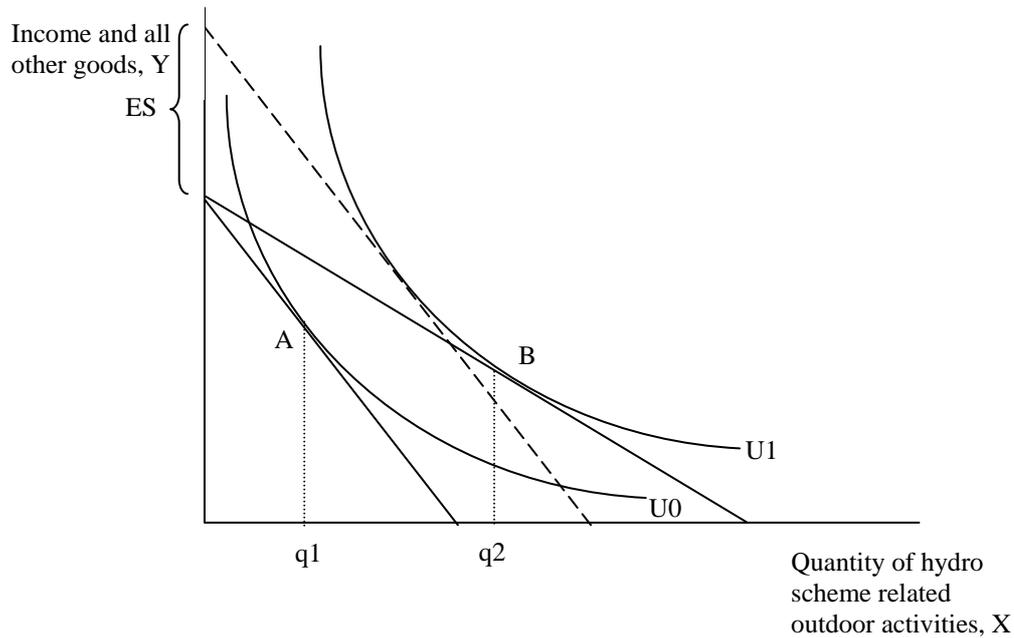
² It should be noted that benefits provided by hydro schemes are a quasi public good: 1) they are semi-non-exclusive (it would be possible to exclude members of the general public from e.g. angling by selling licences or charge a toll for road usage), and 2) they are semi-non-rival (at some point additional visitors to the site reduce the benefits of other users).

Figure 3.4 B: Compensating Surplus to obtain hydro schemes (hydro scheme gainers)



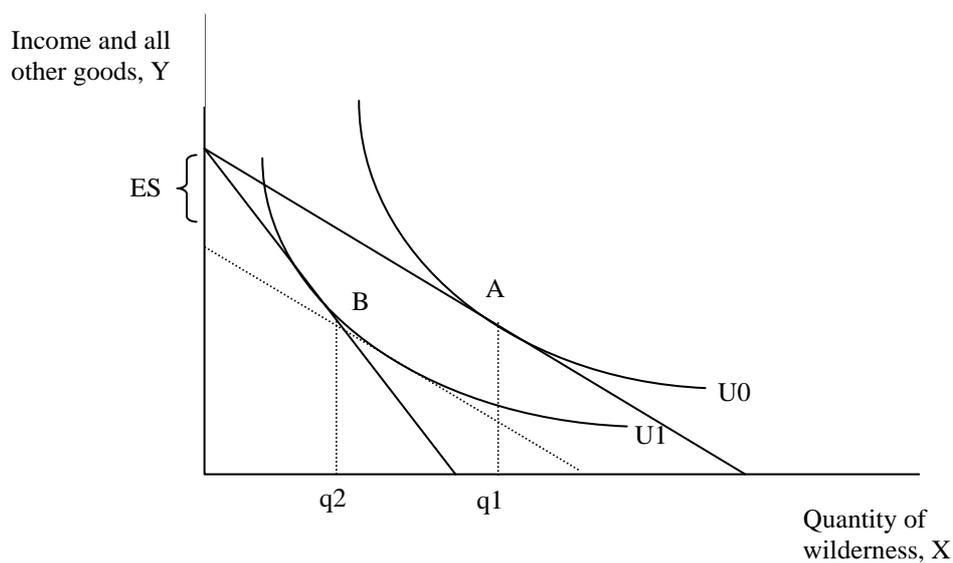
As mentioned above, the equivalent measures can be defined as the minimum amount of money an individual needs to relinquish an environmental change, in order to leave him or her as well off without the environmental change as if it had happened. The consumer therefore expects to move on a higher utility level. Hydro scheme gainers, for instance, would need to be compensated if wilderness was maintained and hydro schemes would not go ahead. In Figure 3.5 A the consumer's utility level is initially at point A on U0. A proposed increase in hydro scheme developments from q1 to q2 would move hydro scheme gainers to a higher utility level, that is, point B on U1. However, as the proposed improvement does not materialise, the consumer is restricted to q1. Hence, ES is the amount of compensation a consumer would claim (WTA) to relinquish hydro scheme related benefits, but stay at the new utility level (U1) (Hanley, *et al.*, 1997).

Figure 3.5 A: Equivalent measure for hydro scheme gainers



However, for hydro scheme losers, the developments would have a welfare declining effect, hence ES would measure the consumers WTP to avoid that loss (see Figure 3.5 B). Due to the reduction in wilderness, hydro scheme losers would move to a lower utility curve (U1) and consume q_2 at point B. However, they might be WTP to avoid the loss and hence will move to U1 as if the change had happened.

Figure 3.5 B: Equivalent Surplus for hydro scheme developments as a loss



3.5.1.1 Choice of welfare measure

Given the two surplus measures, which one should be used in a CV study? The choice of the relevant welfare measure for environmental goods depends upon the property rights held by the consumer. As noted above, CS measures represent the amount of money that would be needed to restore the welfare level an individual had before a change in environmental quality (Garrod and Willis, 1999). If individuals were entitled to their current utility level, they would be WTA compensation to endure an environmental loss and WTP to obtain an environmental improvement in order to maintain their initial utility level. On the other hand, ES measures assume that an individual is entitled to an alternative level of utility, and therefore needs to be compensated (WTA) for forgoing a gain/WTP to avoid a loss, in order to move to the alternative utility level (Vatn and Bromley, 1994).

The selection of compensating or equivalent surplus to measure lost wilderness benefits and gained hydro scheme benefits in Iceland, therefore depends on the entitlement perceived by Icelandic citizens. There has long been uncertainty regarding the property rights of the Icelandic highlands and up until the adoption of wilderness legislation, vast areas were not owned by anyone. According to the legislation adopted in July 1998, the state is the owner of the highlands, that is, of all land that is not privately owned. The legislation does not diminish the rights of individuals, groups and municipalities to use the highlands, e.g. for recreation or sheep grazing, but man-made constructions, excavations, hunting and the utilisation of hydro power and geothermal energy are prohibited, unless the prime minister grants a permit (Web source: Icelandic Parliament). Furthermore, people have some property rights because they have freedom over whether and when to visit the wilderness area. Although the property rights are clearly defined by law, the perceptions of respondents as to the entitlement structure may be different (see Chapter 5.2.3) and hence the welfare measure should be chosen according to respondents' perceptions.

Surprisingly, a number of CV studies ignore the allocation of property rights by exclusively measuring WTP (Vatn and Bromely, 1994). For instance, in circumstances where the environmental change leads to a deterioration of welfare

the practice of estimating WTP in CV studies is inappropriate in the context of prevailing property rights. If individuals are convinced that wilderness should remain untouched, they will be reluctant to pay to prevent it from being developed, because they perceive that they should not have to pay for wilderness assets that have always been there and are now at risk of being developed by someone else. Instead they might wonder why they should not be compensated for the loss. The use of WTP as a surrogate for WTA is troublesome as it violates the principles of property rights, yet WTA measures of economic value for environmental deterioration are rarely used. For example, Kriström (1995) evaluates the non-market costs arising from the closure of an airport using WTP estimates, and Clinch and Murphy (2001) base their estimation of non-market afforestation costs on WTP.

3.6 Challenges to CV

Although economic theory is the theoretical foundation of CV, respondent behaviour and high WTA responses have suggested that CV does not always comply with expectations of economic theory. This section will discuss two challenges of CV that tend to be overlooked in the literature, but are essential for obtaining accurate value estimates, and play an important role in the selection of the survey method for this study: Firstly, the use of the WTA measure, and secondly, the notion that CV respondents need to construct preferences.

3.6.1 The use of WTA

So why is the wrong measure of environmental losses employed in most CV studies and why are WTA measures discouraged in the NOAA report? Conventional economic theory suggests that WTP and WTA measures are roughly equivalent as long as income and wealth effects are small, hence the measures can be used as substitutes for each other and it should not matter which measure is selected. The theoretical equivalence of WTP and WTA measures and the general assumption that WTA questions are troublesome due to problems with protest rates of 50% or more and strategic overbidding (Mitchell and Carson, 1989) led

the NOAA Panel commissioned to test the reliability of CV to recommend the use of WTP questions only³, thus encouraging researchers to measure WTP to avoid a welfare loss as a substitute for WTA. This has resulted in an extensive use of WTP for both welfare gains and losses. However, the advice, as stated in the NOAA report, can hardly be justified, since the assumptions based on economic theory contradict with results from empirical tests, which show that WTA measures yield considerably higher values than those obtained from WTP. For example, the reluctance to give up a box of organic eggs (Anderson, *et al.*, 2000) or a lottery ticket (Knetsch and Sinden, 1984) result in higher WTA bids as compared to WTP. Although, the disparity between WTP and WTA has not been satisfactorily explained, a number of economists attribute these empirical results to income effects or flaws in the CV survey design (Gregory and McDaniels, 1987). Empirical evidence does not support the practice of using WTP only, and according to Brown and Gregory (1999), the use of WTP for environmental losses is, in fact, incorrect because it may well underestimate the environmental costs of a project, especially when the good to be valued is unique and not substitutable, or when it is an important component of the respondent's endowment. Decisions based on lower WTP responses may therefore be biased towards environmental deterioration rather than improvement because the real value of loss is not appropriately measured. The reluctance to use WTA is therefore likely to influence the outcome of cost-benefit analyses. Similarly, compensation payments may be too small in order to make appropriate restitution or deterrence (Bromley, 1995)

The investigation into the sources of the WTP and WTA disparity explains better why substituting WTP for WTA may not be necessary or desirable. One of the major explanations for the disparity is income effect. When people are asked to pay for an environmental good they must give up a part of their income, and hence their budget constraints become relevant. This is clearly not the case with WTA questions, as compensation claims are not restricted by income, and could therefore be infinite. Income effects often generate strategic behaviour, that is, in WTP questions people are more likely to understate their bid, whereas the WTA

³ 'The willingness to pay format should be used instead of compensation required because the former is the conservative choice' (NOAA, 1993, p. 4608).

question may create an incentive to overstate bids because of the absence of income constraints. However, as long as compensation payments do not greatly increase someone's welfare, the difference between WTP and WTA responses is said to be insignificant (Bromley, 1995 and Gregory and McDaniels, 1987). The income effect is also influenced by the availability of substitutes. Hence, if perfect substitutes are absent, individuals may demand large amounts of compensation and thus enhance the disparity (Clinch and Murphy, 2001 and Brown and Gregory, 1999). However, it should be noted that a lack of substitutes is likely to increase both WTP and WTA bids, and Hanemann (1991) states that the absence of substitutes is not a cause of disparity.

An incentive to state high WTA bids may also be created because people tend to become attached to goods they own, and therefore value them more and are reluctant to 'sell' them. 'Selling' is associated with a loss, whereas buying the same good generates a gain. The compensation payment required for losing the good is greater than an individual would have been originally willing to pay to obtain it. This loss aversion or endowment effect creates a significant disparity between WTP and WTA (Kahneman, *et al.*, 1991 and Mitchell and Carson, 1989). Some experiments show that one of the main causes for endowment effects is the absence of suitable substitutes (see Shogren, *et al.*, 1994), and that it is natural that rare and irreplaceable goods that have no substitutes generate greater WTA than WTP bids. Goods that are substitutable are less likely to create significant differences between payment and compensation measures (Hanemann, 1991).

A further explanation for the disparity is the intrinsic value attached to the good to be valued and the respondent's moral responsibility for preserving it. Anderson, *et al.* (2000) assume that there is a link between an individual's entitlement to a good and the moral responsibility to care for environmental assets under threat. Hence, a compensating surplus measure for an environmental loss (WTA) always involves intrinsic values as respondents hold the rights to the good and may therefore assume responsibility for the loss. Intrinsic values and moral responsibility do not seem to play a role when individuals are not entitled to the environmental good in question. In WTP questions respondents assume that the responsibility lies in parts in the hands of the institution that receives the payment.

Certainly, the endowment effect, and some other sources of error also justify concerns about freely substituting WTP for WTA measures for valuing losses. However, Coursey, *et al.* (1987) found that the disparity can be reduced when respondents are given the opportunity to learn about and gain experience with the transactions. While this study does not focus on the WTA/WTP disparity, it will attempt to create an environment that enables participants to successfully complete the unusual transaction involved in WTA questions in order to overcome the general assumption that cognitive difficulties associated with WTA questions are too high and discourage the use of incorrect welfare measures.

3.6.2 Preference construction and respondent motivation

The notion that respondents may need to construct preferences, provides a further challenge to CV design: currently CV practitioners rely on economic theory, which suggests that preferences are simply retrieved. In theory, CV respondents are expected to consider and answer the WTP question in a way that coincides with economic theory. That is, they are required to make a trade-off between their budget constraints and their preferences. According to assumptions of economic theory, this should not pose a problem because people have fixed and well-defined preference orderings for all goods which forms a crucial basis for their purchase decision (Gravelle and Rees, 1993). As long as respondents are familiar with the commodity to be valued, this trade-off should be relatively straightforward because preferences are simply retrieved from an existing preference set in their minds (Schkade and Payne, 1994). However, the application of CV is most required for public goods, many of which are complex and/or unfamiliar, and the question arises how respondents manage to answer the WTP question in accordance to economic theory when their preferences are not fully defined.

A number of research papers have shown that in many cases respondents fail to make the required trade-off. Examples include the purchase of moral satisfaction, protesting, symbolic responses to environmental issues, strategic bidding or non-responses to the payment question (see Clark, *et al.*, 2000, Schkade and Payne, 1994 and Kahneman and Knetsch, 1992). All these response types undermine the validity of WTP results as they provide false signals about respondents' preferences. A wide range of psychologists therefore criticise

economic theory of decision behaviour and claim that individuals that are not familiar with a good, cannot consult existing preferences (Slovic, 1995).

3.6.2.1 Existing preferences

The economic theory of consumer behaviour forms the underlying theoretical foundation for contingent valuation, however a considerable number of empirical studies have shown that CV does not always appear to be compatible with its theoretical assumptions. For example, the question arises how individuals can be informed and possess complete and transitive preferences, when a good is novel or the consumer has no experience with it, as it is the case with many environmental commodities valued in CV.

Economic theory does not detail preferences for goods that one did not know existed, e.g. a remote wilderness area (Burgess, *et al.*, 2000, Hutchinson, *et al.*, 1995 and Gregory, *et al.*, 1993). Despite observed inconsistencies, economists tend to believe that *all* goods are integrated in the preference set and therefore simply need to be retrieved. A further aspect that has received considerable attention involves shifts in preferences with varying information levels or contents (Fischhoff, *et al.*, 1980). Although economic theory is not clear about whether preferences should remain stable when individuals are presented with differing information levels, there seems to be a tendency to assume that preferences ought not to vary despite external influences (Mitchell and Carson, 1989 and Shapansky, *et al.*, 2003) and the effects of varying amounts of information and/or its content on preferences have been considered to be undesirable by a number of authors. Mitchell and Carson (1989) talk about 'information bias', and the NOAA report implies that the 'information problem' can be ameliorated or eliminated by providing adequate information. Hence, according to NOAA, state-of-the-art CV surveys reduce or remove information biases and elicit true preferences for the environmental good under investigation (NOAA, 1993 and Burgess, *et al.*, 2000). Nevertheless, a number of studies show that even with well-designed CV surveys WTP and WTA bids do differ according to information level (e.g. Kenyon and Edwards-Jones, 1998). Dixit and Norman (1978) argue that such changes in preferences are not problematic and instead are natural. They raise the point that advertising (that is, new information) does

indeed shift preference over goods. This view is also shared by Samples, *et al.* (1986), Hanley and Munro (1999) and MacMillan, *et al.* (2004a) who argue that an individual's value for endangered species may change in response to additional information.

A further divergence between economic theory and CV involves the embedding effect, that is, CV respondents systematically violate theoretical assumptions because their WTP or WTA is insensitive to differences in scope (Carson, *et al.*, 2001, Dubourg, *et al.*, 1997, Macdonald and McKenney, 1996 and NOAA, 1993). Although economic theory predicts that a rational consumer is willing to pay more for a higher level of provision of a certain good than for a lower level, CV studies have shown that people are willing to pay roughly the same for a fraction of an environmental good and for the entire good. Desvousges, *et al.*'s CV study on the preservation of migratory waterfowls provides a classical example of the existence of such context effects. The study found that people's WTP for 2000 waterfowls was about the same as their WTP for 20,000 and 200,000 waterfowls (Desvousges, *et al.*, 1993).

A number of explanations for these inconsistencies between CV practice and economic theory have emerged. Mitchell and Carson (1989), for instance, label them as bias and blame inadequate survey design for inaccurate revelation of respondent preferences and thereby imply that economic theory is an adequate foundation for CV. A different view is taken by Tversky and Kahneman (1992) who ascribe the biases to a mismatch between the current theoretical framework and CV practice, and Fischhoff (1991) and Kahneman (1994) who go as far as questioning the existence of preferences for non-market goods.

3.6.2.2 Preference construction

Numerous CV studies have provided evidence that preferences are labile and sensitive to task and context factors. These findings have led psychologists to assume that preferences for environmental goods may not pre-exist in people's minds and instead are constructed (Shapansky, *et al.*, 2003, Sudgen, 1999, Ajzen, *et al.*, 1996, Slovic, 1995 and Fischhoff, *et al.*, 1980). Hence, when asked for

their WTP or WTA for an environmental good, CV respondents are forced to give a response based on unclear or ill-considered preferences.

While individuals may have stable preferences for some goods, they need time and deliberation to work out what their preferences are for other issues (Burgess, *et al.*, 2000). Research on consumer behaviour shows that before consumers decide to purchase a new or complex commodity they go through a process of preference construction, and gathering and processing of information is a crucial part in the formation of a consumer's preferences. Hardly anyone acts as *homo oeconomicus* who is assumed to be aware of all product alternatives available, be able to rank all alternatives in terms of their advantages and disadvantages and be able to determine the best alternative on the spot. Consumers neither have sufficient and accurate information nor an adequate degree of involvement or motivation to enable them to make a thought-out decision straightaway. Social scientists suggest that characterising consumers as *homo oeconomicus* is unrealistic for three reasons: Firstly, individuals are limited by their skills and habits, secondly, they are limited by their existing values, and thirdly, they are limited by their level of knowledge (Schiffman and Kanuk, 1991).

The cognitive model of decision-making seems to be more compatible with the CV process as it assumes that consumers seek and process information, in order to establish preferences and ultimately make a purchase, and consumer behaviour in real markets shows that time to think about a purchase and discussions with friends or family members are an important aspect in this context. Prior to making a purchase decision, consumers engage in pre-purchase search, that is, they search their memory and seek external sources of information (Schiffman and Kanuk, 1991).

A common and effective procedure for preference formation under this model involves the advice of another person, e.g. a friend, a family member or a salesperson, yet the opportunity to discuss with others are unavailable in CV (Schiffman and Kanuk, 1991, Harris, *et al.*, 1989 and Bettman, 1979). With decisions involving complex or unfamiliar goods this pre-purchase search is likely to be more extensive and interpersonal search plays an increasingly important role in the decision-making process (Beatty and Smith, 1987). Since information

processing is a basis for preference construction, it might be assumed that for many goods preferences are not existent in people's minds, and this would also explain why preferences for environmental goods are at risk of being incomplete, intransitive and variable. Schiffman and Kanuk (1991) state that rapid decision-making does not suit everyone. For unfamiliar commodities, such as environmental goods, preference revelation becomes especially 'difficult when the decision is complex: many consumers prefer to approach a fairly costly and complex decision with much more deliberation especially when they have no prior experience on which to draw' (p. 561).

Given that CV respondents are required to make a quick decision, it is not surprising that they anchor their WTP or WTA on factors that are less relevant to the decision-maker but obvious to the respondent, for example the payment vehicle or certain bits of information. The fact that preferences vary depending on task and context means that people do not simply report existing preferences. Instead they construct them using whatever cues available during the CV exercise (Dubourg, *et al.*, 1997 and Gregory, *et al.*, 1993). Furthermore, respondents are not used to think about environmental goods in monetary terms (Dubourg *et al.*, 1997 and Kahneman, 1986). Gregory, *et al.* (1993) suggest that familiar market goods, such as groceries are represented in money terms in people's minds, but the less familiar people are with buying goods the more their ability to represent preferences in monetary terms declines. Preferences for environmental goods, such as wilderness, for which no market exist, are even more difficult to link with money values. Shapansky, *et al.* (2003) state that people may hold non-use values for 'environmental goods that are nebulous, complex and ill-considered' (p.4) without having a price attached to them. Hence, when environmental goods are complex the case for preference construction is greatest, because respondents are expected to consider several unfamiliar dimensions of the commodity.

If individuals are to form coherent and consistent values, they need to be provided with complete information and sufficient time (Fischhoff and Furby, 1988, McClelland, *et al.*, 1992 and Gregory and Slovic, 1997). According to Corbin (1980) additional time helps to decrease uncertainty and encourages decisions, as it allows people to acquire additional information or simply think about the issue

under investigation and hence, makes them become more confident in their decision. The neglect of information and assumption of complete knowledge in economic theory has been criticised: 'the best technology is assumed to be known; the relationship of commodities to consumer preferences is a datum' (Stigler, 1961, p. 213 and Chiplin and Sturgess, 1981). Indeed this presents a paradox, as people are assumed to be fully informed about all goods, even those they did not know they existed. As yet, there is no clear answer in the literature as to what adequate or complete information is that seems so crucial for preference construction. On the one hand, Harris, *et al.* (1989) assumes that too much information confuses individuals and encourages them to simplify when asked the WTP question, and Hutchinson, *et al.* (1995) confirm that a high level of information does not necessarily result in well-considered WTP bids. On the other hand, Svedsäter (2003) claims that additional information has a desirable effect. In his opinion, arbitrarily constructed WTP responses and differences between actual and stated WTP can be resolved when respondents are given the time and opportunity to consider information and learn during the CV exercise. This view is also shared by Blomquist and Whitehead (1998) who suggest that information enhances communication about policy effects, and hence reduces uncertainty as well as potential divergences between stated and actual WTP (see also Macdonald and MacKenney, 1996 and Samples, *et al.* 1986). Blomquist and Whitehead's wetland valuation study provides evidence for this, as the detailed information presented increased the theoretical validity of WTP. This is in line with assumptions in consumer research postulating that consumers search for more information if the good is infrequently purchased and expensive (Chiplin and Sturgess, 1981). According to consumer research, the amount and source of information acquired by an individual for decision-making depends on several factors:

- the consumer's desire to make an informed choice/ the perceived benefits of information search
- the complexity of the good/perceived risk
- the attributes of the good in which the consumer is interested
- the detail in which these attributes are described in each information source
- the quality of each information source
- the transaction cost of obtaining information

- time pressure impinged on the individual (Schiffman and Kanuk, 1991 and Beatty and Smith, 1987)

Clearly this shows that the amount of information required varies among individuals. Whereas some CV respondents may be overtaxed by a standardised information set provided in CV, for instance due to limited time or because they are not interested in making an informed decision, others cope with the information because transaction costs are low or because they are risk averse or are keen on making an informed decision.

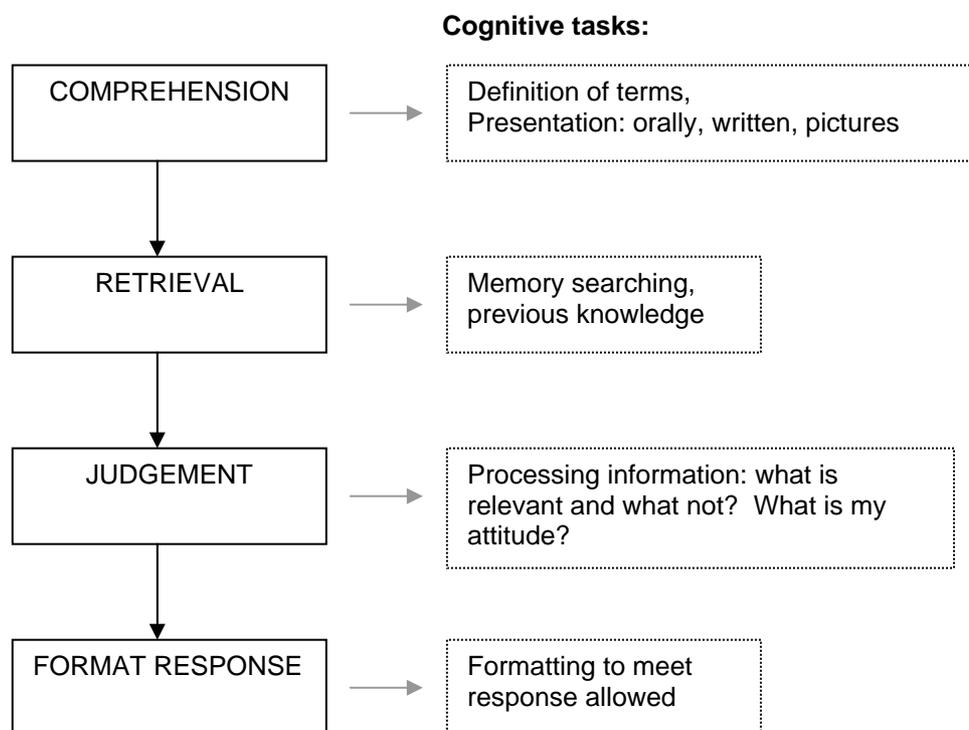
Economists are primarily concerned about the amount of information respondents should be given in order to obtain valid and unbiased answers and the NOAA panel recommends that full and unbiased information should be provided in a CV questionnaire, since otherwise respondents cannot form a reasoned opinion. However, according to Endres and Holm-Müller (1998) it is impossible to say how much detail in the description of the CV scenario derives true preferences. The question about the quality and quantity of information given to respondents has so far not been answered in the CV literature (Hanley, *et al.*, 2001, Endres and Holm-Müller, 1998 and Kristström, 1997), but from consumer research it is clear that individuals who are expected to value an unfamiliar and complex environmental good may not be able to reveal or construct their preferences unless they receive information that suits their needs. The question about the overall level of information on the environmental change under investigation does not seem important and the focus should lie upon the varying requirements of information by individuals with different background knowledge and cognitive skills, and the fact that information needs to be adjusted to suit different individual needs. CV relies on the respondents understanding of the environmental issue at stake, hence it is essential to provide each respondent with an optimal amount of information in order to maximise their understanding (MacMillan, *et al.*, 2004a) and the design of a CV exercise should take account of this.

3.6.2.3 Cognitive effort and motivation

Learning about a complex environmental good, forming preferences and stating these in terms of WTP or WTA requires substantial effort on behalf of

respondents. According to Tourangeau (1984) and Sudman, *et al.* (1996), answering survey questions is a complicated process that involves a high level of cognitive effort (see Figure 3.6). First of all, respondents have to comprehend any written, verbal or pictorial information and retrieve further information by searching for memories and previous knowledge. In order to form a judgement, information needs to be processed, that is, the respondent has to decide which information is relevant, which is not relevant, and what his attitude towards the issue is. Finally, the respondent has to state his or her response in a given format. Usually, respondents are not allowed to report their judgement in their own words, for example the only allowable answer to the CV payment question would be to express preferences in terms of WTP. Hence, CV questionnaires, in particular the WTP or WTA question, are a demanding task that requires a considerable amount of motivation and cognitive effort. Tourangeau (1984) points out that respondents may become de-motivated at any stage of this cognitive process and engage in heuristics or satisficing by looking at cues that point to an answer that seems acceptable and requires little mental effort (Krosnick, 1991).

Figure 3.6: Cognitive processing of questionnaire content



(Source: Tourangeau, 1984)

The cognitive process described in Figure 3.6 would suggest that the valuation of environmental goods is a challenging task for CV respondents, and if an unfamiliar or complex good is to be valued, proper information processing may not be possible. In order to construct preferences or form a judgement, people need to carefully process information, a prerequisite that is not always provided in conventional survey methods. In addition, according to Chipilin and Sturgess (1981), people may want to consult further information sources and seek advice from friends, family or experts. Furthermore, the 'judgement' phase for the WTP or WTA question is limited by the fact that respondents require different levels of information to form an opinion depending on how keen they are to make a well considered decision, the transactions costs involved in assimilating information provided, the complexity of the good and the attributes of the goods the respondent is interested in. Clearly, interview situations do not provide an ideal basis for forming a judgement, as they often do not allow for these factors to be available because the answer to the elicitation question has to be formulated on the basis of limited time and information. Given these constraints, it is not surprising that some respondents base their WTP or WTA decision on irrelevant factors.

If respondents are familiar with the public good under investigation, they are likely to absorb the information provided with ease, unless they feel under time pressure. The 'retrieval' and 'judgement' phase (Figure 3.6) should be relatively straightforward, although the effort put in memory searching, consideration of existing knowledge and the generation of an opinion again depends on perceived time pressure as well as motivation, and there is a possibility that respondents skip this important part. Given the nature of the WTP/WTA question, formulating a response may be difficult, even if preferences are existent, because preferences for environmental goods are unlikely to be stored in money terms in people's minds (Gregory, *et al.*, 1993). Inexperience with such trade-offs, time pressure and lacking motivation may hence lead to strategic thinking and satisficing.

Clearly, when preferences have to be constructed from scratch for environmental goods that are complex or/and unfamiliar, processing of questionnaire content becomes even more complicated. According to Sudman, *et al.* (1996), in many

cases respondents 'will [often] not find an appropriate answer readily stored in memory and will need to compute a judgment on the spot' (p. 69). The 'comprehension' phase involves the understanding of new and complex information in limited time and possibly with limited motivation. If the environmental good is unfamiliar, respondents are unlikely to have any information stored in their memory, and hence the 'retrieval' phase is bypassed. The same may happen to the 'judgement' phase, because if the issue is novel, respondents probably do not have an opinion and may not be given the opportunity to engage in information search. However, a judgement might still be formed when, instead of processing all information, respondents focus on irrelevant factors, such as the payment vehicle or marketed values. With complex or unfamiliar goods questionnaire content processing is challenged by time pressure, motivation and the fact that survey respondents do not have the opportunity to discuss and engage in external search, although all these factors are important when decisions are made over unfamiliar goods in the real market (Beatty and Smith, 1987). As mentioned above, the WTP/WTA response is at risk to be influenced by various biases, and since 'retrieval' and 'judgement' are at risk to be bypassed, response refusals are likely to occur.

How well CV respondents cope with the cognitive effort of answering a WTA or WTP question also depends on their motivation. According to Mannesto and Loomis (1991), de-motivation occurs when the perceived benefits of participating in a questionnaire exceed the costs. Whereas the costs include time, inconvenience, mental effort in processing information and discomfort, such as embarrassment, rewards are very few and less tangible, for example being regarded positively by the interviewer, being within a carefully selected sample and assuming that one's answers matter. Another factor that plays a role when attempting to maximise motivation involves the respondents' trust that the collected data will be handled confidently and that rewards will be delivered (Dillman, 1978). Costs, rewards and trust vary depending on the survey method (see Chapter 4). In a CV survey, the full costs of participating are often not revealed until during the survey, when participants realise the amount of information they are expected to process and the mental effort required to

formatting the payment question. Hence, motivation that is high initially may decline or even disappear.

When faced with valuing an unfamiliar and/or complex public good, motivation is important, as participants are expected to use new information conveyed to them or actively search for information in their memory in order to make an informed purchase decision. However, even in real life, many consumers do not always engage in an extensive search or a comprehensive evaluation of some purchase decision, especially when it is of less relevance to them (Fischer, 2003 and Zaichkowsky, 1985). Hence, the hypothetical nature of the environmental good and the purchase that an individual faces during a CV exercise may increase the likelihood that cognitive precision and careful evaluation in Tourangeau's questionnaire content processing model (Figure 3.6) is absent. According to Fischhoff, *et al.* (1980) preferences are labile due to inattention, laziness, fatigue and amount of information, and extensive decisions may be at risk due to competing demands on the respondent's time, complexity of the task and an uninteresting survey topic (see also Esposito, 2002 and Beatty and Herrmann, 2002). A sufficient level of motivation depends on three factors: the participant's ability to tackle the valuation task, the difficulty of the task, and the decision-making environment. When motivation to participate in the survey is absent respondents may become disengaged (Krosnick, 1991) and are inhibited from 'carefully reporting a substantive opinion' on an issue (Krosnick, 2002, p. 96).

3.7 Conclusion

This chapter has explained the concept of total economic value for wilderness and pointed out that wilderness is valuable to a wide range of people and for different reasons. Furthermore, valuation methods were reviewed and contingent valuation was decided to be the most suitable technique to value the non-market costs and benefits of the proposed hydro schemes in the Icelandic wilderness area. It was made clear that property rights play a significant role in the selection of the correct Hicksian welfare measure. While a more detailed investigation into property rights is presented in Chapter 4, this chapter suggests that the use of WTA should

not be avoided. Several challenges of CV research were detected, including careful design of the WTA question, preference construction, appropriate levels of information, the opportunity to learn about complex environmental goods for which preferences might not exist, and sufficient motivation; all of which are likely to be responsible for generating valid WTP and WTA responses, but have not received sufficient attention in the CV literature.

If preferences are constructed, this has strong implications for the theory and practice of CV. Firstly, the neo-classical economic theory assumptions that people have existing well-defined preference orderings for all goods, as well as complete knowledge may not hold true in many CV contexts. Secondly, and following on from this point, some conventional survey methods and standardised information sets used in CV may not offer appropriate tools to elicit people's values for environmental goods because they do not allow for extensive 'comprehension', 'retrieval', 'judgement' and 'formatting' phases, and hence do not provide ideal conditions for preference construction. Providing CV respondents with basic information and limited time in conventional surveys is unlikely to enable true preference revelation, because respondents may be unable to construct their preference for a particular good on the spot. One of the prime challenges for CV is therefore to encourage 'rational' decisions about WTP and WTA by careful design and implementation of the CV exercise in a way that allows respondents to thoroughly engage in each of Tourangeau's questionnaire content processing phases. This study aims to make following improvements:

- raise participant motivation necessary to consider the hypothetical trade-off
- adjust the task to suit a wide range of individual abilities and decrease the task difficulty
- find a suitable decision-making environment that is closer to purchases in real markets and enables participants to construct preferences. Important features include sufficient time to think, information and discussion.
- Use the correct welfare measure and achieve an acceptable response rate to the WTA question.

The following chapter describes survey methods for CV and discusses their advantages and disadvantages for preference construction.

4 RESEARCH METHODS FOR VALUATION

The main objective of this chapter is to review survey methods for contingent valuation. Given the complexity of hydro scheme impacts on wilderness, special emphasis will be laid on each method's scope for preference construction and incentives for motivation. Several other factors, such as cost and quality of the decision-making environment, influence the choice of a survey method for this study. Initially, different quantitative data collection methods are compared. The chapter concludes with the selection of the research methods used in this study.

4.1 Conventional survey methods in CV

CV questionnaires are usually administered in form of conventional data collection modes, such as in-person interviews, telephone surveys or self-administered mail questionnaires.

4.1.1 Interview surveys

In-person interviews are the most popular survey method among CV practitioners. This approach was recommended by the NOAA panel rather than telephone and mail surveys because the face-to-face situation allows the interviewer to assist respondents to understand the environmental issue under investigation, to raise motivation and it permits the use of graphic supplements (NOAA, 1993). Contrary to telephone or mail surveys, in-person interviews allow for the use of both visual and auditory types of presentation, and hence make the task easier for respondents (de Leeuw, 1992). The NOAA report states that interviews have greater potential for achieving representative samples and higher response rates as compared to telephone and mail surveys (Mannesto and Loomis, 1991). Despite this, Dillman (1979) and others point out that in general response rates to in-person interviews are in the decline (see also de Leeuw and de Heer, 2002 and de Leeuw, 1992).

Despite these advantages, in-person interviews face a number of limitations associated with time, information and the social context of the interview situation.

5 DEVELOPMENT OF THE CV QUESTIONNAIRE

The data obtained from three focus groups and a pilot survey gave essential clues for the development of the CV questionnaire, in particular the design of a comprehensible information folder and the selection of an acceptable payment vehicle. This chapter describes the different sections of the questionnaire used to obtain WTA and WTP estimates in the Market Stall and interview approach and the revisions made following the pilot survey. Finally, a method proposed for behaviour observation during the exercise is described, and sampling details are explained.

5.1 Focus group research

Respondents sometimes interpret information provided in CV questionnaires in a different way than the researcher, as their understanding on certain issues does not always match scientific descriptions in the questionnaire. Such misinterpretations may lead to biases and it is therefore necessary to carefully test people's understanding of certain definitions or expressions used in the information folder or questionnaire. Hence, the use of focus groups prior to CV survey implementation is widely recommended in order to derive descriptions and questions that are understood and will facilitate reliable communication between the interviewer and survey participants, and thus improve the accuracy of results (Chilton and Hutchinson, 1999 and Johnston, *et al.*, 1995).

In focus group meetings participants are encouraged to discuss issues introduced by the moderator and to raise issues that are of relevance to them. The major advantage of such discussions is that participants are collectively able to raise more issues than an individual alone and hence, interaction and feedback within the group provides insights into the issues that are relevant to people (Brouwer, *et al.*, 1999, Krieger, 1999 and Morgan, 1998).

Focus group research seemed essential in order to generate an understanding of people's experiences of, knowledge about and attitudes towards different management options for the wilderness area. The guided discussions were conducted in the pre-survey stage of the valuation process, in order to

investigate the participants' views as to what they perceived the most desirable management option and to guide the design of questionnaire and information folder.

A total of three focus groups were scheduled between 1 August and 16 September 2001. Participants were selected from a wide range of people, both from remote communities and from urban areas. Although an attempt was made to recruit participants that reflect the general population, random sampling is impossible considering the limited number of participants in focus groups. Opinions and views expressed in the discussions can therefore not be taken to represent those of the general population and do not produce one correct answer (Chilton and Hutchinson, 1999). Snowball sampling, in which a friend or relative is asked to bring a family member or friend along to the focus group and so on was used to select a range of different participants (Bryman, 2001) (see Appendix 1 for respondent characteristics). However, one group included a number of geographers and therefore represents a more knowledgeable group.

In each group several questions were discussed amongst 5-9 participants. The focus group members were provided with information sheets that included pictures, maps, and descriptions of the wilderness area and different management options. The group discussions were taped and lasted between 60-90 minutes. The purpose of the questions posed in the discussion guidelines (see Panel 5.1) was to elicit information on participants' knowledge about the wilderness area, and the pros and cons of different management options, in order to enable a comprehensible presentation of background information and to devise a meaningful and realistic hypothetical market. Furthermore, focus groups were hoped to generate an insight into people's views regarding the future management of the wilderness area, for example National Park, hydro schemes or the status quo. In addition, the focus groups were also used to select an appropriate payment vehicle for the elicitation of WTP and WTA, and opinions towards different types of survey administration were investigated to help select a survey method that is accepted by respondents.

Panel 5.1: Structure of focus group meetings

Reception

- of participants
- introduction of each participant to other group members

Introduction

- information sheet with definition of wilderness
- participants' knowledge about wilderness in general
 - why is it important?
 - what are the threats?
 - should it be protected?

Deepening

- information sheet with a) a description of the wilderness area and b) a description of land use option A (hydro schemes)
- awareness of problems related to hydro power generation
- suggestions for alternative future management of the wilderness area
- information sheet on land use option B (national park)
- how do participants feel about a national park?
- awareness of advantages and disadvantages of a national park
- who owns the wilderness area?
- how do people feel about having to pay extra tax in order to finance either scheme?
- do they prefer another way of paying?
- what do participants like/dislike about different survey methods (in-person interviews, telephone and mail surveys, group-based approaches)

Finalising

- questions and issues that participants would like to discuss
 - fill in form to gather information on participants gender, age and occupation
-

Overall a number of focus group participants did not find wilderness to be very important and were unaware of any threats to wilderness. While the majority found that wilderness has no direct value to themselves, option values for private future use and use by others, as well as existence values were detected. There was a general unawareness regarding the hydro scheme impacts on the wilderness area

in East Iceland and the discussions tended to focus on the benefits of such developments. While a few adverse impacts, such as landscape changes, impacts on tourism, as well as impacts on vegetation and reindeer were mentioned, some participants believed that wildlife would remain unaffected, given that it could simply move to another part of the island if the hydro schemes were created.

The idea to establish a national park in the area was well received by some respondents, but during the discussions it was realised that this option would be too restrictive for the future management of the wilderness area: some participants wanted to keep the option open to use the area in one or another way in the future. Furthermore, a national park was considered to cause damage to the wilderness area due to increasing number of tourists. Overall, participants concluded that the status quo would be most desirable.

Generally, focus group members believed that they should not have to pay for the future management of the wilderness area and no agreement was reached as to the most preferable payment vehicle. Reasons for not wanting to pay were partly influenced by property right perceptions: a number of respondents felt they had the right to the status quo and hence were not prepared to pay for any kind of development. Interestingly, some respondents, however, thought that they did not have the right and therefore agreed to pay given that the 'owners' need to be compensated for any changes to the area.

In-person interviews were perceived to be the best survey method, as they are considered to be more personal and give respondents the chance to clarify issues as compared to telephone or mail surveys. However, it was pointed out that inconvenient timing is a disadvantage, and therefore interviews should be carried out in a place where one has nothing else to do, for example the airport lounge (see Appendix 3 for detailed focus group summaries).

5.2 Questionnaire development

As common for CV, the questionnaire is composed of six sections including following questions and information sets:

- 1) Introductory questions about the environment.
- 2) A definition of the environmental goods and services provided by wilderness and hydro schemes.

- 3) A description of hydro scheme proposals and their impacts on the wilderness area.
- 4) A description of the hypothetical market in which non-market environmental goods and services are made available to respondents.
- 5) Description of the payment method, which elicits hydro scheme gainers' and hydro scheme losers' preferences in terms of maximum WTP and minimum WTA to restore their original level of welfare.
- 6) Validation questions about respondents' socio-economic characteristics.

The information provided in the information sets was composed taking into consideration people's knowledge on respective issues. Considerable effort was spent to analyse data obtained from focus groups in order to identify information that need to be provided in the information sets. The fact that focus group members were not too keen on the proposal to establish a National Park in the area (see Appendix 2) meant that a more realistic valuation scenario would be the choice between the status quo and hydro schemes.

5.2.1 Introductory questions about the environment

The purpose of the introductory part of the CV questionnaire is twofold. Firstly, it is a way of preparing respondents for the valuation task starting with general questions about the environment, and then moving towards questions more closely related to the environmental context in question. This gives the respondent an opportunity to think about his/her preferences regarding the environment and wilderness prior to answering more specific questions about the environmental issue under investigation. Secondly, these questions provide information about the respondents' attitudes to, preferences for, and levels of concern for the environment in general, which can be used for validation purposes (see Chapter 6). Typical questions asked in the introduction of CV questionnaires include priorities for policies participants would most like the government to follow, as well as priorities regarding government spending on environmental programmes. In addition, respondents' familiarity with the wilderness area was investigated (see Appendix 3).

5.2.2 Definition of wilderness assets, hydro schemes and their impacts

The description of the hydro scheme proposals and the environmental and cultural assets in the wilderness area is a crucial component of the CV survey because it informs the respondents of what they are being compensated for or purchasing (see Appendix 4).

CV relies on the respondents understanding of the environmental issue at stake; hence it is essential to provide an optimal information set that maximises the understanding of respondents with a wide range of different backgrounds. According to psychology research, individuals only consider factors that are explicitly expressed in the information sets and are reluctant to assimilate information that needs to be logically inferred. Furthermore, respondents are likely to focus on pre-conceived notions or particular aspects of the information given to them to tackle the decision task (Harris *et al.*, 1989). In order to reduce the complexity of information, it was considered useful to carefully describe the environmental good and change under investigation. A clear description is ‘a prerequisite for any valuation task, especially where the products of concern are the less-tangible outputs of wildland recreation [...]’ (Harris *et al.*, 1989, p. 219).

A considerable effort was spent on describing the complex and sometimes unpredictable hydro scheme impacts on the wilderness area. Transcripts from the focus groups show that participants had a broad understanding of the main species and geological features in the wilderness area, but were unaware of the significance of the area for certain species or the rarity of a number of wilderness assets. Whereas all focus group members had an extensive knowledge of hydro schemes and their positive implications on regional development and the island’s economy, only a minority was aware of the range of environmental impacts they may cause. A lot of effort was therefore spent on developing a straightforward and precise information set that would describe the wilderness assets, hydro schemes and environmental impacts in a lucid manner. In order to maximise comprehension, respondents were presented with an information folder, that included literary descriptions, as well as pictures and maps for visualisation. It was assumed that in this way, clear and meaningful information would be conveyed to all respondents.

The information folder was arranged in the following way. Firstly, positive impacts on rural economy and migration, as well as non-market benefits

in terms of recreational opportunities were listed to ensure that all these factors are taken into account in the respondents' decision. Since focus group members were very knowledgeable about these impacts, there was no need to explain these in further detail. Wilderness assets were split into four main groups: Flora, fauna, geological features and cultural heritage. In each category, the species or features were described and information was provided on their rarity, and potential impacts as a result of hydro schemes (see Appendix 4). Most hydro scheme impacts are complex, and there is considerable uncertainty about actual effects. An attempt was made to list all major impacts in a way that is easily comprehensible, although this sometimes involved making assumptions and simplifications. For participants that were keen on learning more about the issue, a 'Question and Answer' sheet was provided at the back of the information folder to clarify issues regarding the wilderness assets, hydro schemes, the payment vehicle and reasons for payment/compensation (see Appendix 5).

5.2.3 Description of the hypothetical market

After the environmental assets, the change in their provision and hydro scheme benefits have been defined, the hypothetical context in which they are made available has to be explained. Focus groups revealed that the development of hydro schemes would generate a considerable number of losers, that is those who prefer wilderness but also some gainers, that is people who benefit from the non-market benefits created by hydro schemes. Since the hydro scheme developments would generate both gainers and losers WTP and WTA measures are required. Furthermore, the hypothetical market must be designed in a way to allow participants to engage in a monetary transaction that reflects their property rights. Focus group results also showed that individuals lack clarity as to the actual entitlement structure with the majority assuming that the general public has the right to wilderness and some assuming that the land is owned by the state (hence individuals assume they are not entitled to wilderness). The property right perceptions seem to vary among Icelandic citizens, because the ownership of Iceland's central highlands has been debated in the media and legislation regarding the property rights of the Icelandic highlands is very recent.

Due to the ambiguity in the perception of entitlement structure, it was assumed that some CV respondents might disagree with the entitlement structure

implied in Compensating Surplus questions (WTA to endure hydro schemes and WTP to obtain hydro schemes). It was therefore decided to develop an alternative scenario for those perceiving non-ownership of the wilderness area using Equivalent Surplus to elicit people’s WTP to avoid hydro schemes and WTA to forgo hydro schemes (see Chapter 3). The possible welfare measures for the hydro scheme issue are reported in Table 5.1. CV studies that have attempted to value wilderness that is threatened by destructive activities such as oil drilling or hydro schemes have either elicited people’s WTP for wilderness preservation (e.g. Barrick and Beazley, 1990) or their WTP to avoid developments (Sanders, *et al.* 1990 and Carlsen *et al.*, 1993). These scenarios assume that developers have the property rights, and even though the legal situation in the US is unclear, these authors did not investigate the respondents’ perceived property rights, and instead went straight for the WTP measure.

Table 5.1: Property rights and their correct welfare measures for wilderness in Iceland.

	Hydro scheme losers	Hydro scheme gainers
Scenario 1 (entitled to wilderness)	CS (WTA to endure HS*)	CS (WTP to obtain HS)
Scenario 2 (entitled to HS)	ES (WTP to avoid HS)	ES (WTA to forgo HS)

*HS= Hydro schemes

A realistic hypothetical market context was considered to be one based on government policy that focuses on the development of three hydro schemes in the wilderness area. It was made clear that Icelandic households would either save money or need to pay extra, depending on whether the three hydro schemes will run on profit or not. This way, both hydro scheme gainers and losers could be presented with the same scenario.

In the focus groups it became obvious that people in favour of hydro schemes believed that the development would trigger economic growth on a regional and national scale, generate additional employment opportunities, and counter out-migration from peripheral areas in East Iceland. A special attempt was therefore made to develop a hypothetical market that would neutralise these

issues in order to assure that they would not influence the valuation of non-market benefits. In the scenario respondents were told that several other options exist to achieve economic growth and create more jobs that would leave the wilderness area untouched. A number of examples were listed, such as eco-tourism, small-scale industry, forestry, research centres and a science park (see Appendix 6).

5.2.4 Selection and description of the payment method and elicitation format

After the reason for the payment/compensation has been explained, a payment vehicle has to be specified and presented to respondents. The payment vehicle describes in which way respondents are supposed to pay for the environmental good in question. WTP and WTA bids can be collected through a number of different payment methods, e.g. income tax, local tax, admission fees, price increases or donations to trust funds. Some payment methods (e.g. tax) may be less desirable than others when respondents object a rise in taxes, and hence value the payment vehicle rather than the environmental good in question. An undesirable payment vehicle may therefore strongly influence value estimates. Furthermore, the elicitation of preferences may be affected when respondents compare the payment (e.g. admission fees or donations to a charity) to similar payments they have made before. Hence, instead of searching their preferences, they state a 'reasonable' or 'fair' bid for the environmental good under investigation (Mitchell and Carson, 1989).

A considerable effort was made to decide on a plausible payment method that would be appropriate with regards to the credibility of the hypothetical market, as well as minimise potential biases and protest responses. Focus group discussions revealed that tax seemed an unpopular payment method among participants, and there was a general opinion that the general public should not have to pay. Hence, it was decided to use an increase or decrease in household expenses due to changes in electricity bills, VAT, and prices of certain goods in order to elicit maximum WTP for hydro schemes and minimum WTA compensation. This was considered to be realistic as there is uncertainty about whether the development of the three hydro schemes would be profitable or not; depending on this, household expenses might either fall or rise. The listing of many different ways of saving or paying was also considered to counter potential objections to one particular payment method.

In order to elicit people's maximum WTP and minimum WTA, it is necessary to determine an elicitation format. The most commonly used formats for CV are described in Panel 5.2.

Panel 5.2: Description of different elicitation formats

Open-ended:

The open-ended elicitation simply asks the respondent for his/her maximum WTP or minimum WTA. This approach has several advantages. Firstly, the analysis is relatively straightforward and simple. Secondly, stated preferences are free from anchoring bias. Thirdly, it is easy to implement, especially in mail surveys where only limited assistance can be provided. Despite their popularity, open-ended questions have been criticised, because they are mentally very demanding. Respondents are put in a situation that is very unlike a real market situation, where consumers are presented with a price, which they either accept or reject. Difficulties with answering open-ended questions often lead to high non-response rates and zero answers. The format also provides an opportunity for strategic behaviour, such as free-riding and overbidding (Mitchell and Carson, 1989 and Garrod and Willis, 1999).

Discrete Choice:

This approach is more closely related to the real market situation, and simplifies the difficult task of placing a value on an environmental good by presenting respondents with a single WTP or WTA bid and asking them to answer 'yes' or 'no', e.g. would you pay £25 every year? Since the amount is varied randomly across the sample, discrete choice formats require large sample sizes and demand complicated statistical analysis. Mitchell and Carson (1989) point out that the discrete choice format is not very efficient as opposed to other elicitation methods, because much more observations are needed to achieve the same statistical accuracy. Furthermore, empirical tests show that values elicited using discrete choice are significantly larger than those obtained from the open-ended format.

Reasons for this might be ‘yeah’-saying and anchoring bias. However, the format has the advantage of reducing non-responses and strategic bidding. Discrete choice is the recommended format according to the NOAA report (NOAA, 1993 and Mitchell and Carson, 1989).

Bidding Game:

In an in-person interview, the interviewer reads out a bid, e.g. Would you pay £38 per year? If the respondent answers ‘yes’, the interviewer increases the bid until the respondent answers ‘no’. If the respondent answers ‘no’, the interviewer decreases the bid until the respondent answers ‘yes’. This format is considered to give respondents the opportunity to think more carefully about their WTP or WTA bids due to repetition. While the analysis of results is straightforward and relatively simple, the disadvantages of the approach include its vulnerability to starting point bias and strategic behaviour. The former bias evolves when respondents assume that the first bid is indicative, and hence their final WTP or WTA bid may be affected and not represent true preferences. Furthermore, the bidding approach runs the risk that respondents become bored, especially when their actual WTP or WTA is much higher than the starting bid. In long bidding games, the respondent might terminate the process before his maximum WTP or minimum WTA has been read out. Apart from a lengthy bidding process, the explanation required prior to the implementation of the bidding game is very time-consuming (Garrod and Willis, 1999 and Mitchell and Carson, 1989).

Payment Card:

In this approach, respondents are asked to go over a range of values and circle the highest amount they would be willing to pay. The payment card was first developed by Mitchell and Carson (1981), in order to minimise various biases that occur in bidding games. The primary advantages of the payment card are that there is no need for a starting point, as payment levels range from £0 to some high bid, and that it reduces strategic bidding. While biases associated with starting points can be eliminated, biases relating to the bid range may emerge. Range bias may occur for various reasons: Firstly, the payment levels on the card may not exactly

represent the respondent's value, and hence forces him or her to choose a payment level that is either higher or lower. Secondly, the highest bid on the payment card may be lower than the respondent's maximum WTP. Thirdly, respondents may be influenced by the highest payment level on the card, and hence might state a higher bid than they would usually be prepared to pay. However, Rowe, *et al.* (1996) show that range bias can be avoided when the range of the payment levels is that large that it does not constrain the respondent. Furthermore, the payment card requires considerable explanation and is considered to be time consuming (Reaves, *et al.*, 1999 and Garrod and Willis, 1999).

The choice of the elicitation format is of considerable importance, as each approach has its advantages and disadvantages. After careful investigation of the pros and cons of all options, it was felt that both discrete choice and the payment card would be reliable elicitation formats. However, as discrete choice requires large sample sizes it was considered to be unsuitable for the Market Stall approach, which is restricted by a relatively small number of participants. Hence, with regards to the methodological approach used in this study the payment card was decided to be the most suitable elicitation format. Furthermore, the payment card is considered to discourage strategic overbidding and might therefore be useful for the elicitation of WTA.

A number of modifications were made to the conventional payment card format, in order to avoid some of the biases associated with this approach. As suggested by Boyle and Bishop (1988), the range of payment levels shown on the card is likely to affect respondents' true preferences. Hence, it was decided to 'hide' the range of levels. Instead of presenting respondents with a card showing all bid levels, the levels were read out one by one and respondents asked to agree or disagree to each level. Also, as opposed to the ascending order of bid levels in conventional payment cards, the order of bids in the payment card used in this study was at random. Thus, it was impossible for respondents to make assumptions about the remaining bid levels or the highest bid, which could influence their true preferences. In order to avoid biases due to gaps between the

payment levels (which might lead to inexact representation of respondent' WTP or WTA), it was decided ask respondents a follow-up open-ended WTP or WTA question. Prior to asking the open-ended question, it was necessary to establish whether the respondent is a project loser or gainer. Those answering 'no' to the question whether "Are you in favour of the hydro schemes?" were asked to state their minimum WTA, whereas those who answered affirmatively were asked to report their maximum WTP (see Appendix 7). Although the open-ended question is vulnerable to strategic bidding, it was hoped that the preceding payment card would give respondents an idea of reasonable compensation or payment claims. Also, WTP respondents were reminded of their budget constraints to avoid strategic overbidding, and in order to discourage free-riding respondents were told that the hydro schemes might not be created if not enough money can be raised. Those answering the WTA question were reminded that savings to each household would be limited and should be realistic. The combination of payment card and the open-ended format was also assumed to counter the creation of a spike at zero in the open-ended WTP distribution, which, according to Kriström (1997), is a common occurrence in open-ended WTP studies. The lowest bids offered in the payment card were hoped to encourage respondents to state low open-ended bids, instead of opting for a zero response.

Payment cards normally contain an exponential distribution of payment levels with intervals between the values increasing as values increase. This means, that there is a large number of payment levels at low values and fewer payment levels at higher values. If the intervals would not increase the payment card would have too many levels. This approach is reasonable, as the accuracy of WTP and WTA responses is proportional to the value. For instance, an individual might value an ice cream at $£1 \pm £0.10$, and a computer at $£1000 \pm £100$. Hence, valuation errors are consistent with an exponential bid distribution (Rowe, *et al.*, 1996 and Mitchell and Carson, 1989). No strict calculations to determine a bid range were undertaken, and instead the pilot study was used to test the design of the payment card. Eight payment levels were read out to respondents with the highest positive bid being 6,000 krona and the highest negative bid being 7000 krona¹:

¹ 1000 Icelandic krona are equivalent to £7.5.

- 7,000
- 2,500
- 1,000
- 500
- + 700
- + 1,500
- + 3,100
- + 6,000

Respondents were offered 'agree' and 'disagree' response options to each bid level. Although the NOAA guidelines strongly recommend the use of a 'don't know' option, it was felt that the provision of a 'don't know' or 'unsure' option might encourage respondents to satisfice² (Krosnick, *et al.*, 2002) and counter respondent motivation to put the effort in searching their preferences and give the most accurate response.

5.2.5 Validation and follow-up questions

CV surveys investigate the validity of WTP and WTA bids by incorporating validation questions into the questionnaire that can be used to examine whether expected relationships between WTP/WTA and influencing variables hold.

The questionnaire contained a number of validation questions that help to interpret WTP and WTA estimates. Apart from the introductory questions these involved socio-economic, attitudinal and behavioural indicators, such as membership in environmental groups and touring clubs, preferred outdoor activities, age, household income, and preferences concerning the future management of the wilderness area.

The open-ended question was followed up by a question asking respondents to explain their answer. This question is essential for the identification of invalid responses influenced by strategic bidding or protesting.

² Respondents engage in satisficing when they want to put minimal effort in answering a survey question and choose a response that is acceptable and will satisfy the interviewer.

5.3 Testing the questionnaire

Prior to the main survey, a pilot study was conducted to test the questionnaire and to assess whether the information and hypothetical markets would allow participants to decide on their WTP or WTA bid. Specifically, the aim was to assess potential difficulties respondents might have with answering questions, comprehending the market contexts, and the ability to successfully complete the payment card. Further objectives were to test the bid distribution in the payment card. All comments during the in-person interviews and the Market Stall were recorded for further improvement of the questionnaire and information folder.

5.3.1 Market Stall pilot

A Market Stall meeting was organised in April 2002 to test scenario 1, which assumes that the general public hold the property rights to wilderness³. The MS meeting comprised six participants drawn from friends, relatives and their friends and lasted for an hour. The session was structured as presented in Panel 5.3.

Panel 5.3: Market Stall protocol

STEP 1: Arrival

- Participants fill in introductory questionnaire after arrival and place it into envelope.
- Introduction of each participant to other group members.

STEP 2: Introduction

- Purpose and outline of the meeting.
- Information folder handed to participants.

STEP 3: Presentation by moderator

(first four pages of information folder, explain maps and photo montage)

- What is wilderness? Wilderness areas in Europe. Wilderness in East Iceland. Why is it important?

³ It was decided to focus on scenario 1 in MS, since two scenarios would have required an unaffordable sample size.

- Hydro scheme proposals north of Vatnajökull Glacier. What are hydro schemes? Positive and negative effects of hydro schemes.

STEP 4: Reading and discussion

- Participants read through information set on environmental assets in the wilderness area, their distribution and rarity, and potential hydro scheme impacts.
- Discussion

STEP 5: Break

- Coffee, cake and biscuits

STEP 6: The Hypothetical Market

- Group reads information set on the future management of the wilderness area, the reason for paying or saving money, and the payment vehicle.
- Clarification of possible questions about the matter.

STEP 7: Elicitation

- Payment/saving levels read out to participants
- Participants fill in the payment sheet, and answer either the WTP or WTA open-ended question individually.

STEP 8: Close

- Participants asked to re-consider the project and their bid in the coming week.
- Distribute coded payment sheets and prepaid envelopes for 2nd elicitation.
- Note telephone numbers.
- Pay participants.

STEP 9: 2nd elicitation on the phone

- Further questions?
 - Read out payment levels.
 - Participants complete and return the payment sheet.
-

Upon arrival, each participant was asked to fill in a short questionnaire with questions about the environment and their socio-economic characteristics. No obvious problems emerged during this stage of the meeting. After a brief

introduction explaining the purpose of the meeting, participants were given information on wilderness and hydro schemes in general, and the future management options for the wilderness area in the north of Vatnajökull Glacier. The information was communicated verbally, and was also provided in an information folder given to each participant.

In the following stage participants were asked to read through the information set describing wilderness assets and potential hydro schemes impacts. Participants were encouraged to ask questions to clarify issues and report any difficulties with understanding the information set. According to participants' comments, the folder was perceived to be very logical and easily comprehensible, and there was no need for further explanation or clarification.

During the discussion, participants were keen on voicing their views on hydro schemes. For example, one participant explained to the others why the lifetime of hydro schemes is only 100-200 years, whereas someone else mentioned that Iceland's economy would not be as well off if hydro schemes did not exist. As expected, questions arose when participants read the hypothetical market. One participant disagreed that there is uncertainty with regards to the hydro scheme impacts on household finances, and pointed out that this has already been estimated. However, this is only partly true, as these estimations are just concerned with the impacts of *one* hydro scheme on the national economy, and the group was informed of that by the moderator. After having reminded participants that the purpose of the meeting is to investigate the degree of change to household expenses *they* would accept everybody seemed happy to continue. Another question asked had to do with the payment and saving levels. One of the participants wanted to know whether the levels were based on estimations provided by economists. The group was told that such estimations do not exist, and that the levels are examples of what the financial implications on households could be. Apart from that no more questions regarding the hypothetical market were asked.

The final stage of the meeting was the completion of the payment card and the open-ended question. Some respondents had difficulties understanding how to fill in the payment card, so the procedure was thoroughly explained. Despite this, results show that some participants had not entirely understood the payment levels. One respondent had minor mistakes in his payment card in the first

elicitation, but completed it properly in the second elicitation over the phone. Another group member, however, successfully completed the payment card in the first elicitation, but in the second elicitation her payment card was inconsistent with her open-ended WTA bid. Table 5.2 shows the number of properly completed payment cards, as well as the number of protesters/lexicographic motives and unsure respondents. Apart from some problems with the payment card, the MS exercise did not generate any protest or unsure responses.

No obvious problems occurred when participants were asked to state their maximum WTP/minimum WTA in the open-ended question. Only one participant wanted to multiply her WTA bid by the number of Icelandic households in order to see how much the hydro scheme profits might be and whether her amount would be reasonable. Strategic bidding was countered by asking participants to decide on a bid that would reflect their household preferences, in terms of how important the wilderness area is to them.

Table 5.2: Market Stall Pilot: Number of properly completed payment cards, protest bids, and unsure responses.

	PC properly completed		Protests/lexicographic preferences		Unsure	
	Elicitation 1	Elicitation 2	Elicitation 1	Elicitation 2	Elicitation 1	Elicitation 2
Yes	3	3	0	0	0	0
No	3	3	6	6	6	6

5.3.2 Interview pilot

The interview survey was also tested in April 2002. Twenty interviews were conducted in the domestic airport in Reykjavík and the town centre. The sample was split into two sub-samples of 10, in order to test both property right scenarios. Interview respondents were provided with the same information folder, in order to test whether discussion and time to think are responsible for potential differences between the two methods.

No major problems emerged with regards to the introductory and socio-economic questions asked in the questionnaire, and the market contexts. All respondents

seemed to understand the information provided on the show cards, and accepted the hypothetical markets.

The main difficulty lay with the completion of the payment card. Answers given on the elicitation sheet showed that respondents had not quite understood the exercise or were confused. It was expected that an economically rational respondent would either agree to at least one of the WTP or WTA bids read out or not agree to any bid if his/her minimum WTA is higher than the highest WTA bid offered in the payment card. However, several inconsistencies were detected, ranging from minor mistakes (only one wrong tick) to more severe errors (entire payment card not making sense or radically different from OE bid). A total of 13 respondents had difficulties with the payment card:

- In two cases, respondents agreed to a WTP bid in the payment card but were actually against hydro schemes and demanded compensation in the open-ended question. One explanation might be that respondents were confused about what they ought to pay for. Thus, instead of paying for hydro schemes, they may have believed that wilderness had to be paid for.
- Another common error was that respondents agreed to a WTP or WTA bid but disagreed to all or some lower WTP and WTA bids (8 respondents), or they agreed to WTP bids, but not to WTA bids (2 respondents), although this is inconsistent with economically rational behaviour. For example, in scenario 2 (property rights with developers) a respondent who was willing to pay 6000 krona for the protection of wilderness, agreed to pay all lower WTP bids, but disagreed to all WTA bids representing the amount his/her household would save due to wilderness protection. A possible cause for this behaviour might be the entitlement structure assumed in this market scenario: Respondents were told that the rights are with hydropower generation, hence Icelandic citizens would need to pay if they wanted an alternative wilderness protection scheme. Instead of thinking what is rational for themselves, respondents might have thought that they do not have the right to be compensated if the wilderness protection scheme went ahead.

The open-ended question generated a number of non-responses (7 out of 20). However, this only occurred when respondents were expected to state WTA bids. Motives for refusals were characterised by protesting behaviour and uncertainty.

In scenario 1 (property rights with general public) two out of seven hydro scheme disagreed to trade wilderness off for money. Three respondents refused to bid because they were not sure whether they were in favour of the hydro schemes or not:

- "I'm not sure whether I want hydro schemes. I leave it to other people to make a decision about this."
- "I can't decide without my family."

Scenario 2, which suggested an alternative wilderness protection plan, generated protest bids when respondents were asked to state a WTA bid to forego hydro schemes. The two hydro scheme gainers in the sample both refused to be compensated.

- "the protection plan wouldn't have an impact on me, I don't believe that I would save any money."
- "this is none of my business, I live on the other side of the country and won't be affected."

Interestingly, some of the hydro scheme losers were not happy to having to pay, but did eventually when they realised that this might be the only way to protect the wilderness area. Clearly, scenario 2 did not match all respondents' perceived property rights. The numbers of properly completed payment cards and protesters in both sub-samples are reported in Table 5.3.

Table 5.3: Interview pilot: numbers of properly completed payment cards, protesters, and unsure respondents.

	PC properly completed	Scenario 1: protest/lexicographic	Scenario 2: protest/lexicographic,	Scenario 1: Unsure	Scenario 2: Unsure
Yes	7	2	2	2	1
No	13	8	8	8	9

5.3.3 Further findings from the pilot survey

The motives for valuing hydro schemes were of particular concern. Generally, most hydro scheme gainers were in favour of the developments because of their positive impacts on regional development in East Iceland and the economy as a whole. Despite efforts to create a market context that would minimise

respondents' tendency to base their values on these motives, most respondents in favour of the hydro schemes stated market benefits, in particular employment opportunities and benefits to the Icelandic economy, as the most important factors influencing their decision.

Another related concern was whether people would value all three hydro schemes mentioned in the hypothetical scenario. Currently the media focuses on only one of the hydro schemes near Kárahnjúka mountain, and provides almost no information on the other two projects. Hence, there is a possibility that respondents value only one scheme instead of all three hydropower projects. Responses like "I am prepared to pay x krona because the Kárahnjúka scheme will have too many impacts on the environment" show clearly that some respondents did not value the entire wilderness area.

Some interview respondents seemed tired by the time they were supposed to read the hypothetical market and complete the payment card. In two cases respondents lacked concentration and were keen on terminating the interview quickly. One respondent rushed off after she had completed the payment card, unwilling to answer the remaining questions. Some interviews lasted as long as 30 minutes, because respondents wanted to discuss each question in more detail or were keen on voicing their views on hydro schemes, decision-makers and politicians during the interview. Other factors lengthening the interviews included calls received on mobile phones and text-messaging. Although all respondents were offered a whole week to think about the project and their individual bids, and participate in a second elicitation on the phone, only 4 out of 20 participants took advantage of this opportunity.

5.4 Modifications

Overall, the trial proved very useful in terms of simplifying phraseology in the hypothetical market and clarifying the payment card procedure. This section describes the modifications that were undertaken in response to difficulties that emerged in the pilot survey.

5.4.1 The interview approach

Overall, it was felt that a more relaxed interview situation needed to be created, in which respondents receive a small incentive and take their time to read all information and answer the questionnaire. This was achieved by offering respondents a seat and a waffle with cream and jam. This set-up was also hoped to be more akin to MS, and by keeping information, the relaxed situation and time constant between the two methods, it would be possible to better test the effect of discussion on estimates.

5.4.2 The elicitation sheet

In the pilot survey it became obvious that providing 'yes' or 'no' answer options to the question 'Are you in favour of the three hydro schemes?' was not sufficient, because a number of respondents were neither definitely for nor against the hydro scheme proposals or simply were not able to form an opinion that quickly. It was therefore decided to add an 'unsure' answer option.

As already mentioned in Section 5.1.4, a number of open-ended bids greatly exceeded the highest WTA and WTP bids available in the payment card. While bid levels on the payment card ranged from WTP 6000 krona to WTA 7000 krona, open-ended bids were as high as 1 million krona for compensation claims and 24000 krona for WTP. Hence, the payment card range was extended by adding a higher bid at both ends of the range. The ten bid levels used were:

- 14,000
- 7,000
- 2,500
- 1,000
- 500
- + 700
- + 1,500
- + 3,100
- + 6,000
- + 13,500

Given the high number of erroneous payment cards it was decided to better explain the payment and saving levels in the interview. In the MS three examples

on how to fill in the payment card were presented on a Flipchart prior to the elicitation. These showed how respondents should complete the payment card if they were for or against the hydro schemes, and how strong or weak views influence choices.

In order to enhance comprehension of the open-ended question, phraseology was changed from "What is the most your household would be willing to pay every year in the next 10 years in order to obtain hydro schemes?" to "What is the most decrease in your household's annual budget in the next 10 years that you would tolerate due to the three hydro schemes?" This is more in line with the preceding description of the payment card, and therefore eliminates unnecessary confusion. Also, before filling in the elicitation sheet respondents were reminded that the payment or saving regards three hydro schemes in order to ensure that participants value all hydro schemes, instead of just the one that was debated in the media at the time of the survey.

5.4.3 The questionnaire

Three debrief questions were added to investigate the CV exercise from a respondent point of view.

Given that interview respondents seemed to get tired by reading the information set, it was decided to find out how people feel about the information sets provided in in-person interviews and the Market Stall meetings. Participants in both sub samples were provided with the same amount of information as this was considered the minimum amount of information needed to value the wilderness area. It was anticipated that the group-based approach is better suited for the valuation of complex issues that require relatively extensive information sets, whereas participants in the interview approach might be overtaxed by the amount of information they are confronted with. Question 15 (see Appendix 3) was therefore added to examine the perceived information load among MS and interview participants.

In the pilot study it was revealed that both in MS and in the interview control group, a number of people held very strong views about hydro schemes, whereas others were unfamiliar with the hydro scheme issue. It was therefore decided to add two debriefing questions to the questionnaire in order to examine participants'

strength of views, and whether respondents changed their views during the MS or interview (see questions 13 and 14 in Appendix 3).

The pilot survey showed clearly that a number of respondents had difficulties with the valuation part, and/or were not keen to participate in the exercise, in particular in the interview control group. In order to investigate how participants felt about the interview and group-based approach, a debriefing question was added to discover the level of confusion and interest the exercise provoked (see question 16 in Appendix 3).

5.4.4 The hypothetical market

Minor changes in the phraseology of the hypothetical market were undertaken in order to make clearer that the valuation only regards non-market benefits. The paragraph aimed at focussing attention away from marketed benefits, such as economic growth and job opportunities, was re-phrased in a way that emphasises that employment and economy could be improved in other ways. It was also decided to re-formulate and simplify the descriptions of and reasons for the negative (WTA) and positive (WTP) bid levels in order to enhance understanding and avoid confusion.

Problems with the scenario 2 (WTP for wilderness protection and WTA for giving up hydro schemes) led to the decision that it might not be suited for the valuation of hydropower developments and was therefore excluded from the overall study. Although the pilot sample may have been too small to draw firm conclusions, there was a tendency that hydro scheme gainers did not believe in the hypothetical market that suggested a reduction in household expenses as a consequence of an alternative development scheme that would protect the wilderness area. Unfortunately, only two out of ten respondents were hydro scheme gainers, but both refused to answer the open-ended WTA question. However, hydro scheme losers also seemed to have difficulties to accept the payment for wilderness protection, even though they eventually stated a bid. Due to uncertainty over whether the scenario would create problems it was decided that it was too risky to use it. Also, the focus groups showed that only a minority accepted the property rights assumed in this scenario.

Another factor influencing this decision was the fact that the decision about the development of one of the hydro schemes was to be taken by mid-summer, and hence, the scenario would have no longer been realistic.

5.5 Participant behaviour and behaviour coding

Mitchell and Carson (1989) state that in order to evaluate CV it is important to consider the difference between observed responses generated in the CV exercise and the value. However, assessing the validity of WTP and WTA responses is complicated by the fact that true WTP and WTA is unobservable and hence unknown. As a consequence, it is impossible to say with certainty whether responses are valid or not and how much they might differ from true values. However, respondent motivation and ability to tackle the valuation task might give some indication over whether WTP or WTA is valid and the investigation of motivation provides a supplement to conventional validity tests. Participant behaviour has hardly attracted any attention in the CV literature. One exception is a study by Berrens (1998), which shows that the inclusion of reluctant respondents in a telephone survey had a significant upward effect in WTP responses to an OE question, whereas it did not seem to influence the discrete choice elicitation. The study did not investigate the impact of reluctant respondents on validity. Social research has shown that reluctance and inadequate behaviour in surveys affects the validity of responses (Dijkstra, 2002, *pers. com.*). Since this is also likely to be the case in CV surveys, the issues surrounding participant behaviour and the impact they may have on WTP and WTA bids are an important challenge for the improvement of CV. Harris *et al.* (1989) state that psychologists would want to know two things in order to see whether a CV survey is successful: Firstly, whether CV respondents have the ability to process information essential for WTP elicitation, and secondly, whether participants are sufficiently motivated to make a careful decision when this effort requires too little or too much stress. The pilot study revealed that confused, intimidated and respondents under time pressure had difficulties with information processing, and inconvenient timing and lacking interest seemed to cause a lack of motivation. However, even though the validity of responses in questionnaire surveys is negatively affected by 'inadequate' behaviour it is usually very difficult to obtain indicators of the validity of the

responses (Dijkstra and Ongena, 2002 and Dijkstra, W., 2002, *pers. com.*). One of the challenges of this study is therefore to identify different types of participant behaviours, and an attempt was made to use these as indicators for the validity of responses. Each respondent and their behaviour was carefully observed during the exercise, and a considerable effort was made to develop a set of categories in order to illuminate the variety of sources that might influence the validity of WTA and WTP estimates.

The participant observation undertaken is based on a technique called behaviour coding, which applies a frame of codes to the behaviours of interview respondents while the interview occurs. Although behaviour coding is an established psychological method in human observation, it has not been used to detect motivation in surveys. Initially, behaviour coding was used 'to explore the behaviorable variables that influence interview outcomes, e.g. data accuracy' (Esposito *et al.*, 1994, p. 1). Amongst psychologists, behaviour coding is used for questionnaire design, for example, to address issues of respondents' difficulties with the wording of questions, the length of the interview or the sensitivity of the topic to be researched (e.g. Esposito, 2002 and Burgess and Paton, 1993). Hence, an adoption of an existing coding scheme was impossible.

The pilot survey was used to develop a list of behaviours to identify 'disengaged' respondents, and will help to determine whether participants have sufficient motivation to engage in preference construction and trade-off decisions during Market Stall meetings on the one hand and interviews on the other hand. Examples of behaviours that may indicate some sort of 'disengagement' include perceived information overload, interruption by mobile phones, keenness to terminate the interview quickly due to boredom or inconvenient timing, perceived time pressure in answering the WTP or WTA question and uncomfortable and intimidated appearance. The allocation of respondents into one or more of the categories is undertaken during and after the interview/MS meeting and relies both on statements by the participants and on a subjective appraisal of observed behaviour by the interviewer/moderator (see Bakeman, 2000 and Burgess and Paton, 1993). Panel 5.4 describes the types of respondent behaviour detected.

Panel 5.4: Categories of participant behaviour during the CV exercise

Confused:

- fails to carefully read information and hence gets confused during elicitation

Lack of focus:

- irrelevant comments to interviewer/moderator
- cannot cope with reading the information sets
- does not stick to the subject (story telling, political discussions, etc.)
- easily disturbed during interview (e.g. interruption by family members)

Bored:

- respondent wants to terminate exercise quickly
- asks how much more time the interview will take
- ignores information given
- PC completed in a rush, just ticking something

Under time pressure:

- thinks he/she has to answer questions promptly

Annoying/not serious:

- disbelieving in information given
- trying to provoke interviewer by making inappropriate comments
- receiving phone calls and text messaging during the interview

Uncomfortable:

- appears uncomfortable and intimidated
-

But how do we know whether respondents have managed to carefully construct their preferences during the CV exercise? A number of indicators show whether respondents were engaged and interested in searching for preferences. The

following checklist on participant behaviour was used to identify whether WTP and WTA is well considered:

- reads information sets carefully
- asks for clarification
- searches for more information at home
- attentive, co-operative and motivated
- understands all aspects of the exercise
- does not feel under time pressure
- no strategic bid
- no protesting

CV respondents with these characteristics are likely to provide valid estimates.

5.6 Sampling

5.6.1 Target population

The case study involves the estimation of the total economic value of wilderness in East Iceland, as well as the non-market costs and benefits of three hydro scheme proposals in the area. In order to decide on the target population, it is necessary to consider to whom these costs and benefits accrue and which groups matter to decision-makers. Furthermore, the choice is affected by the categories of value that are of interest. As wilderness values are to a large extent based on existence values the target population is likely to have a wide geographic coverage, even beyond the island's borders. Currently, Icelandic government policy focuses on the development of hydro schemes rather than wilderness preservation, and hence decision-makers would be reluctant to take account of existence values that may be held by people abroad. Also, the definition of a target population outside Iceland would be problematic, as existence values may accrue in the whole world. It was decided that the relevant population of potential gainers and losers is all Icelandic households, as it is likely that all households might value the wilderness area regardless of whether they directly benefit or lose from the hydro scheme developments. The population targeted for recruiting included Icelanders older than 16 years, as these were considered to have experience with household expenditure and able to take a household decision regarding the hydro scheme issue.

5.6.2 Sampling frame

The sample was drawn from households in Reykjavík and vicinity, as this would include both wilderness visitors and non-users. This sample frame was considered most feasible given that interviews can become very expensive if the sample is geographically dispersed. Clearly, the sample is not geographically representative of Iceland, since only 62% of the population live in the capital area. However, the sampling frame is representative with regards to age and income. With 2,252,000 krona per year, the annual income per capita in Reykjavík lies only slightly above the island's average (2,190,000 krona/yr/capita) (Hagstofa Íslands, 2002). Unfortunately, no reliable information exist over the division between hydro scheme advocates and hydro scheme opponents in the capital area and other municipalities in Iceland.

5.6.3 Sample size

To date there is little guidance on the appropriate sample size for contingent valuation studies. Although Mitchell and Carson (1989) developed a system to determine appropriate sample sizes for open-ended CV studies, there is no such guidance available for other elicitation formats (Garrod and Willis, 1999). The choice of the sample size entails a trade-off between cost and precision of results desired. It was therefore decided to sample as many households for the Market Stall sample as the resources available for the study would allow. This was estimated to be roughly 50 participants. Whereas the number of participants in the MS meetings was entirely restricted by the budget constraint, the sample size for the interviews was determined by the fact that their main purpose is a comparison with MS. Hence, it was decided to obtain at least 50 usable interviews.

One of the goals of the interviews is to compare how people feel about the information provided and how they behave during the CV exercise in comparison to Market Stall participants. Hence, the interviews were taken by myself to allow for careful observation of each respondent's behaviour during the interviews, and to ensure that the payment card is filled in properly. After each interview a little summary on the respondent's behaviour and difficulties was produced. However, another factor that influenced the sample size for the interview control group was that the extensive use of mobile phones restricted the availability of potential respondents. Furthermore, the unexpected announcement that an official decision

regarding an operation permission for one of the hydro schemes would be made by mid-summer 2002 with constructions starting at the same time meant that interviewing should ideally be completed prior to the decision date, as new information communicated to the general public by the media might affect the credibility of the hypothetical market.

Due to the small sample size in the group-based approach, probability sampling is impossible. However, an ideal substitute is quota sampling methods (Harrison and Lesley, 1996). Quota sampling determines variables such as gender, age, income and education and the aim is to fill the quota of each of these variables in order to obtain a sample that reflects the population in terms of relative proportions of people in each variable. This method is cheap, because it avoids the high costs involved in the late stage of a survey based on probability sampling, in which costs per respondent become higher as it becomes more and more difficult to locate respondents with the right characteristics (Bryman, 2001 and Harrison and Lesley, 1996).

Participants were recruited according to following quotas: age, gender and membership in environmental groups. While no data is available as to how many Icelanders are member in an environmental group or organisation, it was decided to have no more than 20% of respondents that are in an environmental group, to ensure the samples are not biased towards people with high interest in environmental issues.

5.6.4 Recruitment

MS respondents were recruited via e-mails that were sent to a range of companies in Reykjavík, from the telephone directory, and by word of mouth. Potential participants were asked to provide contacts of relatives or friends. Eventually, all recruited participants received a letter describing the location of the venue, and were telephoned to resolve potential ambiguities and remind them of the meeting. Interview respondents were approached in the domestic airport, by a garage and, if the weather was good, in the central park.

5.7 Conclusion

The CV questionnaire consists of six stages and took recommendations from focus group discussions into account. The original intention to value the benefits of a National Park was ejected given that this option did not receive any support from focus groups participants. Instead, the decision between hydro schemes and status quo seemed to be a more relevant issue. The pilot survey crystallised a number of problems, and led to modifications on phraseology and the elicitation sheet. Furthermore, it was decided to investigate respondents' perceived views towards the CV exercise. Given the long duration of the interviews as a result of undesirable participant behaviour, questions arose regarding the impact of such behaviour on respondents' effort and ability to report well-considered WTP and WTA estimates. It was therefore decided to develop indicators for lacking motivation during among participants to be used in behaviour coding during the MS and interviews. Results from the CV questionnaire and behaviour observation are reported in the following chapter.

CV interviews usually take place in the street, in family homes or on site, and normally last between 15-30 minutes. In this context, respondents are expected to assimilate and comprehend information regarding an environmental change, research their preferences, and state their preferences in terms of their household's WTP or WTA while taking their budget constraint into account. With Tourangeau's model on questionnaire content processing in mind, the question arises whether the time given to respondents to process the information communicated to them and to give legitimate answers is sufficient. During in-person interviews respondents are typically given a minute or so to answer each question. This gives them little time to think carefully about the environmental issue in question, to assess its importance and to state this in form of a WTP or WTA bid (MacMillan, *et al.*, 2002 and Whittington, *et al.*, 1992). According to Dillman (1979) limited time to think and unsuitable timing of an unexpected interview may cause high costs in terms of mental effort and time costs, which is likely to trigger insufficient motivation to construct preferences.

Another source of problems is associated with information. Interviews normally target a wide range of respondents with different backgrounds and present them with a standardised information set. As cognitive skills and existing knowledge differ amongst individuals it is likely that the information set does not meet every respondent's requirements. Some respondents may have difficulties to comprehend the given information and therefore generate unreasoned responses, whereas others may perceive the information as being too simplistic. Respondents with high cognitive abilities may require more detailed information in order to be encouraged to carefully think about their preferences. Hence, interviews may cause confusion and possibly trigger de-motivation due to an information overload or an information underload (MacMillan, *et al.*, 2002, Blamey, 1998 and Ajzen, *et al.*, 1996). Also, respondents entirely rely on the information provided as they cannot consult a wider range of information sources to form their preferences. According to consumer research, individuals tend to engage in pre-purchase search, especially when the commodity is complex and/or unfamiliar (Schiffman and Kanuk, 1991). However, interviews do not allow for individual information search.

The social context in which in-person interviews take place may also be inappropriate for household decisions. Some respondents might want to discuss the issue with their family or friends, in order to thoroughly assess their preferences before they state a WTP or WTA bid (Whittington, *et al.*, 1992). Since interpersonal information gathering is not possible in in-person interviews, there is a risk that some individuals might be unable to give well considered WTP and WTA responses or give an answer that is socially desirable. On the other hand, respondents might be averse to interviews, become impatient or tired and are therefore anxious to terminate the interview quickly. This might lead to insufficient effort in giving a thoughtful and comprehensive answer, and instead respondents might aim for responses that will be accepted (Hanemann, 1994 and Dillman, 1979). As a result WTP or WTA bids might be influenced by 'yeah saying' in discrete choice questions or by stating some random bid in open-ended or payment card formats. There is also a possibility that unenthusiastic participants oppose the hypothetical market and payment method and give a protest response in order to escape quickly from the interview (MacMillan, *et al.*, 2002). Related to this is whether respondents trust the interviewer and the information they are given. Since respondents are approached by a stranger there is a risk that their perceived credibility of the exercise is low and hence respondents may lack motivational effort to research their preferences (Dillman, 1979).

As to the implementation costs, in-person interviews are more expensive to administer than mail or telephone surveys, as they take the longest time to complete, especially when interviews are geographically dispersed (de Leeuw, 1992). Although in-person interviews are considered to generate higher response rates compared to mail and telephone surveys, Dillman (1979) suggests that high refusal rates and resistance to the interviewer may generate data of lower quality and make the implementation of the survey very expensive.

4.1.2 Telephone surveys

In a telephone survey contact by telephone is done in a few minutes without any prior warning, although sometimes the telephone contact is preceded by a mail shot. This survey method is characterised by the same drawbacks as personal

interviews, and is even more unsuited for CV because it does not allow for the use of visual aids and rating scales (de Leeuw, 1992 and Mitchell and Carson, 1989). Respondents rely exclusively on verbal information, which requires high mental effort in order to grasp the task, and it is doubtful whether such a confined presentation of information suits all individuals in the preference construction process. Furthermore, it is more difficult to maintain the respondent's attention and co-operation over the telephone than in personal interviews, because the interviewer has hardly any control over the interview (Berrens, 2000 and Dillman, 1979). Since the interviewer remains anonymous, there is a possibility that respondents distrust the information and credibility of the exercise. Also respondents are increasingly hesitant to participate in telephone interviews due to telemarketing. In order to prevent low response rates, a lot of effort needs to be put in encouraging reluctant respondents to participate, however research has shown that making respondents participate in an unwanted task is likely to bias WTP estimates, especially when the open-ended format is used (Berrens, 2000). Nevertheless, telephone surveys have advantages in terms of costs and make it possible to reach the representativeness and sample size needed for the research (Garrod and Willis, 1999, NOAA, 1993 and Dillman, 1979). Also, similar to in-person interviews, there is an opportunity for the respondent to ask for clarification if necessary (Loomis and King, 1994).

4.1.3 Mail surveys

Because of their relatively low cost mail surveys are often used among CV researchers. Similar to in-person and telephone interviews, mail survey respondents are restricted to assimilate standardised information that may not suit their cognitive abilities, and information has to be relatively basic in order to encourage potential respondents to participate. However, interested respondents have the opportunity to gather additional information on their own in order to reach a decision. Nevertheless, mail surveys are the least flexible survey method. Since clarification is not possible and respondent motivation often insufficient, mail surveys may lead to inaccurate WTP or WTA bids, especially when the topic is complex and hard to comprehend (de Leeuw, 1992 and Mitchell and Carson, 1989). As a consequence, some questionnaires may be completed on the basis of

superficial understanding of the hypothetical market. However, in contrast, interested respondents may use the time available to discuss the issue with others and gather additional information to help form preferences.

One might argue that strategic answers are more likely to emerge in mail surveys, as respondents state their WTP or WTA less spontaneously than in interview or telephone surveys and have therefore time to act strategically. However, there is no evidence for this in the literature. The major drawback of mail shots is the low response rate and the possibility of sample non-response bias resulting from self-selection (Garrod and Willis, 1999, King and Loomis, 1994 and NOAA, 1993). In order to raise the response rate time, money and effort need to be increased considerably. However, sending out reminders and new questionnaires may trigger another potential disadvantage, because WTP means differ between early and late responses (Dalecki, *et al.*, 1993). The reason for low responses rates in mail surveys may be explained by the fact that the rewards of participating are fewer than the costs. Whereas rewards are limited to individually addressed cover letters, real signatures and tokens, costs include mental effort and time. The balance between costs and rewards varies among individuals depending on their interest, cognitive skills and background knowledge (Dillman, 1979).

The prime advantage of mail surveys is that respondents can give themselves as much time as they need to fill in the questionnaire and to better understand the context of the questionnaire as compared to telephone and in-person interviews, in which respondents are asked one question at a time, and therefore have the opportunity to thoroughly construct their preferences (Loomis and King, 1994). This means, that costs in terms of inconvenient timing and mental effort under time pressure are kept at a minimum. Questions that are sensitive or require high mental effort, for example the WTP or WTA question, are therefore more likely to be answered truthfully and may result in a lower non-response rate (Mannesto and Loomis, 1991). Another advantage is the absence of interviewer bias and socially desirable behaviour due to the anonymous nature of the questionnaire as opposed to telephone and in-person interviews, although the anonymity of the researcher may provoke distrust among some respondents regarding the confidential

treatment of the questionnaire (Loomis and King, 1994, Mannesto and Loomis, 1991 and Dillman, 1979).

4.2 Web-based surveys

In the past few years, some researchers have administered CV surveys on the World Wide Web. The main advantages of this technology are the low cost, because it avoids expensive colour printing, and achieves bigger sample sizes as compared to mail surveys or in-person interviews. Another potential advantage is the provision of information in text, pictures and video. If provided, respondents are also likely to benefit from links to relevant web pages or definitions provided in pop-up windows that help them learn more about the environmental change in question. Also, answers to questions can be transferred directly into programmes for data analysis, as opposed to conventional surveys, for which data has to be coded and entered by the researcher. Open-ended questions to which respondents have to write the answer are often difficult to read when mail surveys are used (Boyer, *et al.*, 2001). Further advantages are similar to those of mail surveys, in that the respondents can take themselves the time they need to think about the issue, and there is no inconvenient timing such as with in-person or telephone interviews. Finally, there is no risk of socially desirable answers due to anonymity (Tsuge and Washida, 2003).

Since internet access is not available to all socio-economic groups within a population, sample non-response bias occurs to be the most problematic drawback of web-based surveys. Even computer users are often not familiar with computer technologies and not always prepared to spend time and effort to learn how to complete the survey. While respondents get a quick overview over the contents of a mail survey, information about the length and content of a web-based survey is not obvious. Boyer, *et al.* (2001) reckon that this may have an impact on data quality. In addition to that there is a possibility that respondents complete the questionnaire twice or more often, in order to make sure their views have an impact (Tsuge and Washida, 2003). Similar to mail surveys, the researcher remains anonymous and clarification is impossible, hence web-based surveys may

not be suitable for the evaluation of complex environmental changes where strategic behaviour may possibly influence the outcome.

4.3 Deliberative group-based approaches

In recent years a number of deliberative group-based approaches, such as the Citizens' Jury or Values Jury, the Market Stall and the Valuation Workshop have evolved for environmental decision-making to overcome problems associated with conventional data collection modes in CV (Sagoff, 1998).

Sagoff (1998) states that deliberation within groups is likely to ameliorate a number of shortcomings in CV, because it enhances the credibility of responses as information, time and discussion allow for informed decision-making. As group-based approaches allow for discussions, information held by group members and other individuals with differing backgrounds and experience can be shared. The exposition of participants to a wide range of perspectives, opinions, arguments, ideas and understandings generates more information and leads to better understanding (Burgess, *et al.*, 1988, Aldred, 2002 and Wilson and Howarth, 2002). Hence, for complex issues, an individual in a group is likely to be better off than in isolation, and well-informed responses might be produced.

Furthermore, an emphasis can be placed on taking account of future generations and the process is more democratic as it facilitates more sophisticated public participation than conventional surveys because participants listen to private and public interests. Since the role of public participation is important in a range of policy decisions, deliberative approaches provide an opportunity to facilitate increased involvement of the public and help to meet national and international agreements. Future interests and public participation therefore enhance sustainability (Wilson and Howarth, 2002, James, 1999, Ward, 1999 and Sagoff, 1998).

4.3.1 The Citizens' Jury/Value Jury

The Jury approach involves a group of 10 or more members that comes together over a period of a few hours to a few days to discuss a particular environmental issue. The aim of the Jury is to reach a consensus over the selection between two

or more options for a social project or policy. One of the main features of juries includes witnesses who present a range of interests to the group members (the jurors). The meeting allows jurors to discuss the issue and question the witnesses under guidance of an independent moderator (Aldred, 2002 and James, 1999). Jurors receive a monetary incentive for participating and are compensated for expenses and act as citizens rather than consumers.

The concept of Citizens' Juries was developed 30 years ago in Germany and the US in order to increase public participation in democratic processes. In the UK, Citizens' Juries were initially applied to guide policy decisions within the health sector and in recent years to address local authority and environmental issues. Although Juries have sometimes involved environmental valuation they have never been used to implement contingent valuation explicitly. However this possibility has been discussed and encouraged in several papers (see Kenyon, *et al.*, 2001, Ward, 1999 and Brown, *et al.*, 1995).

A common problem with surveys is that respondents are often not well informed about the issue under investigation, and limited time does not allow to convey all information necessary, especially when the good to be valued is complex and/or unfamiliar. However, full information and understanding are essential for the elicitation of valid responses (Brown, *et al.*, 1995, Ward, 1999 and Wilson and Howarth, 2002). In Juries, information is provided in form of oral presentations by witnesses that represent divergent interests and points of views in a balanced way, and in form of an information folder including textual and visual descriptions of the issue. Jurors also have the opportunity to ask questions and discuss with other group members. Given that Juries can be 2-4 days long, jurors have sufficient time and information to give well-considered responses. Kenyon and Nevin (2001) highlight the problem of limited information and time in conventional CV. In their comparative valuation study on forest development in the Ettrick Valley they found that 13% of CV respondents were not sure about their support for the project, whereas in the Citizens' Juries all jurors were able to express their preferences. Also, the fact that jurors are paid a large amount for participating is likely to generate more motivation to take care over their decisions (Ward, 1999).

Another potential advantage of Juries is concerned with the costs of carrying out the survey. Brown, *et al.* (1995) suggests that Juries may be more cost effective than conventional CV data collection modes given that results may be more reliable than those obtained with traditional CV surveys.

Ward (1999) suggests that the Jury approach might discourage strategic behaviour observed in WTP and WTA elicitation, because jurors are asked to state an impartial collective bid that represents the preferences of the average individual. However, there is no evidence that social values would reduce strategic motives, as social WTP have so far not been researched. A number of authors claim that asking for social values is the only right question to pose when placing a monetary value on public goods. In their view, jurors should act as citizens who take the welfare of other members of the general public into account when deciding over an environmental policy or project, and hence it can be revealed what is best for society (Ward, 1999 and Brown, *et al.*, 1995). Advocates of social values also argue that they better address equity and distributional effects. Hence, whereas consumer values as elicited in conventional CV are dependent on each individual's income and lead to biases when a consumer's WTP exceeds his ability to pay, social values might elicit preferences that are independent of budget constraints (Kenyon, *et al.*, 2001). Brown, *et al.* (1995) suggests a further advantage of using social values: Since Juries are unlikely to be representative due to the small sample size, and hence do not represent all interest groups or the general public, asking jurors to act as representatives of society may ameliorate this problem. However, it is questionable whether participants really take account of other people's interests.

The main drawback of social values is the fact that they ignore neo-classical welfare theory. Social preferences do not coincide with fundamental economic theory assumptions for CV, which call for a trade-off between an individual's preferences for a certain environmental change and his/her budget constraint. Researchers should therefore also encourage the revelation of consumer values, as distinct from social values (Sagoff, 1988). If juries deliver consensus on collective values, then this limits their usefulness to economics.

4.3.2 Market Stall

The Market Stall approach combines the participatory aspects of Juries with the quantitative nature of conventional WTP studies. The design of the method involves a group meeting with up to 12 participants and a second elicitation in a second meeting or via the telephone after a week. During the meeting a moderator conveys relevant information on the environmental issue, the hypothetical market and payment vehicle. Detailed textual and visual information is also obtainable from an information folder that is handed out to each participant. Similar to the Citizens' Jury participants are encouraged to ask questions and discuss the issue with the moderator and other group members, but unlike a CJ, participants state their WTP or WTA bids individually and anonymously at the end of the meeting. During the subsequent week-long interval between the two elicitations participants are asked to think about the project and talk about it with their family or friends. They are also encouraged to use the opportunity to gather additional information about the environmental project in question, for example, consult relevant books, newspaper articles, surf the internet or watch TV programmes. In the follow-up exercise after a week, participants can ask further questions to clarify issues. The valuation exercise concludes with a repetition of the elicitation question (MacMillan and Hanley, 2002 and MacMillan, *et al.*, 2002).

The approach makes sense when comparing preference construction in the hypothetical context with preference construction in the real market. In the real market place individuals construct their preferences for something in response to information, advice, suggestions, and experience of others, as well as over time (Sagoff, 1994 and Schiffman and Kanuk, 1991). The interaction with other group members in Market Stall therefore presents an environment that seems to better meet the needs of consumers.

4.3.3 The Valuation Workshop

The Valuation Workshop offers a similar hybridised approach of the Citizens' Jury and conventional CV methods. It comprises a three-hour meeting of around 10 members in which participants fill in questionnaires individually and participate in

group discussions. Usually, the meeting is organised in three parts. After an introduction, participants fill in a questionnaire and state a WTP bid for the environmental change under investigation. In the next step participants are asked to determine the advantages and disadvantages of the project in a discussion. Finally, participants complete the WTP question again and answer some questions regarding the reasons for revising their bid. In addition to the quantitative output, lots of qualitative information is gathered regarding the participants' viewpoints and feelings towards the issue in question (Kenyon and Hanley, 2003). The Valuation Workshop differs from the Market Stall approach in that it relinquishes the week-long interval and subsequent elicitation, and instead elicits WTP before and after full information is provided during a one-off meeting, so it misses out on time to research preferences and consultation with others outside the group.

4.3.4 Disadvantages of group-based approaches

What is often criticised with group-based approaches, such as Market Stall, the Valuation Workshop or Juries, is the fact that viewpoints stated by some participants may influence other group-members, and hence may affect the values of individual participants. Keeney, *et al.* (1990) state that this can also be seen as an advantage, as the input from dominant participants can have an educational effect on other participants. Aldred (2002) suggests that participants may have good reasons for changing their preferences once they are aware of somebody else's preferences. These reasons include altruism, reciprocity or trust in somebody else's judgement (Wilson, *et al.*, 2002). However, group discussions might also encourage some participants to overstate their views in order to ensure that their opinion is heard. This domination may influence other group members in an undesirable manner and, as a consequence, groups may make more extreme decisions than individuals. This phenomenon is called group polarisation and might result in biased WTP estimates. However, the influence of dominant participants can be countered by an experienced moderator.

Another potential drawback of alternative approaches might be that additional time to think may trigger strategic behaviour (Niemeyer and Spash, 2001). Thus, the time given during the meeting or the week-long interval may facilitate overbidding or free-riding or may be used to calculate a fair share of

costs rather than maximum WTP. So far the few applications of group-based approaches show little evidence of these problems, and further research is required to test for consequences of these potential drawbacks.

The prime disadvantages of group-based approaches are the cost, as participants need a monetary incentive to travel to and attend the meeting, and the small sample size and lack of representativeness. However, this can be substituted for by eliciting values of high quality. Kenyon (2000) estimated the comparative costs of an interview survey and Valuation Workshop showing that the total cost is lower for the Valuation Workshop than for the interview approach but involved far fewer people.

4.4 Comparison of research methods

Normally, the choice of survey methods used in CV is determined by cost and time of implementation as well as the aim to achieve a large and representative sample. Other factors, such as time to think, opportunities for deliberation and motivation triggered by the CV exercise seem to be overlooked when the 'appropriate' survey method is selected, although these factors are essential prerequisites for preferences construction, especially when the environmental change to be valued is complex. This section reviews whether CV survey methods create sufficient motivation to construct preferences. Initially, a comparison of important conventional features between all methods is summarised in Table 4.1.

Table 4.1: Comparison of conventional features among CV survey methods

	Interviews	Telephone	Mail	Web	Juries	VW	MS
WTP/WTA	individual	individual	individual	individual	social	individual	individual
Information	standardised and limited, no independent research possible	standardised and limited, no independent research possible	standardised and limited, independent research possible	adjustable, but doesn't handle complex information, independent research possible	adjustable and very extensive, handles complex information, no independent research	adjustable and extensive, handles complex information, no independent research	adjustable and very extensive, handles complex information, independent research possible
Time available	little	little	variable	variable	1-3 days	~ 2 hours	~7-10 days
Representative	yes	yes	yes	only computer users	symbolic	symbolic	symbolic
Social desirability bias	possible	possible	unlikely	unlikely	possible	unlikely	unlikely
Potential costs per participant¹	£12-15	£5	£6	no data	£360	£40.50	£40
Response rate²	95-97%	56-81%	24-63%	no data	no data	no data	no data

¹ costs include recruitment, room hire, refreshments, travel costs, payment to participants/survey costs, moderators and recording equipment hire where appropriate

² Interview: 95% (Messonnier, *et al.*, 2000) and 97% (Mannesto and Loomis, 1991). Telephone: 56% (Keith, *et al.*, 1996), 62% (Pope and Jones, 1990) and 81% (Mortimer, *et al.*, 1996). Mail: 24% (Mannesto and Loomis, 1991), 35% (Loomis and King, 1994), 41% (Walsh, *et al.*, 1984), 52% (Barrick and Beazley, 1990) and 63% (Loomis and Feldman, 1995).

Conventional survey methods seem to have a clear advantage in terms of representativeness and costs, mainly because respondents do not need to be reimbursed, and time spent on each respondent is limited given the standardised information set, straightforward recruitment and the fact that respondents are not contacted again for a second elicitation. Although Table 4.1 suggests that in-person interviews achieve very high response rates, only studies that have achieved acceptable response rates seem to report these. Normally, the number of potential respondents approached is either not recorded or remains unmentioned. Overall, the advantages of conventional survey methods in terms of response rate is unclear given that relevant data is not available for group-based approaches.

Conventional criteria reported in Table 4.1 do not seem sufficient for deciding on a survey method that is suitable to investigate people's preferences regarding the future management of the wilderness area in terms of WTP and WTA. Due to the complexity of hydro schemes and their environmental impacts, a survey method that overcomes potential problems resulting from incomplete preferences and triggers sufficient motivation to engage respondents to construct preferences is required.

According to the literature on preference construction in hypothetical and real markets, underlying conditions for preference construction include sufficient time to think, a relaxed environment and social context, sufficient information, perceived credibility of the study, motivation, deliberation, pre-purchase search, and some control by the interviewer to guide the respondent if necessary. Furthermore, as mentioned in Chapter 3, the amount and source of information an individual acquires for decision-making in real markets depends on a range of factors, such as the benefits gained from making an informed decision, the complexity of the good, the attributes of the good that are of interest, the quality of information provided, transaction costs and perceived time pressure (Schiffman and Kanuk, 1991 and Beatty and Smith, 1987), and hence CV should ideally be carried out in a way that allows information to be adjusted.

Although these features seem to be realistic prerequisites for decision-making in CV, they do not tend to receive any attention when CV practitioners decide on a survey method. Since, according to economic theory, preferences are assumed to be existent in people's minds, the underlying conditions for preference

construction seem to be ignored, even though a range of biases show that people do construct preferences and these features are essential for making decisions over complex or unfamiliar goods, even in the real market. Considerable effort was therefore put into comparing survey methods from an angle that has so far been overlooked (Table 4.2).

Table 4.2: Scope for preference construction in each survey method

	In-person	Telephone	Mail	Web	Groups
Preference assumptions	must exist	must exist	can be constructed	can be constructed	can be constructed
Time to think	limited	limited	variable	variable	a lot, especially with MS
Perceived time pressure	possible	possible	unlikely	unlikely	unlikely
Presentation of information	verbal, written, pictorial	verbal	written, pictorial	written, pictorial	verbal, written, pictorial
Amount of information	very low	very low	moderate	moderate	high
Standardised information	yes	yes	yes	possible to adjust	possible to adjust
Trust/perceived credibility	possibly low	possibly low	possibly low	possibly low	possibly high
Pre-purchase search	impossible	impossible	possible	possible	Encouraged in MS
Deliberation with friends & family	impossible	impossible	possible	possible	possible with MS
Deliberation with people who face similar task	impossible	impossible	impossible	impossible	possible
Interviewer control	strong	limited	none	none	medium
Social context	formal	formal	formal	formal	informal

Given that CV surveys address a wide range of respondents with differing experience, knowledge and cognitive abilities, the threshold of adequate information necessary for preference construction is likely to be at different levels and standardised information sets have a serious disadvantage in that respect. Group-based approaches seem to be much closer to a real market situation in this respect, since respondents can ask the moderator (who acts as a surrogate for a salesperson) for further details or clarification, and in MS they have the opportunity to engage in further information search from a wider range of sources at home. Furthermore, the group-based process enables participants to relate to their personal beliefs, experiences, values and norms when researching their preferences and information is conveyed using literary, oral and visual cues to suit a wide range of individuals. Although web-based surveys provide some important aspects for preference construction, such as sufficient information and the opportunity to deliberate with friends and family, deliberative approaches seem to have more advantages in the preference construction context.

Participants in group-based approaches are given plenty of time to search their preferences and justify their position and they have the opportunity to discuss the issue inside and outside the group and consider different perspectives. In MS, people get the chance to assimilate information provided at the meeting during the week-long interval and are given the opportunity to reassess their preferences. Giving respondents a chance to revise their initial answers has been repeatedly suggested by survey methodologists, since the second estimate is often more accurate (Tourangeau, 1984). Furthermore, this is an important surrogate for postponing real market decisions in order to better think about and discuss the decision. As opposed to this, conventional approaches only offer very limited time to think, although this may be variable in a mail survey, and do not allow respondents to discuss the decision with others. Furthermore, respondents in in-person and telephone interviews may often perceive time pressure to give prompt answers (Cannell and Fowler, 1963), and pre-purchase search and discussions with others is impossible.

Informal group meetings provide a relaxed environment and relationship between the moderator and participants. If the social context is formal, as in conventional and web-based surveys, it may be less likely that respondents are

relaxed and take their time to engage in careful preferences construction (MacMillan, *et al.*, 2002).

Clearly, conventional survey methods no longer appear to be the most suitable methods for CV data collection when they are viewed from a preference construction angle, as they do not seem to offer as much scope for preference construction as compared to web-based and group-based approaches. Given the limited time and space available in in-person, telephone or mail surveys, it is doubtful whether knowledge can be developed to a sufficient level that enables respondents to make a rational decision (Macdonald and McKenney, 1996 and Payne, *et al.*, 1992). Such limitations do not occur in purchase decisions in real markets. In addition, in real markets consumers have the opportunity to postpone a purchase and discuss the issue with friends (Harris, *et al.*, 1989 and Hoehn and Randall, 1987). Group-based approaches seem to be a promising tool, as they seem to perform relatively well with regards to underlying conditions for preference construction. If the aim of CV is to obtain well-considered preferences for an unfamiliar or complex good in terms of WTP or WTA, then scope for preference construction should play a major role in the decision over a suitable data collection mode.

Another major challenge of this study is to explain the complex changes to wilderness in a way that participants remain interested. A sophisticated approach is therefore needed that triggers sufficient participant motivation to construct preferences. Motivation is a key requirement if participants are supposed to engage in careful preference searching (Beatty and Smith, 1987), especially when the issue is complex. Hence, the CV exercise should have high credibility from the respondent's point of view, and should be designed in a way that respondents are convinced by its authority, accuracy, trustworthiness and effectiveness (Burgess, *et al.*, 2000). The social context in mail, telephone or web-based surveys, for instance, where the interviewer is either a stranger or remains anonymous, may not contribute to perceived credibility. As mentioned in Chapter 3, in order to achieve sufficient motivation among participants to seek and process information and give well-considered answers, the survey method should

maximise rewards and trust, and minimise the costs imposed on respondents (Dillman, 1979).

Although motivational issues are an essential condition for obtaining well-considered and valid answer, they have hardly received any attention in the literature, nor have CV practitioners carefully investigated which survey method is most suited in terms of triggering motivation. The extent to which motivation is generated among the available data collection modes is briefly summarised in Table 4.3.

The table shows that the ‘cost-benefit ratio’ of participating in a CV exercise varies considerably between conventional and group-based approaches, with group-based approaches generating fewer costs and more benefits as compared to other survey methods.

In-person and telephone interviews are likely to cause relatively high costs, due to the risk of inconvenient timing, time cost, limited time to think, high mental effort and possible discomfort or intimidation. Costs are less significant in mail and web-based surveys where respondents can answer the questionnaire at a time that suits and are given time to think. In comparison to that group-based approaches reduce costs of participating even further since respondents agree to participate in advance and are reimbursed for travel expenses. Given that participants have more time to think and information can be adjusted and explained, mental effort is kept at a minimum.

The high costs of participating in conventional surveys cannot always be compensated for, because often only few intangible rewards are available and being interviewed by a stranger may not generate sufficient trust. While group-based approaches have relatively low costs, they also increase rewards and trust by providing a monetary incentive and offering a relaxed and personal relationship with the moderator that encourages respondents to take the exercise seriously and makes them realise that they can make an impact in the decision-making process.

The comparison suggests that group-based approaches are most likely to encourage respondents to learn about the complex hydro scheme issue and determine their preferences in terms of WTP or the demanding WTA format.

Table 4.3: Cost, reward and trust of participating in different CV survey methods

	Personal interviews	Telephone interviews	Mail surveys	Web-based surveys	Group-based approach
Cost	<i>high</i> -risk of inconvenient timing, unexpected -little time to think -time cost and mental effort are high. -potentials for discomfort	<i>high</i> -risk of inconvenient timing, unexpected -little time to think -time cost and mental effort are high. -potentials for discomfort	<i>medium</i> - respondents decide when to answer the questionnaire - time to think - high mental effort	<i>medium</i> - respondents decide when to answer the questionnaire - time to think - high mental effort	<i>relatively low</i> - agree in advance to participate - reimbursed for travel costs - time to think - mental effort is kept at minimum as information can be adjusted and explained.
Reward	<i>low</i> - rewards often intangible: respondents are within a carefully selected sample, their answers matter	<i>low</i> - rewards often intangible: respondents are within a carefully selected sample, their answers matter	<i>low</i> - rewards often intangible: respondents are within a carefully selected sample, their answers matter	<i>low</i> - rewards often intangible: respondents are within a carefully selected sample, their answers matter	<i>relatively high</i> - monetary incentive - participants feel important and taken seriously given the elaborate recruitment and exercise.
Trust	<i>medium</i> - respondents are approached by a stranger, and may be sceptical of the use of their answers	<i>low</i> -interviewer is incognito, which may result in limited trust -respondents may be sceptical of the use of their answers	<i>low</i> -researcher is incognito, which may result in limited trust -respondents may be sceptical of the use of their answers	<i>low</i> -researcher is incognito, which may result in limited trust -respondents may be sceptical of the use of their answers	<i>high</i> -relaxed personal relationship between moderator and group members

4.5 Choice of survey method

In order to obtain valid and well-considered WTA and WTP estimates for a complex environmental change, CV respondents should carefully read and assimilate information and carefully construct their preferences (Krosnick, 1991). Such a task requires a considerable amount of motivation and hence respondent motivation to construct preferences is the most important criteria for the choice of an appropriate survey method. As demonstrated in Table 4.2 and 4.3, there is a risk that conventional survey methods may not provide sufficient incentives for respondents to carefully engage in the CV exercise, and hence the validity of responses may be unconvincing (Dijkstra, 2002, *pers. com.*). In comparison, group-based approaches provide a range of prerequisites for preference construction, and generate similar conditions for decision-making to those in real markets. The comparison in Table 4.3 demonstrates that benefits of participating in a deliberative CV exercise are likely to outweigh the costs, and as a result respondent motivation is anticipated to be sufficient for the demanding valuation task.

This assumption is also in line with Gregory, *et al.* (1993) who argue that if preferences are inconsistent with economic theory a deliberative valuation approach should be used to rationalise the process of preference construction. Moreover, they suggest that CV must be implemented in form of a tutorial, and advocate that CV study designers 'should function not as archaeologists, carefully uncovering what is there, but as architects, working to build a defensible expression of value' (Gregory, *et al.*, 1993, p. 179). Market Stall and the Valuation Workshop seem promising tools for evaluating the economic gains and losses from hydro scheme developments, especially when the demanding WTA measure is used. Both methods are preference construction friendly as they offer an architectural style that allows respondents to assimilate sufficient information and deliberate, and gives them time to carefully construct their preferences. As mentioned in Chapter 3, consumer research points at the fact that individuals seek advice from friends, family members or a salesperson to help making complex decisions (Schiffman and Kanuk, 1991). Market Stall supports this crucial part of the value construction process by giving respondents a week to discuss the issue with others and by providing a moderator who is able to clarify issues. Although

the Valuation Workshop has very similar characteristics, it seems less suited for this valuation study because it provides participants with less time to think. Market Stall was decided to be the most suitable survey method with regards to preference construction for a complex good and because it is not anticipated to trigger participant motivation.

Even though a number of CV studies provide evidence that in-person interviews may not be well suited (see MacMillan, *et al.*, 2002, Clark, *et al.*, 2000 and Brouwer, *et al.*, 1999), this form of data collection is yet the most popular one amongst CV researchers given its relatively low implementation cost and the possibility to obtain large and representative samples. So far little has been done to directly compare the results obtained from this conventional way of data collection and more sophisticated group-based approaches. It was therefore decided to conduct in-person interviews on a small sample of the general public in order to compare the outcomes with those of the Market Stall approach.

6 RESULTS

In this chapter the data obtained from the Market Stall (MS) exercise and the interview control group is summarised and analysed in the following way:

- Validity assessment of WTA and WTP bids, including zero responses.
- Descriptive statistical results for payment card and open-ended estimates.
- Statistical validity tests of WTA and WTP.
- Examination of the occurrence of 'disengaged' behaviour in MS and interview groups based on participant behaviour observation.
- Re-compare validity of WTA after removal of 'disengaged' participants.
- Compare MS and the interview control group based on participant performance and respondents' perceptions regarding the exercise.

6.1 Sample characteristics

Six Market Stall meetings and 62 interviews were carried out between June and September 2002 in the capital area of Iceland. Sixty-five out of 82 recruited participants agreed to participate in one of the MS meetings, of which 53 participants actually showed up, resulting in a response rate of 65%. In comparison to that 62 in-person interviews were completed out of 191 approached individuals, achieving a response rate of 32%.

The distribution of socio-economic respondent characteristics in the overall sample shows that the representation of male and female participants is approximately equal (male 51.3%, female 48.7%). All age groups were equally represented, although slightly more in the youngest (< 25 years) and the oldest age group (65-74 years) would have improved the sample. Household income was distributed considerably evenly, although income groups 351,000-400,000 krona and > 500,000 krona were slightly over-represented in comparison to other income groups in the sample. The relatively small number of people in the lowest income group (< 100,000 krona) and the overrepresentation of the highest income group can be explained by the fact that household income is relatively high and was therefore not covered by the range provided in the questionnaire.

7 DISCUSSION

The aim of this research was to test the Market Stall approach in terms of validity and participant performance and compare findings with conventional in-person interviews. According to the comparison of survey methods in Chapter 4, Market Stall is expected to provide a more realistic environment for decision-making over complex environmental changes, as it provides more time to think, the opportunity to deliberate with others and gather additional information, as well as the chance to consult information sources during the week-long interval. In comparison, in-person interviews seemed to offer less scope for preference construction because they are thought to be less similar to the decision-making environment in real markets.

This chapter discusses the different results obtained in MS and interviews and tries to explain these with findings and assumptions from the relevant literature, participant behaviour observation and perceived respondent views. Then, the usefulness of the week-long interval and revision of WTP or WTA is discussed, as well as the impact of observed 'disengaged' behaviour on the validity of estimates. This is followed by a discussion of the use of WTA in CV. The chapter concludes with an evaluation of the Market Stall method and discusses whether it is a sufficient substitute for conventional CV data collection modes. The discussion mainly focuses on value estimates obtained from the open-ended question and in the first elicitation, given that the number of observations were less sufficient for statistical analysis in the second elicitation presented in Chapter 6.

A number of differences between Market Stall and the interview control group were detected in Chapter 6:

- MS produced significantly higher WTA and WTP responses to the open-ended question than interviews¹.
- the regression models explained WTA obtained in MS better than estimates elicited in the interviews.

¹ There is no statistical difference between estimates obtained in the first and second elicitation.

- the non-response rate to the open-ended question was lower in MS than in the interviews
- respondents attitudes towards the exercise in terms of interest and information load, as well as their behaviour was more positive among MS participants.
- the number of unsure respondents was reduced in the second elicitation in MS

7.1 Possible explanations for differences

7.1.1 Information and discussion

MS and interview respondents were provided with the same amount of information considered necessary for the valuation task, in order to test whether group discussions explain differences in MS and interview results. Despite this, an information effect may be responsible for the detected differences in means, validity and non-response rates to the OE question: while a number of interview respondents only leafed through the folder, and hence absorbed less information, MS participants carefully read the information folder during the meeting and received additional information during the discussions.

Full awareness of all costs and benefits associated with the hydro scheme development may therefore explain the upward effect on both WTP and WTA means in MS. However, the effects of information on mean WTP are still debated in the literature.

While the findings from this research contradict MacMillan, *et al.*'s (2002) study, in which estimated means from MS meetings are 3.5 times lower than means obtained in interviews, a number of other studies show that WTP increases in response to more information. For example, Bergstrom, *et al.* (1990) found a similar information effect in that CV respondents perceived to gain more utility from paying towards the increase of environmental goods when they were provided with additional information. Samples, *et al.* (1986) found that respondents revised their bids for preserving humpback whales upwards after having been shown a film, and Pope and Jones (1990) also discovered that people who received more information in a telephone interview were WTP more than those who were not given this information. Kenyon (2000) found a similar information effect in her valuation workshop: Prior to detailed information and

discussion mean WTP was £11.07, whereas the post-discussion mean was £13.59. The same study also reports a comparison between interviews and the valuation workshop, finding that the interview mean of £10.07 is slightly lower compared to the workshop means. Similarly, Whitehead, *et al.* (1995) reports that mean WTP of people with no experience with an environmental good, who merely based their estimate on information conveyed in an in-person interview, was \$49.46 and participants that had read books, seen a TV programme and talked to someone about the issue prior to the survey had a mean WTP of \$55.76.

Some of these studies suggest that, apart from information, discussion seems to have an effect on people's WTP or WTA, because it enables respondents to consider more details regarding an environmental change, and prevents underestimation of the marginal utility of hydro scheme developments and disutility of wilderness loss.

Information and discussion may also explain the differences in validity. For example, Whitehead, *et al.* (1995) provides evidence that complete information and discussion in contingent markets can affect the validity and reliability of environmental values. Using theoretical validity tests, they found that WTP estimates from CV surveys are more valid for respondents who have read, seen a programme or talked to someone about the natural resource (water quality and wildlife habitat in an estuary), and WTP is less valid for respondents who only gained information about the natural resource from the survey. This is also consistent with MacMillan, *et al.* (2002) who found that WTP was better explained by socio-economic and attitudinal variables in MS and hence may be considered more theoretically valid when compared to interviews.

Fischhoff (2002) suggests that without having time to think and hear other people's perspectives, people have difficulties to devise stable views about a complex and novel issue and Sagoff (1998) states that even though respondents often lack a well-articulated preference set, they are still able to make well-considered, robust and valid value choices in 'circumstances appropriate to making public choice' (p.223). In these circumstances, the respondent determines his preferences 'as a result of deliberation, reflection and social learning' (Sagoff, 1998, p.224). These conditions are also essential for extensive purchase decisions regarding a complex product in the real market (e.g. a car), for which consumers

gather information from various sources, take themselves time and discuss with family, friends or a salesperson, in order to ensure that their purchase makes sense in terms of income and matches their preferences (Schiffman and Kanuk, 1991). Theories in group decision-making and social learning also stress that discussion, deliberation and access to information might enhance the validity of environmental values (Burns and Überhorst, 1988 and Bandura, 1977).

Although interview respondents were encouraged to inform themselves in sufficient detail and discuss the issue at home, incentives for doing so were possibly too low and hence, with the absence of these important elements, it is not surprising that some respondents were unsure about their views or unable to answer the payment/compensation question. Indeed, a number of authors state that less informed respondents are more likely to refuse to answer the elicitation question (see Kenyon and Edwards-Jones, 1998, MacDonald and McKenney, 1996, Slovic, 1995 and Harris, *et al.*, 1989). While the nature of standard CV interviews often prevents respondents from informing themselves and discussing the issue in more detail, an important task for future research is to design interviews that both allow and encourage respondents to engage in a preference construction friendly environment.

7.1.2 Time to think

The design of the comparison attempted to create a relaxed interview environment, in which participants take time to think about their answers. However, participant observation reveals that a lot of respondents were keen on terminating the interview quickly or felt under pressure to give prompt responses. Hence, time to think may also be responsible for some of the differences observed between MS and interviews.

According to Svedsäter (2003), for instance, the validity of WTP responses can be increased with additional time to think about information. Hoehn and Randall's study suggests that WTP is 'non-decreasing' as an effect of time to think and further information sources (Hoehn and Randall, 1987). However, studies by MacMillan, *et al.* (2002) who compared MS and interviews, and Mannesto and Loomis (1991) who compared mail surveys with interviews found significantly higher mean WTP in interviews. The authors suggest that time to

think may encourage respondents to more carefully consider their budget constraints and that socially desirable behaviour is absent in MS and mail. Clearly, time to think about income is not relevant for the elicitation of WTA estimates, given that compensation claims are not constrained by income. Instead low WTA estimates in interviews may be explained by limited time to consider all the costs associated with the hydro scheme developments or some sort of socially desirable bias in the interviews, as respondents may have assumed that high compensation claims are regarded as undesirable.

Possibly, lack of time to think and process information also explains the number of unsure respondents, because a number of MS and interview participants indicated that they were still undecided when they were asked about their views towards the hydro scheme issue. MacMillan, *et al.* (2004a) found similar 'unsure' rates in an MS study, which suggests that time during the MS meeting is too limited if respondents have no opinion towards an environmental change. The week-long interval seemed to help participants to form an opinion and reduced the number of unsure respondents from 18% to 11% in MS. These findings are also supported by MS research reported in MacMillan, *et al.* (2004b), in which a similar reduction in 'unsure' rates is reported, ranging from 11.3 to 18.3% for different wildlife projects at the end of the MS meeting, falling to 5.2 to 12.7% in the second elicitation via telephone a week later.

Lack of time to digest all information may also explain why the interview control group produced more non-responses to the open-ended question than MS (interviews: 37.1%, MS: 22.6%). While non-response rates to the WTP question are hardly ever stated in the CV literature, Urama and Hodge (2004) reported a similar number of non-responses (33%) to their WTP question posed in in-person interviews in Nigeria. Apart from protesting behaviour, respondents stated that they did not know how to value the environmental good in monetary terms and that information was too complex, possibly because the time to process it was too limited. According to statistical findings based on the debrief questions reported in Chapter 6.5.4, participants are more likely to formulate an OE response, when they take time, are satisfied with the amount of information and are interested in the exercise. As opposed to interview respondents, hardly any of the MS

participants perceived time pressure, or an information overload, and the majority was interested in the exercise.

Overall, these findings suggest that time in the valuation process is essential to help respondents to digest information, and form an opinion and preferences towards complex issues. While the OE non-response rate may be reduced by providing sufficient explanation, information and time during the MS meeting, a two-stage elicitation approach seems to be beneficial for reducing unsure responses. This is also consistent with assumptions from psychology and consumer research, which suggest that people need time to think about all the relevant attributes associated with a complex good and decide how much they care about each: spontaneously forming an opinion is difficult in the time provided in conventional CV (Fischhoff, 1988 and Schiffman and Kanuk, 1991).

7.1.3 Relaxed environment in MS

Although an attempt was made to create a relaxed interview context, participant observation suggests that MS respondents were more relaxed during the CV exercise. According to behaviour coding, only one participant was confused in MS as opposed to eight in the interviews, who did not carefully read the information folder and hence failed to understand the payment/compensation question. This might suggest that the relaxed and informal meeting in MS indeed seemed to play a significant role in allowing participants to process information cognitively, understand the valuation task and construct and report preferences in monetary terms when answering the OE question. In MS participants also seemed to be encouraged to ask for clarification, which nearly eliminated confusion. In many cases participants resolved obscurities with their neighbour, and a variety of individuals with differing background knowledge successfully completed the exercise. The importance of a relaxed decision-making environment is also backed by the fact that none of the MS participants reported time pressure as opposed to a number of interview respondents, who felt under pressure to give prompt answers. Furthermore, none of the MS participants was intimidated by the complicated exercise. In comparison to that, some interview respondents seemed uncomfortable or intimidated by being approached and interviewed by a stranger and reported difficulties to understand the task. Hence, creating a relaxed

environment, in which respondents are given sufficient time to think, as well as the opportunity to learn about an environmental good and go through all stages of questionnaire content processing, may enhance participant performance and encourages well-considered answers.

The importance of a relaxed environment is also confirmed by participants' perceptions to the exercise as elicited in the debrief questions. Table 6.27 in Chapter 6.5.5 shows that in total 98% of MS participants considered the exercise to be interesting as compared to 85% of the interview control group sample, and none of the MS participants found it totally confusing as opposed to 13% of interview respondents. These percentages imply that MS seemed to be slightly more 'popular' among survey participants. Evidence from chi-square tests suggests that time pressure and information load, as perceived by participants, are responsible for differences between MS and interview results: Participants who perceived no time constraint and were happy with the amount of information provided were more likely to find the exercise interesting.

As revealed in the participant observation and the debrief questions, MS participants were not under time pressure and a high percentage was happy with the amount of information provided; as a result none of them found the exercise confusing and instead participants were interested in the exercise. This suggests that the relaxed context in MS, in which people are allowed to take themselves time to read and digest information is advantageous, and one of the prerequisites for obtaining valid and well-considered WTP and WTA answers.

7.1.4 Motivation issues

Apart from information, time and discussion, motivation may be one of the main factors explaining why MS estimates are better explained by independent variables than bids obtained in the interview control group and why there is a difference in the OE non-response rate between the two survey methods. Participant observation suggests that all, apart from three, participants in the MS were motivated and able to tackle the valuation task as compared to only 50% of interview respondents.

Dillman's theory (1979) suggests that respondents only state well-considered and accurate responses when they are motivated, that is, when the cost of participating in a survey is minimised, and rewards and trust are maximised. If

‘the potential payoff is small relative to information costs, then valuation responses may be made in a setting of ignorance’ (Berrens, *et al.* 2001, p.7). A number of psychologists and survey methodologists have provided evidence that motivation causes respondents to put more effort in giving answers that match with their perceptions (see Dijkstra and Vanderzouwen, 1982 and Cannell and Fowler, 1963). Lack of motivation may lead to heuristics and result in inconsistent answers and satisficing (Ajzen, *et al.*, 1996, Krosnick, 1991 and Tourangeau, 1984), e.g. respondents might say they are unsure about the hydro scheme project, state a random bid or refuse to answer the OE question, because they are not motivated to put effort in thinking about their answer.

Harris, *et al.* (1989) states that ‘the best situation [...] is one where respondents experience a state of optimal arousal and their motivation to provide accurate values is high’ (p. 224), and hence, validity of WTP responses is high when motivation is at a sufficient level. Respondents tend to make a trade-off between speed and accuracy, and if respondents are not motivated to participate, it is likely that they prefer to answer quickly rather than accurately, because they think they have to give prompt answers or because timing is inconvenient (Cannell and Fowler, 1963 and Fischhoff, 2002). Furthermore, Dillman (1978), Loomis (1990), Krosnick (1999) and Krosnick, *et al.* (2002) postulate that the cognitive requirements of answering complex questions, as well as reluctant behaviour often result in item non-responses. In a time diary survey, Triplett, *et al.* (1996) found that converted telephone interviewees who initially refused to participate had a higher item non-response rate than respondents that were cooperative. Indeed, statistical results reported in Chapter 6.5.4 show that ‘engaged’ respondents are much more likely to respond to the OE question.

The Market Stall exercise was designed in a way to meet optimal conditions for motivation: A monetary incentive compensated for the physical and mental costs associated with participating in the CV exercise. Furthermore, participants felt their comments during the discussion and answers to the questionnaire were taken seriously and were important for the future management of the wilderness area, and thus rewards for participating were maximised. The informal and easygoing relationship between the moderator and participants also seemed to create trust amongst participants, an important benefit of survey participation. Overall, MS

participants seemed happy and found it interesting to participate in the meeting. Given the nature of the recruitment, problems related to inconvenient timing were eliminated and detailed information enabled respondents to become more familiar with, and fully comprehend, the topic. Sufficient time to read and complete the payment questions, perceived relevance, the opportunity to seek advice from a person that is engaged in a similar purchase and the relaxed social context clearly enhanced motivation and ability much closer to a level that would be required for real market decisions.

In the interviews these conditions existed to a lesser extent, with relatively high costs on behalf of the respondent in terms of inconvenient timing and mental effort, a small reward in the form of a waffle with cream, and being approached by a 'waffle-making stranger', which might not generate sufficient trust. Hence, motivation and effort to give well-considered answers was less likely to be triggered in the interviews. This may explain why WTA is not equally well explained in the regression model for the interview control sample and why interviews produced more non-responses to the OE question.

Furthermore, motivation to process information carefully is diminished when the topic has no or low personal relevance or participants feel that they are not responsible for the environmental problem under investigation, and hence, respondents may adopt a peripheral processing mode (Ajzen, *et al.*, 1996, Sudman, *et al.*, 1996 and McClelland, *et al.*, 1990). This may cause problems because respondents may have to construct preferences on the spot, instead of simply retrieving them from an existing preferences set (see Chapter 3). According to participant observation, it is likely that the nature of MS improved the participants' perceived relevance of the study, since it allowed the moderator to carefully explain the objectives and outline of the exercise at the beginning of the meeting: all participants were focused on the topic and there was no evidence of respondents' attention wandering, for example, by telling unrelated stories about elves or politicians. The fact that MS participants were concentrating, did not seem bored or acted annoyingly (e.g. questioning the credibility of the information or text-messaging), shows that they realised the important role they played in the decision-making process. On the other hand, these behaviour categories were common in the interview control group. Lack of focus, boredom

and annoying behaviour suggest that interview respondents may have not been aware of the relevance of their answers, and there is a possibility that some interview respondents considered the exercise just as another marketing survey.

A further cause for the differences in results is given by Harris, *et al.* (1989), who suggest that people do not engage in careful decision-making when they are under too much stress, for example, due to intimidation by extensive information material. If respondents are under stress, motivation cannot be triggered and respondents are likely to engage in simplified thinking. This is especially the case with unfamiliar or complex goods, such as wilderness, for which respondents are expected to construct preferences. Instead of processing all information, respondents truncate the retrieving process as soon as they have enough information in their mind to form a judgement that is sufficient. In addition, memory searching takes time and the limited time given in the interview further contributes to the respondents' tendency to truncate their searching effort. As a consequence, not all, including potentially relevant information, is integrated in the judgement, and survey responses are based on the information that is most accessible at the time of the interview (Sudman, *et al.*, 1996). This may either cause random error in WTP estimates, because respondents get confused, or systematic error because respondents guess what the right answer is. Furthermore, extreme values might be stated when respondents are asked for a clear and coherent reflection of preferences (Payne, *et al.*, 1992 and Fischhoff, *et al.*, 1980). Hutchinson, *et al.* (1995) also suggest that insufficient knowledge and experience results in 'random, chaotic and uninformed bidding' (p.100).

7.1.5 Information load

Findings from the debrief questions on respondents' perceptions of the exercise provide a further possible explanation for differences in MS and interview results: A large proportion of interview respondents perceived an information overload as compared to no-one in the MS sample.

The fact that 37% of the interview control group sample perceived an information overload demonstrates that a number of interview respondents did not manage to process the information provided. On the other hand, 10% of the interview

respondents found they had received too little information. This observation is interesting, as it shows that individuals have different information requirements, and suggests that the provision of a standardised information set does not suit all individuals in the sample. In MS, the perceived information load did not vary so drastically: 29% stated that they had received too little information and the rest was happy with the amount of information provided; hence none of the MS participants perceived an information overload during the meeting.

While this might mean that MS participants were provided with relatively too little information or interview respondents with relatively too much information, the findings also suggest, that information was adjusted to a greater extent to individual needs in MS, possibly due to the information provided during the discussion, the possibility to ask the moderator for further details and the time to read. The fact that over 70% of all MS respondents were satisfied with the information provided during the meeting may be one reason why MS estimates perform better in the regression than interviews and why a higher OE response rate was achieved. As mentioned above, Harris, *et al.* (1989) assume that too much information confuses individuals and encourages them to simplify when they are asked the WTP question. If this is the case, MS indeed produces more valid results given that nobody stated that they had received too much information and only 1.9% of participants was classified as confused in the participant behaviour observation. The fact that nearly 13% of interview respondents were confused also suggests that information overload may lead to inaccurate estimates.

7.1.6 Explanations for differences: Summary

Theories and findings from psychology and survey method research, as well as the participant behaviour observation show clearly that MS provides many of the underlying conditions for preference construction and the reporting of well-considered preferences. A range of conditions, including sufficient time to read and think, as well as adjustment of information, are better represented in MS as compared to interviews, and this might explain why MS respondents seem to better tackle the elicitation task.

The reduction of unsure respondents in the second elicitation of the MS approach and the lower proportion of non-responses to the OE question in MS suggest that respondents are constructing preferences, instead of retrieving them.

The comparison between interviews and MS implies that MS participants carefully utilise time to think, the information folder and discussions inside and outside the group to construct their preferences. The fact that these prerequisite features for preference construction are either not available or are not utilised by respondents in the interview control group may explain why the non-response rate to the open-ended WTP and WTA question was higher.

Although the comparison was initially designed to test discussion effects by providing both sub-samples with the same amount of information, offering interview respondents to carefully think about the issue and revise their WTP/WTA after a week, as well as creating a relaxed interview situation, it is not possible to conclude that discussions were responsible for difference between the two survey methods. As mentioned above, participant observation showed that not all interview respondents absorbed all information provided in the folder, some were under time pressure and hardly anyone wanted to participate in the second elicitation over the phone. Hence, it is difficult to draw conclusions over which of these factors specifically are important to achieve the response quality and participant performance as found in MS. An interesting task for future research would be to keep all factors, apart from discussion, constant in order to investigate the importance of discussion for preference construction and decision-making. This would show whether CV needs to be implemented in form of group-based approaches or whether any other conventional survey method would be suitable, as long as respondents are given time to think and as long as the format triggers sufficient motivation.

Certainly some of the undesirable factors of in-person interviews might be adjusted if interviews took place in the respondent's home and were arranged beforehand over the phone. Future research should investigate participant behaviour during mail or web-based surveys to get a better picture of participant performance in different data collection environments. This might provide further insights into the suitability of these survey methods and provide clues over how to change their design and how to improve the decision-making environment.

7.2 The week-long interval and revision of WTP and WTA

The week-long interval and revision of WTA and WTP was thought to reflect complicated decisions in real markets, which people can postpone in order to think or inform themselves in more detail. Giving respondents the chance to revise their initial answer is also repeatedly suggested by survey methodologists who assume that adjusted answers are more accurate (see Tourangeau, 1984). In this study, giving MS participants the opportunity to revise their bid after a week did not result in statistically significant changes to mean estimates, but the regression model for open-ended data explains more variance between WTA in terms of adjusted R^2 . Although means were not affected, a substantial proportion of participants revised their open-ended bids.

Of the interview control group sample, only three respondents (4.8%) agreed to the opportunity to think about the project and their WTP or WTA and participate in a second elicitation over the phone after a week. As opposed to this, all, apart from five MS participants participated in the second elicitation (90.6%), suggesting that in general MS participants are more motivated to make a well-considered decision. While this can be explained by the monetary incentive given to MS participants, other benefits of participating, such as the informal meeting, raised interest in the issue, relevance of participating and wanting to have an impact, seemed to outweigh the cost of participating in a second elicitation². In the interviews, the benefits of participating in a telephone follow-up seemed to be low and possibly did not compensate for the cost (in terms of mental effort and providing their telephone number). Some unsure respondents stated that they would be unable to form an opinion in only one week. However, there is also a possibility that interview respondents were sufficiently sure about their preferences and therefore decided that a second elicitation is not necessary. Hence, it is difficult to draw unequivocal conclusions over differences in motivation generated in the two survey methods.

Like in MacMillan, *et al.* (2002) and Whittington, *et al.* (2002), the week-long interval and the opportunity to clarify estimates in the second elicitation over the

² A number of MS participants stated that they would have participated without reimbursement, as they found the meetings very interesting and enjoyable.

phone resulted in a significant proportion of MS participants (27%) changing their open-ended estimate.

The week-long interval seemed particularly important for hydro scheme losers in determining their WTA in compensation. In total, seven hydro scheme losers revised their bids as compared to two hydro scheme gainers. According to explanations given by participants, the week-long interval enhanced their insights into the hydro scheme issue. For example, participants used the time to look at the information folder again and realised that the loss of wilderness benefits was more severe than they initially thought. One participant stated that her eleven-year old son read the information folder and became very upset about the landscape change and the animals that would be distressed by the reservoirs. He took the information folder to school, and presented the issue to his classmates and teacher. After a discussion with her two sons and the teacher, the participant decided to revise her WTA bid upwards. This suggests that WTA questions regarding a complex environmental change would be too demanding for some participants in a one-shot CV exercise, even if it is conducted in form of MS, because people are inexperienced with compensation claims and preferences are not simply retrieved from a well-articulated preference set. Since respondents did not report any further information search on the issue, it can be assumed that time to digest the information provided at the meeting and talking to others seemed to be the most important aspect for re-considering WTA or WTP. Repetition helped respondents to get used to the compensation task and may be essential when the WTA measure is used.

A large proportion did not change their estimates, and overall there was no statistical difference between WTP/WTA means elicited in the first and second elicitation. While MacMillan, *et al.* (2002) found significant differences in mean estimates based on bids that people were 'probably WTP', no difference was found in means calculated from bids that people were 'definitely WTP'. While the first and second elicitation in this study are highly correlated (see Chapter 6.3.2.2), a test-retest study by Kealy, *et al.* (1990) and Loomis (1990) found a slightly lower correlation coefficient between WTP obtained two weeks and nine months apart (0.66 and 0.57, respectively). Although one might assume that participants already had fairly stable preferences by the end of the MS meeting

(first elicitation)³, there is also a possibility that participants did not want to be seen to change their mind, or that not changing the estimate required least effort. Further research is needed to better investigate the reasons why some respondents held on to their initial bid. If it is due to stable preference, then this would show that requirements for optimal decision-making vary among individuals (as postulated by Bettman, 1979) and that CV should therefore offer some flexibility, such as in MS. Alternatively, the low marginal cost and convenience for respondents in web-based surveys opens up the possibility to move away from one-shot interviews or mail surveys and instead give respondents time to think and learn about the environmental change in question, as well as the opportunity to revise their WTP/WTA estimates, if desired. However, if it would turn out that people do not change their estimate because of high mental effort and time costs, further incentives would need to be created to encourage respondents to make the best use of the week-long interval, and this might be difficult even in web-based surveys.

Overall, these findings show that not all CV respondents are able to process the information given during a one-shot valuation exercise. There is some evidence that the week-long interval seems useful for a considerable proportion of participants, and hence presents a valuable part of a preference construction friendly environment. More research is required to investigate what role time plays. Furthermore, more incentives should be created for answering the OE question in the second elicitation, for example implementing the second elicitation in form of a group meeting rather than over the telephone may be more suitable in avoiding non-responses to the OE question or dropouts. Since the sample was divided into project gainers and losers, the sample size was too small for complex statistical analysis on data obtained from the second elicitation. A way to circumvent this problem would be to focus on WTP only.

³ Table 6.32 in Chapter 6.5.7 shows that 57% of MS respondents did not change their views during the meeting.

7.3 Information requirements

Results from the statistical analysis reported in Chapter 6.5.6 provide some interesting insights into the factors causing different information requirements. According to statistical tests, ‘engaged’ respondents, as well as respondents that were less familiar with the wilderness area were either happy with the amount of information provided or perceived an information underload. Similarly, respondents with weak views on the issue were more likely to be saturated with the information provided, as well as respondents that were interested and understood the exercise. Hence, the perfect respondent for the information set provided would be one who is engaged, not too familiar with the wilderness area, has not too strong attitudes about the issue, and, as mentioned above, is interested in the exercise. While MS respondents are more likely to meet some of these ‘prerequisites’ (e.g. being engaged and finding the exercise interesting), it is obvious that respondents within a sample vary as to their motivation and background knowledge, and clearly a standardised information set does not suit all.

Unfortunately, no data regarding the information load was collected after the second elicitation to find out whether participants who had perceived an information underload in the meeting engaged in further information search during the week-long interval and had the right amount of information when they revised their estimate after a week. Future research should invest in finding out how much time and what sources CV respondents require to receive an optimal information load.

In the CV literature, a vast amount of articles debate the optimal amount of information that should be provided in CV surveys. However, the findings from this research provide evidence that differing information needs are the real issue, and the debate over ‘optimal’ standardised information sets seems less essential. Instead, future research on information provision should shift towards finding ways to adjust information to individual needs, an issue that seems to have high relevance for CV design. Given that information overload may be responsible for less valid estimates, more research is required on how to adjust information in CV. While MS seems to provide a promising design in this respect, further improvements should be considered, for example, by providing relevant web-links

during the week-long interval in MS, an online notice board respondents can consult if they want to base their decision on more detailed information, or a chat room to give participants the chance to discuss the issue further. These suggestions would also be applicable to conventional data collection modes, in particular mail surveys.

7.4 Identification of invalid responses

Given that one of the main challenges of CV is to obtain valid WTP and WTA estimates, the impact of participant behaviour on validity is of concern. The findings from participant observation suggest that the recognition of ‘disengaged’ behaviour may be an important element of CV research, as well as an essential supplement to conventional validity tests. Unfortunately, studies surrounding the impacts of motivation on questionnaire validity are not only non-existent within the valuation context but also very limited in other fields, such as survey research and psychology. The few studies that exist are on the one hand focussed on the persuasion of reluctant respondents to participate in telephone interviews (e.g. Triplett, *et al.*, 1996) and on the other, on the occurrence of item non-responses as a result of reluctance to co-operate in questionnaires (e.g. Krosnick, *et al.*, 2002).

One of the motivations for observing participant behaviour in this study was to respond to claims in the literature that indicators for validity are needed (see Dijkstra and Ongena, 2002 and Whitehead, *et al.*, 1995). While a number of behaviour types that are assumed to prevent people from carefully engaging in value formation were detected, the list presented in Chapter 5.5 may not be complete and the impact of each individual category on preference construction needs to be tested with a large sample before firm conclusions can be drawn regarding the reliability of this approach.

Nevertheless, there is some evidence that general ‘disengagement’ has an impact on validity: The regression results in Table 6.21 (Chapter 6.4.1) show that validity slightly improves when ‘disengaged’ respondents are removed from the analysis, although further research is required to draw firm conclusions regarding the impact of ‘disengaged’ behaviour. Nevertheless, this study suggests that

'disengaged' behaviour may have implications on the conventional identification and elimination of invalid responses: Normally, CV researchers merely remove protest and strategic bids in order to prepare the data set for analysis, and all remaining bids are usually regarded as valid. If one takes account of the fact that a number of psychologists suggest that 'disengaged' participants may not produce valid results (see Krosnick, 2002, Tourangeau, 1984 and Bettman, 1979), this classification might not be sufficient, as some of the remaining bids used in the analysis may be stated by 'disengaged' respondents. Schkade and Payne (1993) suggest that respondents with 'wrong motives' should be dropped from analysis⁴, and therefore a very precautionary approach for classifying observations into valid and invalid would be to identify and remove 'disengaged' respondents prior to CV analysis.

When using in-person interviews, this more sophisticated approach for classifying observations into valid and invalid may be especially relevant. Whether this is efficient is questionable, because the exclusion of bids calls for a larger sample, and hence interviews may become less cost-effective. Also, while the elimination of 'disengaged' responses may result in more accurate results, it does not solve the problem of how to trigger sufficient motivation among respondents to deal with a demanding task. CV research should therefore spend far more effort on data collection, rather than trying to resolve the problem in the post survey analysis phase. Market Stall seems to offer some solutions in this respect, since it hardly generates 'disengaged' behaviour.

7.5 Use of WTA

WTA is regarded to be an unsuitable welfare measure for CV due to the cognitive demands it imposes on respondents, potentials for strategic overbidding and the WTA and WTP disparity. According to this study some of these concerns can be countered with careful CV design.

⁴ By 'wrong motives' they mean respondents who do not make an economic trade-off, and instead give a symbolic response or come up with some random amount. Although this study did not investigate the thinking behind WTP/WTA responses, the suggestion to eliminate responses that seem not to be well-considered seems to be sensible.

7.5.1 Formulating a WTA response

As mentioned in Chapter 3, there are at least two circumstances when WTA might be the preferred measure for contingent valuation studies involving environmental losses. Firstly, people often assume they have the property rights for environmental goods, and asking for compensation required due to an environmental loss is the only correct measure and presents a more realistic hypothetical market (Halstead, *et al.*, 2002). Secondly, using WTP as a surrogate could severely underestimate the value, because losses are valued more than gains (Bromley, 1995). Despite this, the NOAA panel recommended the use of the WTP measure and hence discouraged careful consideration of property rights in CV survey design. A large amount of the literature considers WTA scenarios to be implausible, because respondents do not have experience with compensation claims for environmental goods (e.g. Ward and Duffield, 1992). According to empirical studies that elicit WTA for environmental losses, the concerns regarding problems with the WTA measure seem indeed justified. These include the WTA-WTP divergence and the fact that the cognitive effort required for answering the WTA question may result in a high number of non-responses, protesting or strategic bidding (Gregory, *et al.*, 1993 and Mitchell and Carson, 1989).

Whereas the former concern was not investigated in this research, results obtained from this study seem to attenuate the latter concern. The payment card enabled respondents to state their preferences and no protesting or refusals occurred with regards to the WTA bids. Although some people's compensation claims were higher than the levels provided in the payment card, in most cases WTA was successfully elicited in the follow-up OE question. Interestingly, the OE question seemed to work well with respect to WTA in both sub samples; a finding that is inconsistent with critics claiming that OE formats and WTA are too demanding for respondents. Protest rates (including lexicographic motives) to the WTA question accounted for 3.8% and 12.5% in the first and second elicitation in MS respectively and for 12.9% in the interview control group. No strategic bids were detected in MS as compared to only two in the interview control group. Apart from the protest responses mentioned above, no further non-responses to the WTA question occurred in the MS sample, whereas the overall non-responses to the WTA question in the interview control group total 14.5% (including protest

responses). In comparison to that, the protest rate to the WTP question was 0% in both MS elicitations and 3.2% in the interview control group.

Unfortunately, a comparison with WTA protest or non-response rates in other studies is difficult given that most research that employs WTA focuses on the WTP/WTA disparity, and hence non-response rates are rarely reported. However, the non-response rate to the WTA question found in this study is far below protest rates of 50% or more for WTA questions as stated by Mitchell and Carson (1989). Furthermore, two studies found that 80% of respondents answered 'no' or 'don't know' to a dichotomous WTA question (Halstead, *et al.*, 2002) and report a 50% protest rate using a payment card (Shackley and Dixon, 2000). Reasons provided for these high response refusals rates include lack of substitutes and endowment effects. However, the latter study also utilised 'WTP to avoid' as a proxy for WTA and found that the non-response rate to the WTP question exceeded the non-response rate to the WTA question. Hence, there is a possibility that survey design might be accountable. In Groothuis, *et al.*'s (1998) and MacMillan, *et al.*'s (2001) studies 14% and 25%, respectively, answered 'no' or 'don't know' to a dichotomous choice WTA question. Hence, acceptable response rates can indeed be achieved. Unfortunately, no studies have been found that use the OE format to elicit WTA, so no direct comparison is possible.

There are several possible explanations why the WTA scenario was successful in this study:

- The WTA scenario was not 'implausible' and the hypothetical market was accepted and in accordance with respondents' property right perceptions. An investigation into property rights in focus group research and pilot surveys enabled careful design of a scenario that took into account the general public's views and perceptions.
- The fact that close substitutes for the threatened wilderness area are available, may explain why there was no obvious reluctance to 'sell' the wilderness area under investigation.
- The payment card seemed to be an important preparation stage to the OE question, as it allowed respondents to learn about the transaction. Asking an OE question straight away might have come as a surprise.

- The exercise was designed in a way that encouraged respondents to carefully think about the WTA answer. While in the interviews, some respondents felt under time pressure, overall an acceptable non-response rate was achieved.
- Respondents were provided with detailed information as to the hydro scheme proposals, the wilderness area and the hypothetical market. In addition to that a ‘Question and Answer’ sheet was handed out to participants. According to Kenyon and Edwards-Jones (1998) and MacDonald and McKenney (1996) additional information reduces protest behaviour.
- Market Stall produced an even lower number of WTA protests and non-responses. As mentioned in Section 7.1.4, possible reasons for this are that a high perceived credibility of the study helped to discourage protesting and strategic bidding and the fact that people had the opportunity to learn and gain experience with the WTA transaction (Coursey, *et al.*, 1987).

Despite the overall success of using the WTA measure, some problems occurred regarding unexpected relations between independent variables and WTA in the regression results. The regression results for WTA reported in Table 6.19 (Chapter 6) show that the sign of the beta coefficient for the variable ENV GROUPS is positive for the regression run on Market Stall data, indicating that WTA is higher among people that are not in an environmental group or hill-walking club, while it is negative in some regressions run on the combined data set. As mentioned in Chapter 6.3.4, this can be explained by the fact that the few high WTA bids were stated by participants who were not in an environmental group. Regression is influenced by high bids, and a small number of observations restricts accurate predictions. Further investigation into the relation between independent variables and WTA is necessary with bigger sample sizes, in order to test whether WTA can be reliably predicted by independent variables.

7.5.2 Wild and implausible responses?

According to the NOAA report extreme WTA and WTP responses can ‘enlarge estimated values wildly and implausibly’ (p. 4608), and hence it is common practice to eliminate ‘extreme bids’ or to trim means by 5%. Although some compensation claims required for the loss of wilderness were indeed high, such treatment cannot be justified in this study. Several indicators suggest that all high

WTA responses stated were well considered: Firstly, participant observation revealed that respondents who stated high WTA bids carefully thought about their answers and took time to decide. Secondly, there was no sign of ‘disengaged’ behaviour among people that formulated a high WTA bid; in the contrary respondents were co-operative and concentrated. Thirdly, participants stated reasonable explanations for their compensation claims (see Chapter 6.2.2). Fourthly, although slight problems occurred with one independent variable in one regression (see above), most regression models described in Chapter 6 show that WTA was satisfactorily explained, providing direct evidence that respondents’ answers made sense. Overall, this study shows that good survey design is likely to discourage ‘wild and implausible’ WTA bids.

In this study, techniques to ‘adjust’ WTA results by eliminating high responses would therefore lead to an underestimation of environmental losses, because it is unlikely that all high WTA values are invalid overstatements. Clearly, a thorough investigation of respondent motivation and motives for stating a given bid can help to identify invalid responses, which then should be eliminated from the analysis. Verbal protocols would provide an additional tool to help investigate which responses can be taken seriously and which not.

7.5.3 Importance of asking both gainers and losers

CV has been criticised because mean and aggregated WTP often seem unrealistically high. While this is often attributed to strategic overbidding, another explanation, which has only received limited attention, is the obvious fact that many CV studies tend to ignore project losers, and instead only ask gainers for their WTP for projects that enhance the environment, or focus on project losers for projects that lead to environmental deterioration, even though it is common sense that most environmental projects involve both gainers and losers.

In this study, ignoring hydro scheme losers would have led to a serious overestimation of hydro scheme benefits, instead of results showing that the non-market costs of hydro schemes outweigh their non-market benefits. On the other hand, only asking hydro scheme losers for their WTA in compensation for the wilderness loss would have overestimated the value placed on wilderness. For most projects, benefit estimates would be smaller if project losers were given a chance to state their preferences in terms of WTA (see Chapter 6.3.2.5). Although

the existence of losers is recognised, only a limited amount of studies take account of this fact by eliciting WTA in compensation (see Amigues, *et al.*, 2002, MacMillan, *et al.*, 2001 and Shackely and Dixon, 2000). Whereas a few studies ask project losers a 'WTP to avoid' question (see Clinch, 2001 and Kriström, 1995) and hence undervalue the loss, most CV researchers merely elicit values from project gainers. For example, Pope and Jones (1990) did not ask opponents of wilderness preservation for their preferences, although these were clearly identified. Avoiding the WTA question is likely to lead to high numbers of zero WTP, and despite the fact that zero responses lower mean WTP, potential compensation claims are overlooked in the decision. This study shows that the incorporation of both gainers and losers in a CV survey can be straightforward and successful and has important implications for decision-making over projects.

7.6 Evaluation of the potential of the Market Stall method in CV

The findings from this research suggest that Market Stall has some advantages over in-person interviews. A number of the Market Stall features, such as time to process information, discussion and a relaxed context, seem to raise motivation among participants, help respondents to answer the complicated OE question and generate more valid WTA estimates. This section aims to investigate whether MS can replace conventional surveys and to what extent.

Market Stall provides a decision-making environment that allows for preference construction and gives people the opportunity to decide over an environmental change in a way that is similar to real market decisions. Despite these advantages, there are a number of issues that show that MS cannot act as a full substitute for conventional survey methods.

7.6.1 Sample size and representativeness

The prime drawbacks of the Market Stall approach are the time and costs associated with its implementation. The requirement for an extensive information folder in the MS meetings involves a long preparation stage, in which information is gathered and the information folder is designed. Similar to focus groups, MS participants need to be reimbursed for participating in order to cover travel costs and create an incentive to attend the meeting and participate in the second

elicitation. Hence, relative to conventional surveys, only small sample sizes are affordable and as a consequence, complete representativeness cannot be assured.

Although probability sampling, which requires large sample sizes, is thought to be the only way to achieve representativeness, Harrison and Lesley (1996) provide evidence that sophisticated quota sampling greatly improves the representativeness of samples. Using quotas on relevant socio-economic characteristics of the population for small-scale sampling is assumed to reflect the population and would mitigate the problems of small sample sizes as required for MS.

Nevertheless, the relatively small sample size is prone to criticism as it may be insufficient to obtain precise estimates of mean WTP/WTA for the aggregation to the population level. However, aggregation of mean estimates over large populations is not always the objective of CV, and where estimates are needed from small and homogeneous populations, such as special interest groups, mean and aggregate values obtained from MS provide useful and accurate information. This means, that MS is not useful for cost-benefit analyses for which estimates from a large population are required. If the aim of the study is to take account of both gainers and losers, the size of MS samples also offers reduced flexibility as to statistical tests.

7.6.2 Mean estimates

In Chapter 6.3.2.5 the mean non-market costs of hydro scheme developments were estimated for comparison purposes between MS and the interview control group. The difference between the estimates was substantial, but not statistically significant. While higher WTA and WTP bids in MS can be explained by additional information and time (Section 7.1.1 and 7.1.2), lower WTA in the interview control group might be caused by more conservative or socially desirable interview respondents, who stated lower WTA bids, as well as unobserved strategic overbidding in the MS sample. It is therefore difficult to say whether MS produces superior estimates, and further research into strategic bidding is required.

7.6.3 Recruitment

The nature of recruitment for Market Stall runs the risk that participants are favourably disposed to environmental issues. When potential respondents are first contacted, it is unavoidable to tell them what the project is about, so they can decide whether they would like to attend the MS meeting or not. This is also likely to be the case in conventional survey methods, especially mail or web-based surveys, in which people may only participate if they are interested in the topic. However, there is more risk of self-selection in MS, given the time and effort people need to spend on getting to and attending the meeting.

If the recruitment aims at both gainers and losers, such as in this study, the recruitment process becomes more neutral in that gainers and losers are equally interested, and hence eliminates the risk of merely recruiting people who are interested in environmental issues. The only people missing from an MS sample are likely to be those who are less interested or do not care about the future management of the wilderness area either way. Clearly, this would not be different in recruitment for conventional surveys, and MS does not seem to have any serious drawbacks in terms of recruiting a wider range of respondents if compared to other survey methods, but there is a possibility that people who are less interested are more likely to participate in a conventional survey due to the more coercive situation.

In this study, statistical comparisons suggest that both sub samples were more or less equal as to respondents' interest in the environment. There was no statistical difference between the proportion of respondents with membership in environmental groups, average number of outdoor activities and strength of views towards the issue.

7.6.4 Group norms and polarisation

One of the main concerns regarding the implementation of MS is the influence of dominant participants on other group members. Research in psychology suggests that participants in groups are easily influenced by other people's views and attitudes (Ajzen and Fishbein, 1980). Furthermore, participants tend to regard other people's assumptions and beliefs as facts and sometimes believe statements, especially when these are repeated several times; for example views expressed by an extremely dominant group member (Loftus, *et al.*, 1978 and Hasher, *et al.*,

1977 and Turner, 1991). Group polarisation may occur when dominant group members influence participants who initially have weaker preferences or when individuals state more extreme values to ensure their views are taken into account. Hence, the mean response of participants may become more extreme after the group discussion than prior to interaction (Turner, 1991).

Clearly, this might be problematic for the elicitation of individual preferences and lead to biased attitudes and hence biased WTP or WTA towards an environmental issue. While an experienced moderator can eliminate such effects to a large extent by discrediting incorrect arguments stated by dominant participants, some of the influences caused by group interaction cannot be controlled. It was anticipated that group dynamics would vary among groups, and hence, if group norms develop, these would result in different mean estimates among individual groups. According to the ANOVA results reported in Chapter 6.3.2.4, there is no statistical difference between open-ended WTA and WTP means between groups in this study. Although the test was run on a very small number of observations in each group, the findings suggest that group polarisation did not develop, but further testing on bigger samples is essential.

Nevertheless, group influences are a serious concern and further research is essential to assess the suitability of MS for the elicitation of individual preferences. Verbal protocols during the elicitation stage at the end of the MS discussion could be employed on an individual basis in order to investigate how well, and on what basis, participants justify their views and WTP/WTA bids towards an environmental change.

7.6.5 Strategic behaviour

It can be argued that MS participants have more time to think and hence are prone to acting strategically. In this study, MS participants appeared to take the exercise seriously, seemed to be aware of the importance of stating correct bids for decision-making, and gave valid explanations for deciding on a certain amount, including those who stated high WTA bids. Hence there is no evidence for strategic overbidding in WTA. This is consistent with MacMillan, *et al.* (2002) and Whittington, *et al.* (1992) who found little evidence of strategic behaviour,

even if people were given up to a week to think about their answer. Nevertheless, the possibility of strategic thinking is an issue in MS, and detailed follow-up questions to the WTP/WTA question should be asked to further investigate strategic behaviour in group-based approaches.

7.6.6 Unsure and non-responses

Apart from obtaining valid answers, two important tasks of CV are to reduce respondents' uncertainty regarding the environmental change and achieve a high response rate to the WTP/WTA question. The results presented in Chapter 6.5.3 show that MS was not superior to interviews as to the number of unsure respondents⁵, but it was found that the week-long interval in MS helped some unsure respondents to decide on an WTA or WTP bid. The use of the OE elicitation format is often criticised for producing an 'unacceptably large number of non-responses or protest zero responses to the WTP question' (p. 97), let alone WTA questions, due to the high mental effort required to answer such questions (Mitchell and Carson, 1989). Indeed, response refusals are a common problem in CV, and WTA is hardly ever used for this reason (Gregory, *et al.*, 1993 and Harris, *et al.*, 1989). Despite these concerns MS generated relatively fewer non-responses to the OE question. Hence, for the valuation of complex goods, unsure and non-responses may be more likely to be reduced in MS.

7.6.7 Type of good

Despite the potentials for group norms, the exposure of participants to a wide range of perspectives, opinions, arguments, ideas and understandings including those of dominant participants is also viewed to have an educational effect and is advantageous since the generation of more information leads to better understanding (Aldred, 2002, Wilson and Howarth, 2002 and Kenney, *et al.*, 1990). Hence, for a complex environmental good, such as the hydro scheme impacts on wilderness, an individual in a group is likely to be better off than in isolation, and well-informed responses are more likely to be produced. Given the importance of preference construction for complex or unfamiliar goods, MS is likely to be more suited for the valuation task than conventional survey methods.

⁵ That is, respondents were unsure whether they were in favour or against the hydro scheme developments.

However, as mentioned above, so far it has not been empirically tested, which aspects CV participants find most important in reaching a decision, e.g. time to think, revision of WTP or WTA or discussion. Further research is required to assess the impact of discussion on decision-making. If it turns out that it plays a minor role, web-based and mail surveys, designed in a way that respondents are given time to think and the opportunity to revise their bid may be a good substitute for MS.

For decisions regarding familiar environmental changes, for which CV respondents are likely to have existing preferences, the preference construction friendly environment in MS may not be necessary, and any other survey method may be successful. In order to aid the decision of an appropriate survey method, it should therefore be clearly established in focus groups how familiar people are with the environmental change under investigation. In order to investigate whether MS is required for familiar goods, comparative studies between conventional survey methods and MS should be carried out and the validity of results should be tested.

7.7 Limitations of this study and suggestions for improvement with hindsight

This section discusses the main limitations of this study, and describes what would have been done differently given more resources and time, and in the hindsight of the experience gained during this study.

As mentioned above, the design of the study aimed at investigating whether discussion plays a role in the valuation task but keeping factors, such as amount of information, time to think and revision after a week-long interval, as well as the relaxed social context constant proved difficult. In order to encourage interview respondents to carefully read all information and participate in the second elicitation, sufficient rewards should have been given to respondents in order to assure that they engage as much as MS participants.

In order to get a better insight into the aspects that help CV participants decide on a WTP or WTA bid, more detailed debriefing questions regarding respondents

views towards the exercise in terms of time to think, relaxed social context, discussion, revision of WTA/WTP, information load at the end of the second elicitation would have been useful. In order to do this, a second meeting instead of a telephone interview could have been organised in order to discuss these needs in the hindsight of participants' experience. Furthermore, a second meeting would have given participants the opportunity to discuss thoughts or information they gathered during the week-long interval.

The relatively small proportion of WTP bids did not allow for regressions on MS and interview data individually, and the comparison between the two data collection modes was therefore based on WTA. Given the unexpected number of 'disengaged' respondents in the interview control group, the elimination of these respondents resulted in a severely reduced number of observations and regressions to test the impact of 'disengaged' behaviour had to be run on a combined data set (both MS and control group). While it was possible to test all hypotheses, additional resources would have allowed a bigger sample size in order to increase flexibility in the statistical analysis. Unfortunately, only three interview respondents agreed to participate in a second elicitation, and therefore comparisons with results from the second elicitation in MS were impossible. In order to encourage interview respondents to participate in the second elicitation they could have been reimbursed. This would have provided valuable information regarding the usefulness of a two-stage in-person interview.

Even though quota sampling represents the most sophisticated sampling method of non-probability sampling methods, the quotas used in this study were merely based on gender, age and membership in environmental groups and overlooked some socio-economic categories such as education and income, for which information was assumed to be difficult to obtain during the recruitment phase. Hence, there is a risk that the sample is not entirely representative of the Icelandic population⁶. Improving quota sampling in the interview survey would have been difficult given the low response rate, but with more resources several interviewers would have been employed to help fill each quota.

⁶ Comparisons between the sample and the Icelandic population show that the sample is representative in terms of age and gender.

As mentioned above, this study applied participant observation during the MS meetings and interviews to get some idea on participants' motivation and ability to tackle the valuation task. The observation of respondent behaviour has rarely been employed in CV and methods available are either lacking objectivity or are unsuitable for in-person interviews. While behaviour coding is an established psychological method often used by survey methodologists to test the understanding of questions prior to survey implementation, the approach is often criticised to be subjective, due to judgements made by one individual (Bakeman, 2000). However, the implementation of participant observation in this study by the same person has also some advantages in that each individual is clearly remembered and consistent coding across all participants is assured. Clearly, the only way to circumvent the risk of subjective appraisal would be to employ several independent observers to assess participant behaviour during the interview and MS. This would allow testing for differences among observers, but might have adverse impacts on respondents and decrease their ease of participating, especially in in-person interviews.

A further potential disadvantage of participant observation might be that 'disengaged' respondents are wrongly assessed. For example, a respondent might be classified as bored, whereas in fact he or she may naturally appear uninterested, but is motivated to give well-considered responses. Equally, a participant with low motivation may have high ability to answer the WTP/WTA question or a respondent's low ability may not necessarily instigate an invalid response if he or she has a high level of motivation. The classification used in this study is based on assumptions, and an area for future research would involve further testing of this type of participant observation, and the development of indicators for motivation. Also, due to the limited number of hydro scheme gainers and WTP observations, the impact of 'disengaged' behaviour was only tested on WTA, despite that fact that a number of WTP bidders were classified as 'disengaged'. In order to further test the impact on validity the study should have focussed on either gainers or losers or, if more resources had been available, on a bigger sample size. Furthermore, an experiment comparing hypothetical with actual payments would have provided further evidence for the reliability of the

participant observation approach. Clearly, this was not within the scope of this study, but would represent an interesting task for future research.

Due to the novel application of participant observation in CV, this research merely provides an idea of factors that might reduce the validity of estimates. To increase the validity of participant observation, debriefing questions should be asked in addition to observation, about perceived time pressure, level of boredom, level of confusion, information load, etc., in order to back the subjective appraisal. While some debrief questions were used in this study, there is a possibility that questions regarding the level of understanding and interest were influenced by socially desirable behaviour. For example, very few people admitted that they found the exercise 'boring and a waste of time', despite the fact that a number of interview respondents seemed very reluctant to participate. Even less embarrassing questions regarding perceived time pressure, do not seem to provide reliable answers in interviews (Fischer, 2003). However, the assessment of motivation using debriefing questions on sensitive issues may be suitable for mail or MS surveys, in which respondents state their answers anonymously. For in-person interviews, participant observation remains the only alternative for motivation assessment, but an independent interviewer might possibly increase the validity of this approach.

Even though the payment card range was enlarged according to results from the pilot survey, a number of respondents in the main survey still had higher WTA and WTP than the bids provided in the payment card. Results from the payment cards were therefore not considered to give accurate benefit and cost estimates. Given that interviews were employed in the control group, it was not regarded feasible to add further payment levels, as this would have prolonged the exercise. However, in the hindsight of experience gained from problems with the payment card, a possible solution to this problem would have been to increase the gaps between the compensation and payment levels in order to capture a wider range of WTP and WTA and, since the payment card was followed up by an open-ended question, range bias would have been avoided. Even though the payment card was not useful for the analysis, it turned out to be well received by participants and provided a straightforward tool for the elicitation of preferences, as well as a valuable 'warming-up' exercise for the open-ended question.

The study collected values for the non-market costs and benefits for three proposed hydro schemes in the Icelandic wilderness area, and hence estimates are most useful for the decision over all three hydro scheme developments rather than if decisions were made for each hydro scheme individually. While more effort could have been spent on eliciting values for each hydro scheme, this seemed impracticable given the time and resources available for this study: the differing environmental impacts of each development would have required a very extensive and complex information folder, and respondents would have been overtaxed. Instead, the study simply provides estimates as to the economic benefits of the entire wilderness area in East Iceland, which could be used to justify its preservation, or on the other hand, if the benefits provided by the developments had outweighed their costs, that any development would make sense.

Another way of dealing with this problem would have been to investigate changes to WTA in compensation for wilderness loss if one hydro scheme received an operation license in comparison to assuming that all three schemes go ahead. It is likely that values for wilderness change if one hydro scheme is created, e.g. WTA might be smaller, because damage is less.

7.8 Summary

This chapter discussed the factors that might explain why MS results were better in terms of validity and OE response rate and differed in terms of means in comparison to results from the interview control group. These include: the opportunity to absorb more information from the folder and in discussions, more time to think, the relaxed environment, motivation and better adjustment of information. Furthermore, the usefulness of the week-long interval and the opportunity to revise WTP/WTA is discussed. The study also discovered that respondents have different information requirements, and the need for recognition of this finding is explained. As a result of high numbers of ‘disengaged’ respondents in the interviews, a more sophisticated classification into valid and invalid responses is proposed. The chapter also discusses the advantages of using WTA. Finally, the Market Stall method is evaluated, bearing in mind its disadvantages, and limitations of the study are described.

A comparison of the socio-economic characteristics of the sample with the Icelandic population shows that it is representative in terms of gender and age, although age group ‘25-34 years’ is slightly over-represented and age group ‘65-74 years’ is underrepresented in the sample (Web source: Statistics Iceland). The distribution of income could not be compared as net income data based on households is not available, but there is evidence for equality between per capita income in Iceland and the sampling frame (see Chapter 5.6.2). Tables 6.1 to 6.3 compare the socio-economic characteristics of participants between the two sub samples and between the overall sample and the population.

Table 6.1: Gender distribution

	Market Stall n=53		Interviews n=62		Overall sample n=115	Population
	N	%	N	%	%	%
Male	28	52.83	31	50.0	51.3	50.3
Female	25	47.17	31	50.0	48.7	49.7

Table 6.2: Age distribution

	Market Stall n=53		Interviews n=62		Overall sample n=115	Population
	N	%	N	%	%	%
< 25 yrs	5	9.43	7	11.29	10.4	11.8
25-34	12	22.64	22	35.48	29.6	21.9
35-44	13	24.53	11	17.74	20.9	22.7
45-54	12	22.64	11	17.74	20.0	20.2
55-64	10	18.87	9	14.52	16.5	13.6
65-74	1	1.89	2	3.23	2.6	9.7

Table 6.3: Income distribution

	Market Stall n=52		Interviews n= 59		Overall sample n=111
	N	%	N	%	%
< ISK 100,000	0	0	3	5.08	2.7
101,000-150,000	5	9.62	4	6.78	8.1
151,000-200,000	6	11.54	5	8.47	9.9
201,000-250,000	5	9.62	6	10.17	9.9
251,000-300,000	5	9.62	4	6.78	8.1
301,000-350,000	5	9.62	6	10.17	9.9
351,000-400,000	4	7.69	10	16.95	12.6
401,000-450,000	7	13.46	4	6.78	9.9
451,000-500,000	4	7.69	6	6.78	9.0
> 501,000	11	21.15	11	18.64	19.8

As the analysis of results will be to a large extent based on comparing the MS sample with the interview control group, a comparison of the socio-economic characteristics between the two sub-samples is essential. According to a chi-square test (Panel 6.1) there is no statistical difference between the proportion of gender, age, income, membership in environmental groups and outdoor activities in the MS and interview samples, although there seem to be people in higher income groups in the MS sample¹. As shown in Table 6.4 the number of hydro scheme losers is higher in the control group. However, these proportions are not different from a statistical point of view.

Table 6.4: Number of hydro scheme gainers and losers in the MS and interview samples

	MS		Interview	
	N	%	N	%
Hydro scheme gainers	18	34.0	15	25.0
Hydro scheme losers	25	47.1	35	58.3
Unsure	10	18.9	10	16.7

¹ For the chi-square test on income, it was decided to merge two income brackets, in order to increase the number of observations in each group.

Panel 6.1: The Chi-square Test

The Chi-square test is a statistical test to examine the independence of two features or the homogeneity of one feature in two samples. The statistical hypotheses are:

H₀: X and Y are independent, and

H₀: the proportion of variable X is the same in both samples (Backhaus, *et al.*, 2000).

The chi-square statistic is frequently used by CV researchers. For example, Loomis and King (1994) tested the independence of overall response rate to a mail and a telephone-mail survey, and Carson, *et al.* (1995) tested whether the distribution of respondents' choices 'for' and 'against' an environmental programme changed between two independent surveys conducted two years apart.

6.2 Validity of responses

Mitchell and Carson (1989) state that prior to analysing CV data, it is important to consider potential for divergence between observed responses generated in the CV exercise and true value. WTP and WTA are valid when respondents state the amount they would be genuinely willing to pay or willing to accept in compensation if the environmental change actually occurred. Although assessing the validity of WTP responses is complicated by the fact that true WTP is unobservable and hence unknown, some biases such as strategic or protest bidding can be identified. The participants' explanations for stating a certain amount provide some assurance over whether their bids are valid (DTLR, 2002). This section aims to identify protest, genuine zero and strategic responses, and reports the reasons participants stated to explain their WTP or WTA bids.

6.2.1 Zero and non-responses

CV samples are normally characterised by a number of participants that respond with a zero value instead of providing their genuine WTA or WTP bid. Since it is only desirable to include zero bids in the analysis if they reflect genuine zero

valuations, participants' reasons for stating zero in response to the open-ended (OE) question were examined.

No zero responses were stated by MS participants who answered the WTA question. The WTP question directed to hydro scheme gainers did not seem to create any objections to the hypothetical market in the MS. Both zero bids stated were genuine reflections of WTP, because the respondents felt that they would not benefit from the hydro schemes. Due to their indifference toward hydro schemes, it is assumed that their WTP is zero. The interview control group generated three zero responses to the WTP question, of which two respondents were identified as protesters because they thought they should not have to pay or disagreed with the payment vehicle.

Apart from stating zero, a number of respondents refused to answer the open-ended payment or compensation question, because they were unsure about their views, felt unable to decide on a bid or had protest or lexicographic motives (see Section 6.5.4). The protest rate for the WTA OE format in the MS sample was estimated to be 3.8% in the first elicitation and 12.5% in the second elicitation as compared to 12.9% in the interview control group. Whereas the protest rate for WTP is zero in both MS elicitations, it accounts for 3.2% in the interview sample (Table 6.5). Overall, protest rates are low in both MS and interviews.

Table 6.5: Protest/lexicographic responses to the open-ended WTA and WTP in MS and interviews.

	MS (1 st elicitation) N= 53		MS (2 nd elicitation) N= 48		Interview N= 62	
	WTA	WTP	WTA	WTP	WTA	WTP
N	2	0	6	0	8	2
%	3.8	0	12.5	0	12.9	3.2

6.2.2 Explaining WTA and WTP

One of the main aims of examining the explanations respondents give for their WTA or WTP responses is to detect whether they act strategically when they answer the payment/compensation question. Respondents that free-ride or overstate their WTP or WTA bid fail to report their 'true' preferences and should therefore be excluded from the analysis. Overall, explanations given by MS

participants for their WTP or WTA bid do not provide evidence for strategic behaviour. Although the OE WTA question generated four relatively high values, the respondents' explanations indicated that their decisions were well-considered. In the interview control group, the majority of responses obtained can be considered as genuine reflections of preferences. In total, only two responses are to some extent based on strategic behaviour. Whereas one respondent cheerfully admitted that he just came up with a random compensation claim in order to save money, another respondent based his WTA amount on what would be a fair amount for each household. In order to prevent contamination of the analysis, it was decided to exclude these bids. The main explanations for WTA and WTP bids are listed in Panel 6.2.

Panel 6.2: Reasons stated by participants to explain their WTA or WTP bids

Explanations for WTA bids:

- 'I want to visit the area in the future'
- 'I am interested in geology and don't want those unique features to disappear'
- 'Land and vegetation will be destroyed'
- 'I am not in favour of the hydro schemes, because such a big area will disappear'
- 'The water level in the reservoirs will fluctuate and cause erosion and desertification.'
- 'I have nothing against hydro schemes in general, but not in this area'
- 'I pay 120,000 krona for electricity and heating every year. I would not be compensated if I saved that amount- I would need 5 times that amount. For 500,000 krona I would accept the hydro schemes.'
- 'I feel sorry for all the animals and plants'
- 'Its just good to know the wilderness is there. It cannot be regained'
- 'There are so few remaining wilderness areas, hence we should make sure we keep it for future generations'
- 'The decrease of household expenses has to be considerable so that the loss is acceptable' (stated 1 million krona).
- 'The damage can hardly be compensated for with less than a million' (stated 1 million krona)

- 'I would need a lottery amount to be tempted to accept the hydro schemes' (stated 5 million krona)
- 'Hydropower developments are not a wise future management option. We are responsible for our children and nature. Wilderness is the most important resource we have and it will be more valuable in the future than hydropower' (stated 10 million krona).

Explanations for WTP bids:

- 'Hydro schemes are good for the country, enhance rural development, stop migration and increase income'.
 - 'Hydro schemes make everyone better off'.
 - 'The development would improve living standards and generate more prosperity'.
 - 'Geese and reindeer will find themselves another place to stay'.
 - 'There will be demand for electricity in the future'.
 - 'I can't afford more than this'.
 - 'I don't think that hydro schemes are that important to me personally'.
 - 'This amount is appropriate for a one-person household'.
-

The reasons stated for WTP centred around the marketed benefits the hydro scheme developments would generate, despite the fact that participants were encouraged to focus on non-market benefits. These included regional development, job creation, increase of wages, and to counter out-migration (see Panel 6.2). Even though the hypothetical market was set up in a way in that the overall project would be neutral a number of respondents seemed to ignore the information. A possible explanation for this behaviour might be that participants had difficulties to abandon pre-conceived views and were therefore unable to focus on non-market values. Also the non-market benefits of the hydro schemes are few as compared to their marketed benefits. For the purpose of this study, it was decided to include these values in the estimation of mean WTP².

²If the estimates were to be used in a CBA, this might lead to double-counting and a biased representation of the overall hydro scheme benefits. For instance, the benefits of employment may already be calculated and included in CBA.

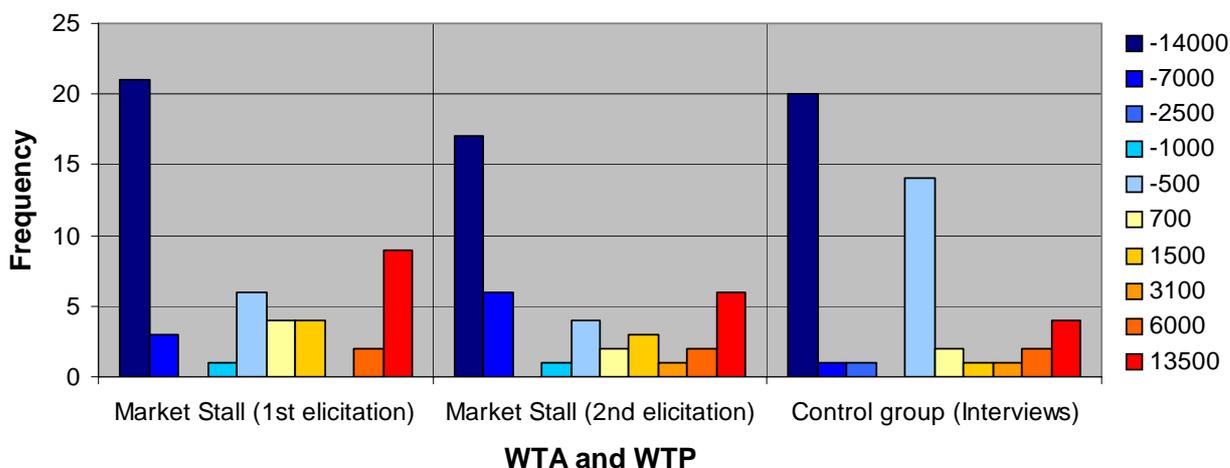
6.3 Quantitative analysis

In the previous section, invalid bids were identified and removed from the data set. The following quantitative analysis investigates the distribution of WTA and WTP bids, reports the descriptive statistics for PC and OE data and tests the validity of WTA and WTP responses statistically.

6.3.1 Frequency distribution

The frequency of WTA and WTP levels in Figure 6.1 indicates that a large proportion of participants are WTA the highest compensation level provided in the PC (-14000 krona) or WTP the highest payment level (13500 krona). This polarisation is especially obvious in the MS sample. The high level of compensation claims on the one hand, and high levels of payments on the other indicate that the costs and benefits of the proposed hydro scheme developments are high and represent an important component of the TEV of wilderness and hydro schemes in Iceland. In the second elicitation, the number of people accepting the highest payment level fell, possibly as a result of reconsidering their budget constraint. Interestingly, a large proportion of the control group agrees to the smallest WTA amount (-500 krona) on the PC. A possible explanation for this might be that respondents were more conservative during the interview or were not aware of the extent of the wilderness loss during the interview. The same may hold for WTP. The distribution also suggests that the payment range was too narrow despite an increase of the range after the pilot survey (although the follow-up OE question allowed more exact values to be expressed).

Figure 6.1: Frequency distribution of PC levels in Market Stalls and control group



6.3.2 Descriptive statistics

A number of statistical descriptors can be used to evaluate the non-market costs and benefits of the hydropower developments in the wilderness area.

- Mean is the most commonly used estimate because it is a cardinal measure of the welfare loss the Icelandic population may forfeit from the reduction of wilderness (WTA) or the welfare benefits it may derive from the development of hydro schemes (WTP). Hence, the estimation of mean is relevant in the context of cost-benefit analysis. If mean WTA compensation outweighs the benefits, the hydro scheme projects should not go ahead from an individual welfare point of view, whereas if mean WTP for all the benefits of the hydro schemes are higher than the costs, they would be worthwhile.
- Median is the amount that divides the sample exactly into two halves. Unlike the mean, the median is not affected by very large positive or negative bids. In comparison to mean, median estimates are of interest in the context of public choice, because it indicates the amount with which consent could just be achieved.
- The standard deviation was estimated in order to demonstrate the variation among the WTA and WTP values in the population.
- The standard error of mean is a statistical index of the probability that a given sample mean is representative of the mean of the population from which the sample was drawn.

- The confidence interval is a specified range of values within which the true population mean lies. As the estimated means and medians only refer to the sample, it is important to give some indication of how accurately they would reflect the population. Table 6.6 shows a 95% confidence interval for the estimates.

Regarding the statistics for the PC it was decided to use the highest WTA or WTP level accepted by each individual. Participants who had WTA greater than the highest WTA level offered on the PC were allocated the highest WTA level (14000 krona), unless they were protesters. This gives a conservative estimate of compensation required.

Table 6.6: Descriptive statistics for WTA and WTP estimates obtained in PC and OE formats (in krona)

WTA	Market Stall 1st elicitation		Market Stall 2nd elicitation		Interview control group	
	PC	OE	PC	OE	PC	OE
N	31	23	28	21	36	26
Mean	10,290	780,107	10,107	863,929	8,236	86,328
Median	14,000	50,000	6,000	50,000	14,000	25,500
Std. deviation	5,724	2,267,717	6,044	2,361,612	6,626	20,9416
Std. error		472851.75		515346.01		41069.80
Minimum bid	500	465	700	500	500	200
Maximum bid	14,000	10,000,000	13,500	10,000,000	14000	1,000,000
95% Conf. interval	8190.78 12389.86	-200527.33 1760741.7	8039.52 12174.76	-211064.36 1938921.5	5994.12 10478.11	1743.08 170912.77
WTP						
N	19	18	14	14	10	13
Mean	7,489	21,326	7,286	19,498	7,200	6,377
Median	6,000	12,500	6,000	10,000	6,000	4,000
Std. deviation	6,044	26,139	5,816	27,003	5,729	7,217
Std. error		6160.97		7216.99		2001.57
Minimum bid	700	0	700	0	700	0
Maximum bid	13,500	100,000	13,500	100,000	13,500	22,000
95% Conf. Interval	4576.54 10402.41	8327.93 34324.96	3927.80 10643.62	3906.93 35089.64	3101.39 11298.61	2015.88 10737.96

6.3.2.1 Comparing the OE and PC format

As the distribution of payment and compensation levels in Figure 6.1 suggest, the OE mean is considerably higher than PC mean, especially for WTA estimates. In

order to assess whether there is a significant difference from a statistical point of view, a t-test was employed (Panel 6.3).

Panel 6.3: The t-test

The t-test is used to compare divergences between means of two samples or two sets of different scores for significance. The underlying requirements for t-tests include sufficient sample size, absence of outliers, normal distribution and nearly equal size of samples (Kinnear and Gray, 2000 and InStat, 2000). Two versions of the t-test are relevant to this study. First, the paired samples t-test for comparison of means within one sample (e.g. differences between first and second elicitation or between PC and OE question). Second, the independent samples t-test for comparisons of means between two different samples (e.g. Market Stall experiment and the control group). Both test the following null hypothesis

$$H_0: \mu_1 = \mu_2.$$

The Levene-test for Equality of Variances is a test for the homogeneity of variance assumption of a valid t-test. If the p-value (Sig.) is > 0.05 the test is not significant, and it can be assumed that the variances are homogenous and the Equal Variances line of values for the t-test can be used. If the p-value is < 0.05 the test for homogeneity of variance is significant and the t-test should be based on separate variances estimates (equal variances not assumed) (Kinnear and Gray, 2000).

According to a paired sample t-test there is a statistically significant difference at a 1% level between WTA obtained in PC and OE in MS and the interview control group sample³. The statistically larger OE bids are not surprising, given that the PC range did not capture all participants' WTP or WTA. Despite a smaller difference between OE and PC WTP means, estimates obtained in MS differ significantly (sig. (2-tailed): 0.014). As the means in Table 6.6 suggest, there is only a slight divergence between PC and OE WTP in the control group, with the PC generating a higher mean WTP than the OE question. However, the limited number of WTP observations (n=10) in this sample is insufficient for a t-test, and hence the difference cannot be tested statistically.

³ Prior to using the t-test on the WTA data, it was decided to transform the estimates into a logarithm in order to get closer to normal distribution.

6.3.2.2 Comparing first and second elicitation (Market Stall)

The estimates in Table 6.6 show that there is almost no difference between the means obtained from the PC in the first and second elicitation, whereas the OE WTA mean increased by approximately 10%. Although a paired sample t-test suggests no significant difference, there is strong evidence that a proportion of participants used the week-long interval to revise their WTA bids. In total, 30.4% of WTA bidders revised their estimate of which 17.4% changed their bid upwards and 13.0% downwards. The slight decrease in mean WTP is partly explained by the failure to return the second elicitation sheet by some WTP participants. According to a Pearson Correlation (Panel 6.4), there is significant correlation at the 1% level between the payment cards and open-ended estimates between the first and second elicitation (see Table 6.7).

Table 6.7: Output for the correlation between first and second elicitation

	Pearson Correlation (2-tailed)
Payment card WTA	0.870
Payment card WTP	0.994
Open-ended WTA	0.891
Open-ended WTP	0.999

Panel 6.4: Pearson Correlation

Pearson correlation measures whether there is a linear relationship between two variables. If there is perfect correlation the Pearson correlation takes a value of ± 1 , and in the case of absent correlation the Pearson correlation is about zero.

6.3.2.3 Comparing MS and interviews

The comparison between PC means generated in MS and those generated in the interview control group reveals that WTA and WTP means are smaller in the interviews, although not significantly smaller from a statistical point of view. However, OE means for WTA and WTP are substantially higher in MS with WTP means being significantly different according to a t-test (Sig. 2-tailed: 0.032).

6.3.2.4 Comparing MS group means

Table 6.8 reports mean values for payment card and open-ended estimates for each MS group.

Table 6.8: Mean estimates for MS groups, first and second elicitation

1 st elicitation				
	PC WTA	PC WTP	OE WTA	OE WTP
Group 1	10625	8425	1732066	38019
Group 2	8600	700	44333	466
Group 3	8417	10300	1280250	28333
Group 4	12600	3000	121333	10000
Group 5	9500	5500	14167	11467
Group 6	12250	10300	52500	25250
2 nd elicitation				
	PC WTA	PC WTP	OE WTA	OE WTP
Group 1	11437	8425	1525438	38019
Group 2	7333	/	140000	0
Group 3	12250	8300	1676000	2878668
Group 4	10500	3750	106667	10000
Group 5	7250	5500	14000	11633
Group 6	10500	9233	52333	18667

The table shows that means fluctuate among groups, and differences are greatest between open-ended means. According to ANOVA results these differences are not significant from a statistical point of view (Sig.>0.05) (Panel 6.5). However, the number of observations in each group is very small for statistical analysis, and results therefore need to be treated with caution.

Panel 6.5: Analysis of covariance (ANOVA)

Like the t-test, ANOVA is concerned with testing for differences between means, using the following hypothesis:

H0: all population means are equal ($\mu_1 = \mu_2 \dots = \mu_n$)

While the t-test only compares between two means, ANOVA allows for comparisons between three or more means. The F-statistic for ANOVA is calculated by dividing the variance between each group by the variance within each group. If the F-statistic is high, there are likely to be large differences between group means and the null hypothesis is going to be rejected (Backhaus, *et al.*, 2000 and Kinnear and Gray, 2000).

6.3.2.5 Comparing WTA and WTP

The open-ended mean estimates reported in Table 6.6 show clearly that hydro scheme costs, as measured by WTA outweigh hydro scheme benefits as measured by WTP. If hydro scheme benefits are subtracted, the overall loss of wilderness would account for 758,781 krona on average according to MS estimates and for 79,951 krona according to interview estimates. Although the two survey methods seem to produce different estimates, the discrepancy is not statistically significant. Possible explanations for this are discussed in Chapter 7.

6.3.3 Validity of WTA/WTP

One objective of the analysis is to assess the validity of WTP and WTA responses quantitatively in order to establish that WTA and WTP bids are not purely random. Garrod and Willis (1999) point at several ways to determine the validity of CV results: Content validity involves experts to assess whether the CV survey asked the right questions and in an appropriate manner. Given the subjective and intuitive appraisal, content validity is an uncommon test among CV practitioners. Criterion validity is probably the most reliable way of testing validity, as it compares WTP with real or simulated markets. Unfortunately, for most public goods, such as wilderness, market prices do not exist, and when WTA is used criterion validity cannot be measured at all. Some CV researchers therefore ask for actual payments (e.g. MacMillan, 1999). The most common ways of measuring the validity of CV are construct validity tests: Convergent validity involves the comparison of WTP or WTA with the same measurement obtained from a different approach, such as the travel cost method, and correspondence between the values would be an indication for validity. However, if results differ, it is impossible to say which of the two approaches is flawed. Since convergent validity can only be tested when the WTA and WTP bids are available from two

different methods (Lockwood, 1998 and Carson, *et al.*, 2001) this validity test can be ruled out given that no comparable study on the non-market costs and benefits of the three hydro scheme proposals exist. Also, no other methods would capture the non-use values of wilderness that are likely to be a large component of mean WTA. Testing the theoretical validity seems to be the most feasible way for validity assessment in this study. The test investigates how well WTP and WTA estimates are explained by theoretical expectations, and regresses value estimates against independent variables that are expected to be determinants of WTP and WTA.

A multiple linear regression analysis (Panel 6.6) was therefore run in SPSS to test the construct validity of estimates and understand the factors that determine the population's WTA and WTP.

Panel 6.6: Multiple linear regression analysis

The essence of regression is to predict a dependent variable (in this case WTA and WTP) from scores on independent variables using the following equation:

$$WTA/WTP = \beta_1(x_1) + \beta_2(x_2) + \dots + a$$

β = regression coefficient

x = independent variable

a = constant

In a multiple linear regression WTA and WTP bids are regressed against a number of independent variables that are likely to influence these values. One of the main requirements for regression is normal distribution. The output of regression answers the following questions:

- How well does the equation fit to the data?
- Which independent variables have a significant influence on WTA/WTP
- How does the independent variable influence WTA/WTP (Backhaus, *et al.*, 2000)?

The adjusted R^2 explains how much of a variance in WTA or WTP can be explained by the regression equation. Mitchell and Carson (1989) suggest that a minimum R^2 value of 0.15 is needed to show the robustness of mean WTA or WTP. The F test tests the following hypothesis: There is no useful relationship between the dependent variable and the independent variables and therefore all

coefficients are zero ($H_0: \beta_1 = \beta_2 = \dots = \beta_j = 0$). The Sig. value is used make predictions regarding this hypothesis.

The Beta weights indicate how much the standard deviation of WTA or WTP changes as a result of a change of one standard deviation on a given independent variable. The t-test is used to assess whether the independent variable has a significant influence on WTA or WTP. Hence, if the t-value strongly deviates from zero, it is unlikely that H_0 is correct, and it can be concluded that there is a relation between the independent variables and WTA or WTP. The signs indicate the direction of the influence on the dependent variable. From the significance column one can see whether it is certain to drop independent variables (Backhaus, *et al.*, 2000).

The variables selected for inclusion in the regression analysis are listed in Table 6.9. Garrod and Willis (1999) state that CV estimates should be consistent with theoretical expectations, hence the respondents' socio-economic characteristics and environmental attitudes should explain WTP and WTA. Since the number of independent variables used in the regression is limited by the number of observations, it was decided to select four attitudinal variables and one socio-economic variable from the questionnaire. In addition, differences in mean estimates obtained from MS and interviews suggested that the data collection mode might explain value estimates. Low correlation between the independent variables, as well as R^2 values (tolerance) close to 1 of each independent variable suggests that multi-collinearity does not exist among the selected variables.

Table 6.9: Coding and mean values for the independent variables used in the regression model⁴

Independent Variable	Coding	Mean
SURVEY METHOD (Market Stall or interviews)	1=MS 2=Interviews	1.54
ENV. GROUP (Membership in environmental group)	1=yes 2=no	1.84
INCOME (Household income in kr/month)	1=<100,000 up to 10=>500,000	6.35
STRENGTH OF PREF. (Strength of preferences regarding the issue)	1=strong 2=medium 3=weak	1.66
OUTDOOR (Number of outdoor interests)	0=0 interests up to 8=8 interests	3.69
GOV. EXP. (Government expenditure for the environment)	1= highest priority 2= high priority 3= medium priority 4= low priority 5= lowest priority	3.33

Multiple regression was used to explain WTA and WTP obtained from PC and OE formats in the first and second elicitation. Apart from testing validity, the regression models specifically aimed to investigate the performance of the two elicitation formats used in the study, the effect of the week-long interval on validity of estimates, as well as the overall credibility of WTA estimates. It was decided to run the regressions on a merged dataset with Market Stall and control group data in order to increase the sample size⁵. As normal distribution of residuals is a major requirement for regression (Backhaus, *et al.*, 2000), residuals

⁴ Caution should be taken in the interpretation of the regression results, especially with regards to the variables STRENGTH OF PREF and GOV EXP, as these have ordinal coding.

⁵ Given the reduced number of respondents in the second elicitation (MS participants only), the number of WTP observations just meets the assumptions for regression analysis. According to Backhaus, *et al.* (2000), the number of observations should be at least twice as large as the number of variables in the regression equation. In the second elicitation only 13 WTP responses are available to enter the regression with six independent variables, hence on the basis of these poor conditions it was decided that valid regression results might not be obtained.

for WTA and WTP were plotted in order to investigate their normality. Residuals for the OE data, especially WTA, were not normally distributed, and a closer approximation of normal distribution was achieved by transforming relevant WTP and WTA data into a natural logarithmic form. Two zero values for OE WTP were transformed into a small positive number, so that a natural logarithm could be taken (Zar, 1984 and Burt and Barber, 1996). The following dependent variables were tested in the regressions:

- WTA, PC, first elicitation transformed into ln (lnWTAPC1)
- WTA, OE, first elicitation transformed into ln (lnWTAOE1)
- WTA, PC, second elicitation untransformed (WTAPC2)
- WTA, OE, second elicitation transformed into ln (lnWTAOE2)
- WTP, PC, first elicitation untransformed (WTPPC1)
- WTP, OE, first elicitation untransformed (WTPOE1)

The remainder of this section reports the regression results for each dependent variable. Since regression is considerably insensitive with regards to minor violations to its assumptions (Backhaus, *et al.*, 2000), it was decided to report the regression results for untransformed data in Appendix 8 where variables in a logarithmic format were used. Regression results are explained starting with WTA data for the first and second elicitation, and then moving on to WTP. Each table presents the parameter estimates (coefficient Beta, t-values and Sig. values) as well as the ANOVA output for the relevant regression model.

Dependent variable: lnWTAPC1

The adjusted R^2 is 0.308, hence 31% of a variance in WTA elicited with the payment card can be explained by the regression equation. There is evidence at the 0.1% level that there is a significant relationship between the dependent variable and the independent variables. According to Table 6.10, SURVEY METHOD, GOV EXP and STRENGTH OF PREF are significant determinants of WTA. The t-values imply that Market Stall participants produce higher WTA bids than interview respondents. Equally WTA rises the stronger people's preferences towards the issue are and the higher they rank government expenditure for the environment amongst other expenditures. This is in line with a priori expectations, since it implies that people who are strongly against hydro

schemes and support government action for environmental protection are more likely to require more compensation.

Table 6.10: Parameter estimates for PC WTA, first elicitation

Lnwtapc1	Coefficient Beta	T	Sig.
Constant		10.309	.000
Survey method	-.210	-1.951	.056
Env. group	-.061	-.483	.631
Income	.112	.981	.331
Strength of pref.	-.381	-3.239	.002
Outdoor	.106	.929	.357
Gov. exp.	-.331	-2.718	.009

R: 0.612 R²: 0.375 Adjusted R²: 0.308
 N: 62 F: 5.598 Sig: 0.001

Dependent variable: lnWTAOE1

The regression results for the OE data show that WTA is equally well explained as for PC. The adjusted R² value (0.310) indicates that the model is significant, and there is evidence at the 0.1% level that not all coefficients are zero. STRENGTH OF PREF is again the strongest determinant of WTA (at 0.1% level). Other determinants are INCOME (at 1% level), with WTA rising with higher income and SURVEY METHOD (at 5% level) with Market Stall participants stating higher WTA (see Table 6.11).

Table 6.11: Parameter estimates for OE WTA, first elicitation

Lnwtaoe1	Coefficient Beta	T	Sig.
Constant		6.330	.000
Survey method	-.257	-2.049	.047
Env. Group	.110	.748	.459
Income	.409	3.048	.004
Strength of pref.	-.530	-3.952	.000
Outdoor	.116	.888	.380
Gov. exp.	-.184	-1.301	.201

R: 0.631 R²: 0.398 Adjusted R²: 0.310
 N: 47 F: 4.522 Sig: 0.001

Dependent variable: WTAPC2

Whilst the model for PC WTA obtained in the second elicitation does not provide any evidence for a relation between WTA and the independent variables, according to the F-test the robustness of mean WTA (0.168) is just above the required minimum of 0.15. Table 6.12 shows that only one variable exerts significant influence on WTA (STRENGTH OF PREF) at a 1% level. GOV EXP is no longer a predictor for the PC estimates.

Table 6.12: Parameter estimates for PC WTA, second elicitation

wtapc2	Coefficient Beta	T	Sig.
Constant		1.270	.217
Survey method	*	*	*
Env. Group	.107	.516	.611
Income	.217	1.099	.283
Strength of pref.	-.590	-3.084	.005
Outdoor	.046	.229	.821
Gov. exp.	.087	.437	.666

* SURVEY METHOD deleted from the analysis due to missing correlation

R: 0.567 R²: 0.322 Adjusted R²: 0.168
 N: 27 F: 2.090 Sig: 0.105

Dependent variable: lnOEWTA2

The model for OE WTA data obtained in the second elicitation produces evidence that the independent variables influence WTA (Sig F: 0.028). The adjusted R² is 0.380. In comparison to the first elicitation the t-statistics show that the same variables (STRENGTH OF PREF and INCOME) have a significant influence on WTA at a 0.1% and 5% level, respectively (Table 6.13).

Table 6.13: Parameter estimates for OE WTA, second elicitation

Lnwtaoe2	Coefficient Beta	T	Sig.
Constant		2.338	.034
Survey method	*	*	*
Env. Group	.273	1.276	.221
Income	.674	3.403	.004
Strength of pref.	-.536	-2.692	.017
Outdoor	-.079	-.427	.676
Gov. exp.	-.099	-.501	.624

* SURVEY METHOD deleted from the analysis due to missing correlation

R: 0.732 R²: 0.535 Adjusted R²: 0.380
 N: 20 F: 3.454 Sig: 0.028

Dependent variable: WTPPC1

The regression results indicate that the regression equation performs well on grounds of the F-test (Sig. F: 0.023). The explanatory power of the model, as explained by adjusted R², shows that the independent variables explain the distribution of WTP values in the sample very well (R²: 0.335). The following variables exert a highly significant influence on WTP: STRENGTH OF PREF (at 0.1% level) and ENV GROUP (at 1% level), that is WTP rises amongst hydro scheme gainers that have strong preferences for the proposed developments and declines with membership in environmental groups or touring clubs (Table 6.14).

Table 6.14: Parameter estimates for PC WTP, first elicitation

wtpcc1	Coefficient Beta	T	Sig.
Constant		3.849	.001
Survey method	.061	.347	.733
Env. Group	-.479	-2.820	.011
Income	-.047	-.248	.806
Strength of pref.	-.569	-3.335	.003
Outdoor	-.203	-.971	.343
Gov. exp.	.117	.691	.497

R: 0.699 R²: 0.488 Adjusted R²: 0.335 Sig. F:
 N: 26 F: 3.178 Sig: 0.023

Dependent variable: WTPOE1

The adjusted R² value of 0.347 is again a good predictor in the model predicting OE WTP, and the regression equation comfortably passes the F-test (Sig. F: 0.014). Again, it is not safe to drop the variable SURVEY METHOD at a 1%

level and STRENGTH OF PREF at a 5% level. Interestingly, ENV GROUP is no longer influential; in fact this variable now exerts the least influence on WTP. However, the variables OUTDOOR and INCOME become more relevant, although only at a 10% level (Table 6.15). People participating in the Market Stall meeting bid higher than interview respondents, and people with lots of outdoor interests are prepared to pay more than those with none or only few outdoor interests, and people with lower income are prepared to pay more than those with higher income.

Table 6.15: Parameter estimates for OE WTP, first elicitation

Wtpoe1	Coefficient Beta	T	Sig.
Constant		1.976	.061
Survey method	-.458	-2.698	.013
Env. Group	-.158	-.941	.357
Income	-.344	-1.969	.062
Strength of pref.	-.327	-2.091	.048
Outdoor	.377	1.979	.060
Gov. exp.	.260	1.631	.117

R: 0.698 R²: 0.487 Adjusted R²: 0.347
 N: 28 F: 3.476 Sig: 0.014

The regression results greatly improve when the assumption of normal distribution of residuals is considered and relevant dependent variables are transformed into a natural logarithm. Overall, WTA and WTP can be fairly well explained with regards to the explanatory power of the regression equation (as indicated by the R²-values and the Sig. F), and with regards to the regression coefficient (as indicated by the Beta weights and t-values). Table 6.16 summarises the main findings from the regression analyses.

Table 6.16: Summary of regression results (Significance, R²-values and significant variables)

	WTA PC 1st elic.	WTA PC 2nd elic.	WTA OE 1st elic.	WTA OE 2nd elic.	WTP PC 1st elic.	WTP OE 1st elic.
Significance	0.001	0.105	0.001	0.028	0.023	0.014
Adjusted R²	0.308	0.168	0.310	0.380	0.335	0.347
Survey method	X		X			X
Env group					X	
Income			X	X		X
Strength of pref	X	X	X	X	X	X
Outdoor						X
Gov. exp.	X					

When looking at the independent variables that influence WTA and WTP it turns out that STRENGTH OF PREF is a very reliable and significant predictor of WTP and WTA throughout all regressions run. The negative relation between STRENGTH OF PREF and WTA/WTP shows that respondents with strong views towards the hydro scheme issue have higher WTP or WTA and people with weak views are WTP or WTA less. In line with the mean estimates, the variable SURVEY METHOD also exerts significant influence on the dependent variables with higher WTA and WTP bids generated in the Market Stall meetings. Income only has an effect on the OE data with the parameter estimates implying that WTA rises and WTP falls with higher income. This is contrary to expectations, and a reason for the WTA results might be that participants in the higher income groups are likely to be engaged in environmental groups, touring clubs or outdoor activities, and therefore wilderness reduction would mean a greater loss for people in high income brackets. The negative relation of WTP and income is also contrary to a priori expectations but is perhaps logical when looking at the reasons for WTP for the hydro scheme developments. The main perceived benefits amongst hydro scheme gainers included job creation and economic growth, hence, the hydro schemes may be much more important to participants in the lower income groups. The number of outdoor interests (OUTDOOR) does only seem to

exert an influence on WTP, but not WTA. The positive relation suggests that WTP rises with an increased number of outdoor activities, and is therefore contradictory to a priori expectations from other studies. However, this seemingly counterintuitive result makes sense when considering that the outdoor activities listed in Question 9, Appendix 4 included jeep driving, angling and hunting. The hydropower developments would increase the potentials for jeep driving and angling and hunting enthusiasts in the highland area. Interestingly, the majority of hydro scheme gainers are interested in these outdoor activities and the data shows that high WTP bids are indeed stated by people with these outdoor interests.

A number of observations were made regarding the statistical validity of the two different elicitation formats, the first and second elicitation and the performance of WTP and WTA. Both PC and OE formats seem to produce regression results with relatively high explanatory power. Hence, as to the validity of estimates, both elicitation formats are equally successful. However, household income does not appear as a predictive variable in the regressions run on PC estimates, whereas it is a significant predictor for OE estimates. This would suggest, that participants were less encouraged to consider their budget when answering the payment card or that OE allowed people to express accurately high WTA and WTP bids. Overall, the validity for OE data improved in terms of explaining more variance between WTA bids (R^2) in the second elicitation. Comparisons between WTP (first and second elicitation) were not possible given the small number of observations. The repetition of the elicitation exercise did not seem to improve the statistical validity of WTA obtained with the PC, although the robustness is still above the suggested minimum.

According to the regression results the explanatory power is very good for both welfare estimates. There is evidence for a useful relation between the dependent and independent variables at the 5% and 1% level. The same applies for the multiple correlation coefficient (adjusted R^2), which is above 0.3 for both WTA and WTP. This means, that over 30% of the variance of both welfare estimates can be explained by the regression equation. The fact that the regression equations for WTA generate excellent explanatory power and beta coefficients with expected signs provides evidence in support of the proposition that both WTA and WTP estimates measure the intended construct. This is an important

finding, as it provides some evidence for the validity of the demanding WTA measure.

In addition to the linear regression it was decided to run a logistic regression (Panel 6.7) to investigate, which independent variables predict whether participants state a WTA or WTP bid in the OE question. The main aim is to examine whether the choice between WTA and WTP makes sense and which respondent characteristics are responsible for choosing WTA and WTP. The dependent variable was entered as WTP=1 and WTA=2.

Panel 6.7: Binary logistic regression

Logistic regression is a technique for making predictions when the dependent variable is a dichotomy (Group 1 and 2), and the independent variables are continuous and/or discrete. The method is used to determine differences between the two groups. In essence, logistic regression estimates the probability of a certain variable to belong to either Group 1 or 2. Furthermore, the output (in particular the odds ratios) shows how this probability changes if one independent variable changes.

Following variables are believed to explain whether participants express a payment or compensation claim (Table 6.17).

Table 6.17: Coding and mean values for the independent variables used in the logistic regression model

Independent Variable	Coding	Mean
GOV EXP (Government expenditure for the environment)	1= highest priority 2= high priority 3= medium priority 4= low priority 5= lowest priority	3.33
ENV. GROUP (Membership in environmental group)	1= yes 2= no	1.84
WILDERNESS (Government expenditure for wilderness protection)	1= highest priority 2= high priority 3= medium priority 4= low priority 5= lowest priority	2.01

The model has sufficient power for the differentiation of the two groups (Sig: 0.005). Nagelkerke's R^2 illustrates the explanatory power of the variables for the group division and the model explains 34% of the variance (Norusis, 1999). According to Table 6.18 the variables GOV EXP and WILDERNESS have a significant influence on the group division at a 10% and 1% level respectively. The Beta values imply negative relations, that is, participants that prioritise the environment above other issues and rank wilderness protection higher than other environmental programmes are more likely to state a WTA bid. Whether a participant is member in an environmental group does not seem to have an influence on the choice between WTP and WTA. Hence, GOV EXP and WILDERNESS are the strongest determinants of the two groups (odds ratio: 0.533 and 0.346, respectively).

Table 6.18: Parameter estimates and odds ratios for WTA and WTP

	B	Significance	Odds ratio
Constant	3.956	0.019	52.226
Gov. exp.	-0.629	0.074	0.533
Env. Group	0.608	0.471	1.836
Wilderness	-1.061	0.008	0.346

Nagelkerke's R²: 0.339 Sig: 0.005

6.3.4 Validity of Market Stall and interview estimates

Since the variable SURVEY METHOD is a significant predictor of WTA and WTP in the regressions described in the previous section and due to differences in means between MS (first and second elicitation) and the interview control group, it was decided to investigate the validity of both survey methods individually. This was also considered essential in order to assess potential differences between Market Stall and interviews in terms of statistical validity. The regression analysis is based on OE data⁶. Given the small number of observations in the two sub samples, especially for WTP, the comparative regressions focus on WTA. The comparison does not include the second MS elicitation, because fewer participants answered the OE question. Due to limited observations the number of variables entered into the equation was reduced to four. Despite the fact that conditions for the regression are not ideal, the model gives some clues regarding the validity of the two survey methods. The R²-values and the F-test show clearly that WTA is better explained by the MS data (Table 6.19). Whereas nearly 53% of the variance in WTA is explained in MS, only 20% is explained in the control group. In MS, there is evidence at the 0.1% level that the independent variables explain WTA, as opposed to evidence at the 10% level in the interview control group. Consequently, only one variable (STRENGTH OF PREF) exerts a significant influence on WTA obtained in the interviews as compared to three variables (ENV GROUPS, INCOME and STRENGTH OF PREF) for the MS

⁶ Due to the number of OE bids that exceed the payment card range, it was decided that OE data better reflects people's preferences as compared to PC data.

data⁷. Overall, Table 6.19 provides evidence in support of the proposition that the Market Stall approach has produced more valid WTA estimates than the interview control group; an interesting result.

Table 6.19: Regression estimates for WTA in MS and interviews

Variables	Coefficient B	t	Sig.
<i>Market Stall, first elicitation (n=22)</i>			
Adj. R ² : 0.525			
F: 7.089			
Sig.: 0.001			
Constant		2.705	0.014
Env. Groups	0.326	1.823	0.085*
Outdoor	0.064	0.429	0.673
Income	0.790	4.771	0.0001****
Strength of pref	-0.690	-3.830	0.001****
<i>Interview control group (n=24)</i>			
Adj. R ² : 0.201			
F: 2.511			
Sig.: 0.074			
Constant		5.271	0.0001
Env. Groups	-0.045	-0.229	0.821
Outdoor	0.129	0.634	0.533
Income	0.058	0.305	0.763
Strength of pref	-0.526	-2.623	0.016**

**** variable exerts influence at the 0.1 % level

**variable exerts influence at the 5% level

* variable exerts influence at the 10% level

⁷ Note that the sign for the variable ENV GROUPS differs between the two methods. Although one would expect that people who are member in an environmental group/touring club care more about wilderness and would hence be WTA more, the relation in the Market Stall sample shows the contrary. A closer investigation into possible reason reveals that six out of the seven highest bids were stated by respondents that are not member in an environmental group.

6.4 Participant behaviour

Given that regression results are poorer for the interview data, the question arises whether this can be explained by the higher percentage of participants with low motivation and mental effort as detected by the behaviour coding (Chapter 5.5). Considerable efforts were spent to create a relaxed interview context that would encourage participants to take their time to read the information and answer the questions, as well as establish a comfortable relationship between interviewer and respondents. Although respondents seemed happy to participate initially, participant behaviour indicated that the majority of respondents turned out to be ill-prepared for the CV interview. Participant observation during the interviews reveals that a total of 29 (46.8%) respondents showed some form of ‘disengaged’ behaviour, whereas only three (5.7%) MS participants belong to one of the ‘disengaged behaviour’ categories listed in Table 6.20. A chi-square test run on grouped data provides evidence at the 0.1% level that MS participants, according to this classification, are more motivated and cope better than interview respondents. Table 6.20 reports the occurrence of each behaviour category in the two samples, respectively.

Table 6.20: Occurrence of ‘disengaged’ categories in Market Stall and interviews

	Market Stall N= 53		Interviews N= 62	
	N	%	N	%
Confused	1	1.9	8	12.9
Lack of focus	0	0	4	6.5
Bored	0	0	8	12.9
Under time pressure	0	0	11	17.7
Annoying	2	3.8	6	9.7
Uncomfortable	0	0	5	8.1
Total	3	5.7	42 ⁸	67.8

⁸ The number of observed behaviours in Table 6.19 is not equivalent to the number of ‘disengaged’ respondents, because several interview respondents were classified into two or three of the ‘disengaged’ categories. The total number of ‘disengaged’ respondents in the interviews is 29 (46.8%).

Careful observation and summaries on each participant during and after the MS and interview, offer an insight into the sources of 'disengaged' behaviour.

Overall, the interview control group generated eight *confused* respondents as compared to one confused participant in the MS. Confusion was mainly triggered during the payment phase. Since a number of respondents failed to carefully read the market context, they consequently had difficulties understanding the payment task, in particular the meaning of the payment levels. However, additional explanations were hardly accepted among interview respondents, possibly due to lack of interest, time or embarrassment. In MS such misunderstandings were countered by group interaction and individual assistance from the moderator. Only one MS participant seemed overstrained by reading the information sets as well as keeping various handouts in order and was therefore confused during the elicitation stage. In the interview approach, the nature of the CV questionnaire was another factor causing confusion. Two respondents were reluctant to read the information because they had expected the interview to consist of questions and answers instead of extensive reading, understanding a complex hypothetical market context, researching their preferences, and stating these in terms of their WTA or WTP. The major factor causing *lack of focus* in the interview control group included external disturbances, such as curious family members who watched, listened and commented. As a result, three respondents were unable to concentrate on reading and searching their preferences. Another indicator for lacking concentration was respondents' difficulties to focus on the subject, and telling of unrelated stories in the course of the interview, although this was only observed in one case. In MS it was expected that political discussion might emerge, however, such off-topic discussions only occurred in one of the meetings when one respondent felt the need to voice his views on the political situation. Other group members who realised the irrelevance of this issue to the valuation exercise helped to terminate the discussion.

One of the major challenges in CV is to maintain the respondents' interest throughout the entire exercise as they would otherwise be keen to terminate the exercise quickly. Participants that are *bored* or impatient may overlook or ignore bits of information and fail to give well-considered responses. In the interview control group, eight respondents were keen on escaping from the interview as soon as possible, because they were bored and/or due to inconvenient timing.

Consequently, the information folder was quickly leafed through or totally ignored. The majority of bored respondents failed to decide on an open-ended WTP or WTA bid. As opposed to the interview, MS participants had been informed about the nature and length of the meeting beforehand, and there was no sign of boredom or participants keen on terminating the exercise as soon as possible. In the contrary, a number of participants stated afterwards, that they found the meeting very interesting.

In the interview, four respondents felt *under time pressure* when it came to the payment questions, as they thought they had to answer promptly. Typical statements included: 'It's impossible to give thoughtful answers about such a complex issue in such a short time' or 'I need much more time to decide on my contribution'. In the MS, people used the time given to think about their OE bid, and those needing more time felt free to take their time to finish the task while others filled in the debrief questionnaire.

The category of *annoying/not serious* participants comprises non co-operative respondents that failed to take the exercise seriously or were annoying. In MS, for instance two hydro scheme gainers questioned the credibility of the information provided and disagreed that wildlife would be affected by hydro scheme developments. However, in the interviews, mobile phones turned out to be the most distracting factor. Six respondents received one or two phone calls during the interview and stayed on the phone for up to 30 minutes or engaged in text-messaging. Some respondents made jokes and asked irrelevant questions, e.g. 'Are you single?', during the interview.

On the other extreme, there were respondents that seemed *intimidated* and *uncomfortable* due to the complexity of the interview. Five respondents expressed that they found the exercise difficult and became nervous as a result of needing extra explanation. Although some MS participants had difficulties during the elicitation stage, there were no signs of participants feeling uncomfortable or intimidated by the fact that they needed individual assistance and additional explanation. Instead, the atmosphere in the group meetings was very relaxed, and respondents were confident to ask questions and take their time to carefully consider their answers. This finding suggests that MS provides an environment, in which respondents are more engaged.

6.4.1 Implications of disengaged behaviour on explanatory power and means

To test the effect of disengaged behaviour on validity, a regression was run on the combined MS and interview data set, excluding 'disengaged' respondents. The regression is based on WTA, as the number of remaining WTP bids after exclusion of 'disengaged' responses (n=13) is too limited for this form of analysis. Table 6.21 summarises the implications of excluding estimates stated by 'disengaged' respondents on the explanatory power of the regression equation. Results show that the regression model improves when only 'engaged' respondents are entered. The adjusted R² increases from 0.258 to 0.318 indicating that more variation in WTA can be explained, and significance improves from 0.003 to 0.002. There are hardly any changes to the variables exerting an influence on WTA apart from a slight rise increase in significance for the variable INCOME.

Table 6.21: Comparison of regression results: all respondents vs. ‘disengaged’ excluded

Variables	Coefficient B	t	Sig.
<i>All respondents (n: 47)</i>			
F: 4.262			
Sig: 0.003			
Adj. R ² : 0.258			
Constant		5.874	0.0001
Gov. exp.	-0.138	-0.957	0.344
Env. groups	0.137	0.904	0.371
Outdoor	0.094	0.701	0.487
Income	0.395	2.840	0.007***
Preference	-0.552	-3.983	0.0001****
<i>Disengaged excluded (n: 40)</i>			
F: 4.725			
Sig: 0.002			
Adj. R ² : 0.318			
Constant		4.912	0.0001
Gov. exp.	-0.207	-1.330	0.192
Env. groups	0.255	1.492	0.145
Outdoor	0.063	0.447	0.658
Income	0.465	3.125	0.004***
Preference	-0.657	-4.319	0.0001****

**** variable exerts influence at the 0.1 % level

*** variable exerts influence at the 1% level

Unfortunately, the elimination of ‘disengaged’ respondents considerably reduces the sample size of interview respondents and therefore does not allow for regression analysis on interviews separately. However, none of the WTA bidders in the MS sample was ‘disengaged’ and hence there is evidence that the negative effects of ‘disengaged’ behaviour as shown in Table 6.21 can be attributed to the interview control group. Overall, this finding is interesting, as it suggests that participant behaviour has an impact on the validity of CV estimates.

But what are the implications of disengaged respondents on WTA and WTP means? Table 6.22 shows that the removal of disengaged respondents barely has an influence on MS mean value estimates, but means obtained in the interview control group are considerably affected, with mean WTA increasing and mean WTP decreasing. This is interesting in a sense that mean WTA gets closer to MS estimates when disengaged respondents are excluded. However, WTP moves further away from MS estimates. According to a t-test, means are not statistically different when bids obtained from ‘disengaged’ respondents are excluded.

Table 6.22: Comparison of means including and excluding ‘disengaged’ respondents

	Interviews		Market Stall	
	WTA	WTP	WTA	WTP
All respondents	86,328 s.e. 41,070	6,377 s.e. 2,002	780,107 s.e. 472,852	21,326 s.e. 6,161
Disengaged respondents excluded	105,270 s.e. 55,799	4,764 s.e. 1,767	780,107 s.e. 472,852	27,242 s.e. 7,034

6.4.2 Rationality of classifying respondents into engaged and disengaged

Given the relative subjectivity of classifying WTP and WTA responses into valid and invalid depending on participant behaviour, it seems necessary to investigate whether the classification is rational. A logistic regression model was applied to test whether the classification can be explained statistically. The dependent variable (1= engaged and 2= disengaged) is expected to be influenced by respondents’ attitudes towards the exercise, strength of initial preferences and perceived information load as elicited in the follow-up questions. The variables expected to determine whether WTA and WTP estimates belong into the ‘engaged’ or ‘disengaged’ category are listed in Table 6.23.

Table 6.23: Independent variables used in the binary logistic regression

Independent Variable	Coding	Mean
STRENGTH OF PREF. (Strength of preferences towards the issue)	1=strong 2=medium 3=weak	1.66
INFO (perceived information load)	1=too little 2=just right 3=too much	2.02
ATTITUDE (attitude towards the exercise)	1=interesting and understood 2=interesting but confusing 3=confusing 4=boring and waste of time	1.45

The regression model has an explanatory power of 0.328 (Nagelkerke's R^2). According to the regression results, the variables INFO and ATTITUDE have a significant influence on the group division at the 0.1% and 1% level with odds ratios of 7.088 and 2.829, respectively (see Table 6.24). According to the parameter estimates (B), respondents that perceived an information overload and those that found the exercise confusing or boring were more likely to be 'disengaged'. Overall, the regression results suggest that the classification into 'engaged' and 'disengaged' can be explained.

Table 6.24: Parameter estimates and odds ratios for 'engaged' and 'disengaged' responses

	B	Significance	Odds ratio
Constant	-6.523	0.001	0.001
Strength of pref.	-0.143	0.715	0.867
Info	1.958	0.001	7.088
Attitude	1.040	0.019	2.829

Nagelkerke's R^2 : 0.328 Sig.: 0.0001

6.5 Comparing the performance between MS and interviews

The fact that WTA obtained in MS can be better explained by independent covariates in the regressions than estimates obtained in the interview control

group raises a number of issues regarding the suitability of the two survey methods. In this section, several criteria are used to assess how the two methods enable respondents to successfully participate in CV and to investigate respondents' views towards the exercise: 1) the revision of WTA and WTP, 2) the number of inconsistencies on the elicitation sheet, 3) the number of unsure respondents, 4) the number of non-responses to the OE question, 5) people's attitudes towards the exercise, 6) their perception regarding the amount of information and finally, how strong people's initial views were and whether they changed as a result of being engaged in the exercise. The CV questionnaire contained a number of debriefing questions regarding some of these issues.

6.5.1 Revising WTA/WTP

MS participants were given a week to think about the hydro scheme issue, research their preferences for wilderness and hydro schemes and re-consider their WTP or WTA. This section examines whether the chance to change WTA or WTP is a useful component in a CV exercise. According to the regression results comparing the explanatory power of WTA bids obtained before and after the week-long interval, the adjusted R^2 and Sig. value deteriorate slightly in the second elicitation.

Although interview respondents were also given the opportunity to re-evaluate their bid, only few accepted this offer, mainly because respondents generally felt that they would not change their bid after a week, or because they were unsure and felt that they would not be able to make up their mind about the issue in only one week. However, another plausible reason might be that the costs of participating in the follow-up exercise would probably outweigh the benefits, and hence participants were reluctant to do more than necessary. In total, only three interview respondents agreed to participate in a second elicitation over the phone. These included two hydro scheme losers that did not decide on an OE bid in the interview and stated a bid in the second elicitation, and one respondent who had stated a WTA bid and increased her bid in the second elicitation. Given the limited number of revised bids in the control group sample, the analysis of revised WTA and WTP estimates will focus on Market Stall observations. In total, 48 out of 53 MS participants returned their second elicitation sheet in the post. Tables 6.25A and 6.25B describe changes in WTA and WTP and unsure responses.

Table 6.25A: Revision of open-ended WTA and WTP in second elicitation (MS)

	WTA (n=23*)	WTP (n=16*)
Same	10	12
Upwards	4	2
Downwards	3	0
Become unsure	0	1
Lexicographic bid	4	0

* two hydro scheme losers and one hydro scheme gainer did not return their elicitation sheet

Table 6.25B: Revision by unsure participants in second elicitation (MS)

	Unsure (n=10*)
Same	5
WTA/WTP	2
Lexicographic bid	1

* two unsure respondents did not return the second elicitation sheet

Although MS participants were encouraged to reflect on and think about the information they gained in the meeting during the week-long interval, in total 22 participants who had stated an OE WTA or WTP bid in the first elicitation did not modify their values. Hence, more than a third of MS participants were certain about their initial bid stated at the end of the meeting. In total 7 (30.4%) hydro scheme losers changed their bid, of which four hydro scheme losers increased their OE WTA bids, and three decreased their bid. Four participants who stated a WTA amount in the meeting, reported lexicographic preferences in the second elicitation because they realised that the loss of wilderness would have an infinite value. Of the hydro scheme gainers two (11%) changed their WTP bids upwards. Reasons for increasing their WTP were reconsiderations of budget constraints and the respondents' ability to pay more. One participant changed from a WTP bid to unsure, because he had discussed the issue with friends and consequently, with lots of new information in mind, felt unable to make a decision. The week-long interval was hoped to be particularly useful for respondents that were unsure in

the first elicitation. Surprisingly, only two out of 10 unsure respondents were able to state an OE bid in the second elicitation (Table 6.25B). Five unsure respondents remained unsure because they had no time to think about the issue or because they could still not make up their mind due to the complexity of the project. One unsure respondent stated lexicographic preferences in the second elicitation because she realised that no amount would compensate her for the wilderness loss. Whereas one participant changed from protesting to stating a WTA bid, four respondents realised that the loss of wilderness has an infinite value and hence stated a lexicographic bid in the second elicitation. Hence, there is a possibility that additional time to think increases the number of undesirable responses, but increases the realism of the results. Half of the unsure respondents remained unsure.

There is evidence from a statistical point of view that fewer men revise their WTP or WTA bids as well as participants that hold initial strong views (Asymp. sig (2-sided): 0.072 and 0.096, respectively). The latter finding suggests that people with strong views are more likely to have stable preferences at the end of the MS meeting.

Overall, a number of MS participants used the week-long interval to revise their bid, but not all unsure respondents were able to state a WTP or WTA bid in the second elicitation. The week-long interval also slightly increased protest behaviour. While revision does not seem to be essential for a number of participants, it is likely to provide an important element in CV.

6.5.2 Inconsistencies on the elicitation sheet

Since participants had no prior experience with the elicitation task, minor mistakes, such as inconsistent responses in the payment card were expected. In MS, the vast majority of elicitation sheets were successfully completed, although the number of erroneous responses was slightly higher in the second elicitation,

possibly due to absence of direct assistance and monitoring over the telephone⁹. An examination of the elicitation sheets in the interview control group sample revealed that most respondents successfully completed the PC and answered the OE question consistently. In total, three payments cards had one mistake and two elicitation sheets were inconsistent due to misunderstandings¹⁰. Overall, MS and interview participants performed equally well in completing the elicitation exercise. Although assistance was required in several cases, the moderator or other group members in MS and the interviewer during the interviews helped to counter problems.

6.5.3 Unsure respondents

The MS approach generated ten unsure respondents. Reasons for this were difficulties to make up their mind about the hydro schemes due to the complexity of their positive and negative impacts. The number of unsure respondents was reduced to six in the second elicitation. In the interview control group ten respondents also stated that they were unable to decide whether they were in favour of or against the hydro schemes.

6.5.4 Ability to formulate WTP/WTA in the OE question

One of the main tasks of the valuation study was to elicit OE WTA and WTP bids. A number of participants failed to answer the OE question, because they were unsure, were unable to decide on an amount, were protesters or had lexicographic preferences. A closer investigation into the number of non-responses in both survey methods was undertaken (see Table 6.26).

⁹ In the first elicitation only one respondent misunderstood, and stated her maximum OE WTA as opposed to her minimum WTA (PC= 500 kr and OE = 14000 kr). In the second elicitation one respondent stated maximum WTP PC= 700 and OE= 76, although the OE was meant to reveal his maximum WTP. A reason why the respondent accepted the lowest WTP on the PC may be that he wanted to make sure that his support to the hydro schemes is heard. Another mistake in the second elicitation again involved a statement of maximum WTA instead of minimum WTA. One respondent made two mistakes in the PC that were not consistent with the OE.

¹⁰ One respondent, for instance, agreed to some positive amounts in the PC but turned out to be a hydro scheme loser. Another respondent stated an OE WTA that was larger than the negative bids he agreed to in the PC.

Table 6.26: Responses and non-responses to the OE question in MS and interviews

	Market Stall (1 st elicitation) (n=53)		Market Stall (2 nd elicitation) (n=48)		Interviews (n= 62)	
	N	%	N	%	N	%
Response	41	77.4	35	72.9	39	62.9
Non-response	12	22.6	13	27.1	23	37.1

Table 6.26 shows clearly that MS generates fewer non-responses, and there is statistical evidence for this at the 10% level (Asymp. Sig (2-sided): 0.093). An examination of the type of people who managed to state an OE bid reveals that participants who did not perceive time pressure, did not find the exercise confusing and who thought that the amount of information provided was ‘just right’ (according to participant observation and the debrief questions) were more likely to give a response to the OE question (Asymp sig. (2-sided): 0.068, 0.001 and 0.007, respectively). Furthermore, there is evidence that ‘engaged’ respondents were more likely to state an OE bid (Asymp. Sig. (2-sided): 0.005). This is an interesting result, as it gives some clues regarding aspects that may prevent people from stating an OE bid.

6.5.5 Attitudes towards the exercise

At the end of the exercise respondents were asked to state their view towards the Market Stall meeting and interview, respectively. The frequency and percentage for each of the four answer options is summarised in Table 6.27.

Table 6.27: Level of interest and confusion in the exercise

	Market Stall (n=53)		Interviews (n=62)	
	N	%	N	%
Interesting and understood	31	58.5	36	58.06
Slightly confusing but interesting	21	39.6	17	26.98
Totally confusing	0	0	8	12.90
Boring and waste of time	1	1.9	1	1.61

58.5% of the Market Stall participants found the exercise interesting and understood everything, 39.6% considered it interesting but slightly confusing, nobody regarded it as totally confusing, and 1.9% thought it was boring and a waste of time. In comparison, the same percentage of interview respondents found the exercise interesting and comprehensible, but fewer found it interesting but slightly confusing (58% and 17%, respectively). In total, 12.9% of interview respondents believed the exercise was totally confusing. The percentage of those regarding it boring and a waste of time was 1.6%. Overall, slightly more MS participants were interested in the exercise than interview respondents. Although the proportion of respondents who found the exercise interesting does not differ between the survey methods from a statistical point of view, eight interview respondents considered the exercise as totally confusing as compared to none of the MS participants. Given the limited number of observations, statistical evidence in form of a chi-square test cannot be obtained (Web source: Electronic Textbook StatSoft). A number of chi-square tests were run to investigate what type of respondents were less likely to find the exercise confusing. These were people who perceived no time constraint (Asymp. Sig. (2-sided): 0.012) and people who found the amount of information 'just right' (Asymp. Sig (2-sided): 0.071). This is an interesting result.

6.5.6 Views regarding the amount of information

Both Market Stall participants and interview respondents were provided with the same amount of information regarded necessary to enable informed decisions. In order to test whether the information level was optimal and suited for both data collection modes participants were asked about their views towards the information provided. Table 6.28 shows that about 30% of MS participants and about 10% of the control group sample perceived an information underload, whereas an information overload was only perceived by interview respondents (37%). Seventy-one percent of the MS members and 53% of the control group were happy with the amount of information ('just right'). Chi-square tests were used to investigate whether there are differences between the survey methods with regards to the information load. The results show that MS has a significantly higher percentage of participants perceiving an information underload at the 1% level (Asymp. Sig: 0.009) and interviews have a higher percentage of respondents

perceiving an information overload. There is also evidence at the 5% level that more MS participants found the amount of information ‘just right’ as compared to interview respondents.

Table 6.28: Perceived information load among MS and interview participants

	Market Stall		Interviews	
	N	%	N	%
Too little	15	28.8	6	9.7
Just right	37	71.2	33	53.2
Too much	0	0	23	37.1
Total	52	100	62	100

These findings are in line with the participant observation, which revealed that a considerable number of interview respondents only leafed through the information folder and seemed to be overstrained, whereas the MS environment seemed to encourage participants to carefully read through the folder. As information was adjusted to individual needs through discussion in the MS, the majority was happy with the amount of information received. A logistic regression was run to investigate what kind of participants found that they had received ‘too much’ information, using 1= ‘too much’ and 2= ‘not too much’ as the dependent variable. Variables that might explain information overload are listed in Table 6.29 and results from the regression are presented in Table 6.30.

Table 6.29: Independent variables used in the binary logistic regression

Independent Variable	Coding	Mean
VIEW (Views towards the hydro schemes)	1=in favour 2=unsure 3=against	1.88
STRENGTH OF PREF. (Strength of preferences towards the issue)	1=strong 2=medium 3=weak	1.66
ENGAGED (according to participant observation)	1=engaged 2=disengaged	1.28
FAMILIAR (Familiarity with the site)	1=visited area 2=visited highlands 3=never been to highlands 4=never heard about area	1.84
OUTDOOR (Number of outdoor interests)	0=0 interests up to 8=8 interests	3.69

Table 6.30: Parameter estimates and odds ratios for information overload

	B	Significance	Odds ratio
Constant	0.577	0.810	1.781
Views	0.066	0.871	1.068
Strength	-0.081	0.865	0.922
Engaged	-3.441	0.0001	0.032
Familiar	1.972	0.007	7.183
Outdoor	0.714	0.006	2.041

Nagelkerke's R²: 0.496 Sig: 0.0001

The regression results show that the variables ENGAGED, FAMILIAR and OUTDOOR significantly influence whether participants perceived an information overload or not. According to the parameter estimates, participants who were disengaged, participants who were familiar with wilderness and those who had no

or few outdoor interests were more likely to state that they received too much information. People who had visited the site or another Icelandic wilderness area did not seem to require very detailed information. Participants who are not involved in outdoor activities were more likely to perceive an information overload, possibly because they would be less affected by the decision, and disengaged respondents were likely to be bored or overstrained by reading the information set.

In addition, it was investigated under which conditions respondents found the information provided ‘just right’. According to chi-square tests, these are respondents who did not have weak views (Asymp. Sig (2-sided): 0.010), were interested in, and understood, the exercise (Asymp. Sig. (2-sided): 0.047) and, in line with the logistic regression results, those who were engaged (Asymp. Sig. (2-sided): 0.002). Statistical evidence as to what type of respondent perceived an information underload is very limited. The only significant result shows that people who were not under time pressure during the interview seemed likely to find the information provided too limited (Asymp. Sig. (2-sided): 0.097).

6.5.7 Change in views

As shown in Table 6.31, strength of views towards the hydro scheme issue vary considerably among participants: 50% of the interview control group had strong views towards the exercise, 36% medium views and 14% weak views. As compared to that the Market Stall sample had fewer respondents with strong views (37.7%), whereas over half of the participants had medium views (56.6%) and 5.7% weak views.

Table 6.31: Strength of views towards the hydro scheme issue

	Market Stall		Interviews	
	N	%	N	%
Strong	20	37.7	29	50
Medium	30	56.6	21	36.2
Weak	3	5.7	8	13.8
Total	53	100	58	100

It was anticipated that participants who had weak or medium views were more likely to benefit from the information conveyed during the CV exercise and change their views as a result, whereas people with strong views were unlikely to change their views¹¹. The answers to the question whether respondents had changed their views as a result of being involved in the exercise are summarised in Table 6.32.

Table 6.32: Change of views during the CV exercise

Views changed...	Market Stall		Interviews	
	N	%	N	%
...a lot	8	15.1	3	4.8
...a little	15	28.3	15	24.2
...not at all	30	56.6	44	71.0
Total	53	100	62	100

About 29% of the interview respondents changed their views a little or a lot during the exercise, as compared to 43% of MS participants, and 71% of interview respondents did not change their initial views, as opposed to 57% of MS participants.

According to a chi-square test on a very limited number of observations there is evidence at a 10% level that more MS participants changed their views ‘a lot’ (Asymp. sig (2-sided): 0.062). Although Table 6.32 shows that a higher proportion of MS members changed their views a little and a smaller proportion not at all, there is no evidence for this divergence from a statistical point of view.

An investigation into the causes for not changing initial views shows that strong initial views towards the hydro scheme issue and a perceived information overload are relevant at a 1% and 5% level (Asymp. sig (2-sided): 0.038 and 0.005, respectively). In addition, there is evidence at the 1% level that men are much more hesitant to change their initial views than women (Asymp. sig (2-sided): 0.019).

¹¹ Participants with strong views tended to merely leaf through the information folder.

6.6 Conclusion

The mean estimates show that Market Stall produces significantly higher OE estimates than the interview approach. According to the regression results WTA and WTP obtained with PC and OE formats can be well explained, with survey method and participants' strength of preferences being reliable predictors throughout most regressions. Separate regressions on the Market Stall data set and the data obtained from the control group reveal that the explanatory power for WTA is considerably better for estimates generated during the Market Stall meetings. A number of findings suggest that participants perform better in MS:

- 1) the occurrence of disengaged participant behaviour is less frequent.
- 2) the second elicitation seems important in order to reduce the number of unsure respondents, and better enables participants to form an opinion than in the initial meeting or the interview control group.
- 3) the number of non-responses to the OE question is considerably lower than in the interview approach.
- 4) considerably fewer participants are confused or bored during the exercise.
- 5) more interview respondents perceive an information overload.

Overall, the Market Stall meetings provided a suitable environment that allowed participants to deal with a complex decision-making task.

8 CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

The overall aim of this research was to estimate the non-market costs and benefits of three hydro scheme proposals in an Icelandic wilderness area, by eliciting thoughtful and informed values from a small number of people. Four specific objectives were put forward in accordance to findings from the literature on economic theory, preference construction and motivation. These were aimed to:

- investigate the property right situation for wilderness and use the correct welfare measure in terms of WTA.
- determine and apply a method that provides a preference construction friendly decision-making environment
- observe participant behaviour during the CV exercise to gain an insight into respondents' motivation and the impact of 'disengaged' behaviour on validity of WTA results.
- compare the results obtained from the Market Stall approach with conventional in-person interviews.

The remainder of the conclusion is organised in two parts: Firstly, the general conclusions, in which the results and implications of the research for environmental valuation and management implications are discussed. Secondly, recommendations for further research are suggested.

8.1 General conclusions

This section is divided into subsections according to the research aims stated above. While some conclusions relate to the methodology of CV, others regard the study's implications on hydro scheme decision-making and wilderness management.

8.1.1 Property rights and WTA

People's property right perceptions are often overlooked by CV practitioners, and instead of using the WTA measure for a good respondents think they own,

respondents are often forced to accept a different property right scenario suggesting they should pay to obtain an environmental change in question.

Focus groups and the pilot survey suggested that the majority of participants felt that they had the rights to wilderness, and an attempt was made to ask hydro scheme losers for their WTA in compensation for the loss of wilderness. While this measure is criticised, because people are assumed to have no experience with such a trade-off, such concerns cannot be confirmed in this study: WTA estimates performed well in the regression both for data obtained in MS and in interviews. However, findings suggest that in-person interviews were not as well suited for the elicitation of WTA, as they resulted in a slightly higher number of non-responses to the open-ended question as compared to MS. While these findings suggest that WTA can produce valid estimates, they also imply that when circumstances are right for preferences construction, people's performance increases.

Furthermore, the survey design helped to eliminate problems with the WTA question. Since the open-ended question was preceded by a carefully designed payment card involving both WTA and WTP levels, which were explained in a realistic and credible scenario, all respondents accepted the nature of the payment card and hence no objections arose regarding the open-ended follow-up question.

While this study is one of the first ones that successfully elicits open-ended WTA, it can be concluded that some of the concerns related to the WTA measure can be eliminated. The following factors seem to help respondents answer the WTA question: they have to agree to the property right scenario, they have to be offered a preference construction friendly decision-making environment, and they have to be presented with a realistic hypothetical market and elicitation context. Clearly, concerns regarding the WTP and WTA disparity remain, but since hardly any strategic overbidding was observed there is some confidence that WTA bids obtained in this study are realistic.

8.1.2 Preference construction friendly survey method

After an extensive review of literature on preference construction and respondents' needs for well-considered purchase decisions, the Market Stall approach was considered to be the most suitable survey method for the valuation of hydro scheme impacts on wilderness out of all survey methods for CV. The results confirm that MS enables and motivates participants to give well-informed answers, and offers a suitable decision-making environment.

The comparative analysis of survey methods with regards to conventional features, such as representativeness, sample size and costs, as well as features essential for preferences construction and motivation, show that the suitability of conventional and deliberative data collection modes is reversed when they are considered from an angle of preference construction and motivation. Merely focussing on criteria regarding sample size, representativeness and costs seems to overlook important aspects that may improve participant performance and the quality of results. A thorough investigation of aspects that are essential for preference construction seems especially important when the environmental change to be valued is complex and/or unfamiliar, and when respondents are unlikely to have existing preferences and monetary values attached to it.

The detected requirements for preference construction have practical implications on the way CV is carried out. Since respondents are likely to be unable to construct preferences for novel or complex goods on the basis of standardised information sets, limited time, absence of deliberation, and possibly low motivation, in-person and telephone interviews may elicit values that are based on irrelevant factors, and may produce less valid value estimates. Instead of implementing a large-scale conventional survey, which would cost as much as a small-scale deliberative approach, decision-makers have the opportunity to collect more informed WTP and WTA estimates. The decision over the survey mode depends on whether the goods to be valued are familiar or novel, easy to grasp or complex, and, of course, whether a representative sample is achievable for the relevant population. Clearly, the appropriate survey method should be carefully selected taking into account the use of CV estimates, the nature of the good and opportunities for preference construction.

8.1.3 Participant behaviour

Given that interviews do not provide all features considered essential for preference construction, it was investigated whether an abstract decision-making environment, as posed by interviews, is reflected by respondents' behaviour during the interview. Indeed, limited time to process information and form an opinion, being asked to make a decision in front of a stranger, inconvenient timing and less perceived importance of the study resulted in perceived time pressure, boredom, intimidation and annoying behaviour. Since only three MS participants were 'disengaged', it can be concluded that participant behaviour reflects the shortcomings of interviews.

According to survey methodologists and psychologists motivation is essential to answer survey questions, such as the WTP or WTA question. While absent motivation is assumed to have adverse impacts on the validity of questionnaire data, statistical results obtained in this study provide some evidence that validity of WTA improves when 'disengaged' respondents are removed from the regression analysis. Although it has not been recognised in CV research, 'disengaged' behaviour may have far reaching implications on project and policy decisions: in this study 'disengaged' behaviour resulted in less valid estimates and different means, and the integration of such CV values in CBA may bias the outcome.

8.1.4 Compare MS and interviews

From a methodological point of view, the major objective of this study was to test the group-based Market Stall approach and compare it to conventional in-person interviews.

Some of the characteristics of MS mentioned above seem to be important as they enable respondents to report well-considered value estimates. Evidence for this was found in regression analyses and the fact that MS produced far fewer non-responses to the open-ended payment/compensation questions. Given that MS participants were 'engaged' according to participant observation, perceived the exercise to be less confusing and did not perceive an information overload also confirms that the MS approach allowed people to make decisions regarding the hydro scheme issue and express these in terms of their WTA or WTP.

An attempt was made to investigate whether discussion plays a role in the valuation task, by providing MS and interview participants with the same amount of information, time to think and creating a relaxed interview context. Despite these measures, it is difficult to draw firm conclusions over which specific factors of MS are responsible for differences in results. Although it is not possible to say with certainty that discussion is an important aspect in decision-making over an environmental change, the comparative design shows that in-person interviews seem to have some drawbacks: they are less suited for conveying information sets required for informed decisions on complex issues and it is difficult to motivate CV respondents to make use of the time offered during the interview and during the week-long interval.

While in-person interview respondents preferred to decline the week-long interval and revision of WTP or WTA bids, results from MS suggests that the week-long interval helped some unsure participants to form an opinion and others to revise their WTA estimates following further thought and discussions with family and friends. Hence, giving CV participants the opportunity to think and re-consider their WTA seems to generate more considered estimates and helps to reduce concerns regarding the mental effort required to tackle WTA questions.

Overall, the MS approach provided a decision-making environment in which people were engaged and motivated to consider their answers, regardless of their cognitive skills. Instead of generating 'disengaged' behaviour, MS enabled respondents to go through Torangerau's five stages of information processing and successfully complete the WTP and WTA question. This assumption is also backed by fact that MS only produced two non-responses to the open-ended WTP and WTA question, as compared to 16 non-responses in the interviews. Hence, Dillman's theory (1979) that the cost of answering complex questions is very high in terms of mental effort and time, and therefore often leads to item non-responses (Dillman, 1979 and Loomis, 1990) is confirmed, but costs can be reduced by adjusting the survey environment. Market Stall provided a suitable decision-making environment that allowed participants to deal with difficult questions regarding complex environmental goods, as the relaxed environment, additional time and discussion in MS motivates and enables participants to form preferences and report them in terms of WTP and WTA.

8.1.5 Management implications

The study attempted to estimate the non-market costs and benefits of hydro schemes in the East Icelandic wilderness area using WTA and WTP measures. Overall, the results suggest that the general public has strong preferences for the status quo, and the development of hydropower generation in the wilderness area should be questioned with regards to public preferences. Although the estimates are not suited for integration in a cost-benefits analysis, the average welfare loss due to loss of wilderness (780,107 krona in MS and 86,328 krona in the interview control group) clearly outweighs the non-market benefits associated with the hydro scheme developments (21,326 krona in MS and 6,377 krona in the interview control group). The study provides realistic estimates of the non-market costs of hydro schemes, by taking account of hydro scheme gainers and subtracting their average WTP from the average WTA. Hence, the overall costs of wilderness loss accounts for 758,781 krona according to MS estimates and 79,951 krona according to interview estimates. The figures obtained in this study show that the optimal future management option for the wilderness area would be to retain the status quo according to public perceptions. Wilderness preservation would provide considerable benefits even when the non-market benefits of hydro scheme developments are taken into account. While these figures provide an insight into people's preferences regarding the hydro scheme issue, it should be noted that they are obtained from a small sample and are not necessarily representative for the general public (note size of standard deviation in Table 6.6 in Chapter 6). Further Market Stall meetings would help to improve representativeness and enhance the credibility of the mean estimates.

8.2 Recommendations for further research

The assessment of the MS and interview approach was to a large extent based on validity tests using regression analysis. In order to further test the performance of MS, further comparative studies are urgently required that use more sophisticated validity tests, such as hypothetical versus actual WTP comparisons. These studies should also investigate in more detail which features provided in MS play a key role in preference elicitation. Whether discussion and an informal meeting is

important or not would determine whether CV should be carried out in a group or not, as all other features could be provided in conventional data collection modes. In order to evaluate MS in more detail, comparative designs are required that keep all factors, apart from discussion, constant. This would provide more substantial evidence for the advantages and disadvantages of discussions in the decision-making process.

Intensive focus group research revealed that Icelanders have differing perceptions as to who owns the property rights to wilderness and that perceived property rights may not comply with the legal property right status of wilderness. This leads to two implications: Firstly, CV practitioners should not depend on the entitlement suggested by legislation, as respondents may not be aware of it or have different perceptions. It is therefore recommended to thoroughly investigate the property rights as perceived by the general public. Secondly, the possibility that not all respondents accept the entitlement structure suggested in a CV study tends to be overlooked in most CV studies, even though this may lead to an unrealistic hypothetical scenario, and hence to response refusals or very low WTP. Findings from the focus groups and pilot survey showed that some people had different property rights perceptions. While this was recognised in this study, little could be done to take account of the fact that not all respondents in the sample have the same views, and there is desperate need for further research to investigate how to deal with differing entitlement perceptions within CV samples.

Despite criticism of the WTA measure in terms of high mental demands and strategic overbidding, this study suggests that good design of the CV study seems to ameliorate this problem. It may be that the key to this problem is to provide sufficient time to think and convey the importance of well-considered answers. While hardly any strategic bidding was identified, there is still a risk that some cases of strategic overbidding remain undetected. Instead of avoiding the open-ended format for WTA measures, future research should invest in finding more reliable ways to assess strategic bidding in WTA, for example by asking concrete follow-up questions, instead of an open-ended question, which merely asks respondents to explain their bid. The answers could be used to justify inclusion or exclusion of WTA responses in the data analysis.

Since the effects of ‘disengaged’ behaviour found in this study could have implications for CV validity, more research is required to test the impacts of lacking motivation on CV performance and the valuation of costs and benefits, as well as determine the factors that may trigger sufficient motivation.

While psychologists and survey methodologists suggest that lacking motivation might have an impact on the validity of questionnaire answers, participant observation and statistical results in this study provide some evidence that ‘disengaged’ behaviour indeed has an adverse impact on the validity of WTA responses. In Market Stall hardly any participant was disengaged, but in conventional surveys the number of ‘disengaged’ respondents and their impact on validity should be of concern. Clearly, this issue seems important and should be considered when choosing an appropriate survey method for CV. Since conventional survey methods may be useful for familiar environmental changes, future research is needed to determine the factors that determine ‘engaged’ and ‘disengaged’ behaviour in order to achieve improvements to participant performance.

This research suggests that varying information requirements exist and that these may be responsible for ‘unsure’ responses, non-responses to the payment/compensation question and the validity of estimates. Hence, there is urgent need for further research inquiring how to adjust information to individual needs. As mentioned in Chapter 7.3, an option would be to provide respondents with relevant web links, or provide access to a specially set up chat room and notice board on the internet for survey participants. While this might also improve conventional survey methods, further improvements to information provision in Market Stall should be investigated. For example, instead of providing only one ‘market stall’ consisting of a moderator, several ‘stalls’ could be provided, consisting of representatives of different interest groups, from which participants could seek further advice and information. Future CV research should ask respondents what sort of information sources they would like to consult and how these should be made available.

8.3 Summary

In this study, MS performed better with regard to eliciting valid responses and reducing the number of non-responses to the elicitation question in a valuation context that involves a complex good. It is therefore likely that MS provides a suitable decision-making environment that engages respondents with differing cognitive skills to construct preferences and carefully decide on both WTP and WTA in compensation.

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[bin/unds.pl?txti=/wwwtext/html/127/O2/r05191410.sgml&leito=Nele%5C0Lienhooop#word1](http://www.althingi.is/dba-bin/unds.pl?txti=/wwwtext/html/127/O2/r05191410.sgml&leito=Nele%5C0Lienhooop#word1)

and

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April, 5, 2003

Appendix 1

Socio-economic characteristics of focus group participants

	Gender	Age	Occupation	Code
<i>Focus group 1</i>				
	F	26	Geographer	Au1
	M	27	Travel agent	Lú1
	F	26	Journalist	NB1
	F	26	Travel guide	Ás1
	F	27	Publisher	NH1
	M	32	Cartographer	Hi1
	F	25	Travel agent	Ág1
	F	25	Student	E1
	F	26	Geographer	Sv 1
<i>Focus group 2</i>				
	M	24	Student	Kr2
	F	20	Pupil	St2
	M	27	Student	Jó2
	M	47	Data base administrator	In2
	M	37	Computer scientist	Óm2
<i>Focus group 3</i>				
	M	59	Geographer	Rú3
	M	39	Lorry driver	Po3
	F	41	Nurse	Fr3
	F	51	Housewife	Na3
	F	25	Student	Hu
	M	54	Driving instructor	In3

Appendix 2

Focus Group Discussion Analysis

The raw data obtained from the focus groups is reported in five descriptive summaries including illustrative quotes of participant comments.

Summary 1: General views on wilderness protection and values

The majority of participants have never visited a wilderness area. When asked why wilderness is often protected and whether it is valuable, focus group participants needed a long time to think and responses were hesitant to this query. Participants in group 1 (consisting of a number of geographers) considered unique natural assets, such as deserts, wildlife and vegetation as valuable, e.g. *In Iceland vegetation areas are very important for wildlife* (Ás1). Natural assets such as wildlife and geological features were not mentioned in group 2 and 3. One participant mentioned that the value of the wilderness area is likely to increase in the future, since there is not much natural environment left.

There was a general understanding that wilderness is most valuable for recreationalists, especially for people from cities. The main reasons for visiting wilderness are quiet, peace, solitude, space and uniqueness. Comments from the participants included:

People in cities are always under stress, and wilderness gives them a good opportunity to get away from it (Lú1)

People want to be away from other people (Þo3)

People look for peace and quite. Most of us live in a man-made environment.

When people go on vacation, they want to see something different (Rú3)

One wants to do and see the opposite of what one does and sees every day (Sv1)

Everything that is different and unique is worth it seeing (Lú1)

It is fun to visit wilderness, because it hasn't been managed and modified. You can always find something that is different and new (Fr3)

A number of participants were of the opinion that wilderness has only value for people that visit it, but no value to themselves, e.g. *For me wilderness has no value, but for my friend who is studying geophysics wilderness is very important.*

He goes there to collect stones. For him it is interesting because he knows so much about stones (Kr2)

Nevertheless, in each group option and non-use values were revealed. The majority of focus group participants have never been to a wilderness area, and some stated that they want to have the option to visit wilderness in the future: *It is good to know that there is wilderness, and that you can go there whenever you want (Hu3)*. A number of participants simply want to know that wilderness exists: *It's a very comforting feeling to know that wilderness exists, to know that it has been there for 1000 years without being modified. It is a very good feeling (Ed1)*.

When asked *Is wilderness threatened by something? What are the major threats?* participants in group 1 mentioned a number of threats to wilderness, including resource exploitation such as oil, gas and gold. In groups 2 and 3 nobody apart from three participants was aware of any threats to wilderness.

Responses to the question whether wilderness should be protected were very diverse. Geographers in group 1 unanimously responded *yes* to this query, and mentioned that animals, such as reindeer and geese need some space and that it would not be fair if their habitats were destroyed. However, protection did not seem to be equally important to the other focus group participants. Comments included:

Wilderness should only be protected in countries in which there are only few remaining unspoilt natural areas (NB1)

Not all wilderness areas should be protected. Only those areas that are unique should be preserved (Na3)

I don't mind whether wilderness exists or not. I have never been to the highlands and none of my friends has ever visited them either. One would maybe visit them after one has been to Mallorca. Wilderness is not important for me and doesn't need to be protected (J62)

I didn't even know that wilderness exists in Iceland. I first heard of it when the hydro scheme debate started. I think it doesn't make a difference to me if wilderness areas are used for other things (St2).

Overall, participants seemed to be fairly unaware of wilderness assets, values and threats. This may be due to a lack of knowledge regarding the importance of flora and fauna for ecosystems, biodiversity and humans (e.g. rainforest was not mentioned), the rarity of wilderness and the unique environmental assets that can be found. Most participants had only very basic knowledge regarding Iceland's wilderness assets, e.g. deserts, unique geological features, geese and reindeer.

Summary 2: Hydro Scheme Impacts

Participants were provided with an information sheet listing the natural and cultural assets in the wilderness area in East Iceland, and informing them of three hydro scheme proposals, which target the same area. Answers to the question: *Do you think that hydro schemes will have an impact on the environment? What kind of impacts?* were very much influenced by the participants' opinions about government plans to use the electricity for aluminium production, and all groups immediately transitioned to a discussion over the impacts of aluminium production on the local economy in East Iceland. In group 1 there was a clear trend against aluminium smelters due to the environmental costs that would be created. However, in group 2 and 3, the majority of participants believed that aluminium production would be advantageous. Typical comments included *job creation in rural areas, stop migration to Reykjavík and diversification of the economy*. Due to strong beliefs in the benefits of hydro schemes, participants in group 2 and 3 seemed to be unaware of, or reluctant to talk about the environmental impacts of hydro schemes. When participants were reminded to think about the impacts on nature too, comments crystallised a general view that hydro scheme effects on the environment would be adverse. The main concern in all groups was the amount of vegetated area that would be destroyed due to huge reservoirs and due to erosion and desertification. Participants in group 1 and group 3 were also aware of the multiplier effects of reservoirs: *Reservoirs trigger*

a kind of a chain reaction. Vulnerable plants, the main source of food for reindeer, will be destroyed. This will lead to a decrease in the stock size of reindeer (Hi2). In group 2 participants assumed that reindeer and geese could easily find another place to live. Apart from adverse impacts on vegetation and reindeer, participants did not mention any other ecological impacts on natural assets.

In group 1, participants voiced concerns about the accumulation of sand in the reservoir: *Hydro schemes are not even sustainable. After 400 year the reservoirs will be filled with sand- an irreversible damage (Sv1) I think the mud accumulation will have impacts that we can't predict or even imagine (Au1),* whereas in group 2 participants were not aware of problems regarding the deposit: *Is it not just possible to demolish the dam after 200 years or so? Then the sand would be washed away and everything would look like now (J62).*

Landscape changes were also an issue of concern in group 1 and 3: *I don't know anything about ecological impacts. I therefore think that visual pollution is the worst impact. It is so unnatural to create a 200m high dam in this canyon (Ed1).* In comparison to this, several participants voiced that hydro schemes are not that bad of an option, since *the reservoirs will after some time be part of the environment (Óm2).*

Participants in group 1 and 2 also discussed the impacts on tourists. Focus group members had different opinions, with the majority assuming that foreign visitors would no longer be attracted by the highlands. Some participants mentioned that hydro schemes would attract visitors, because of an improved road network and easier access.

Summary 3: National park as an alternative?

According to focus group members, a national park would have both advantages and disadvantages. It was generally agreed that a national park would be beneficial for nature and tourists: *I think it is a good idea to protect the area because we don't know yet how valuable it will be in a few years time. This area is probably very unique (Rú3)*

Rangers could guide visitors around the national park and tell them about all the plants and animals (Kr2).

Interestingly, in group 2 and 3 participants mentioned that a national park is a good option for the wilderness area as it was considered to be a reversible undertaking: *I think we should try a national park for 10 years or so. If it turns out to be a bad option we can do something else. It is not possible to try a hydro scheme, because it is irreversible (Rú3).*

However, those being aware of the regulations of national parks voiced that strict nature conservation is not a good option: *Then it won't even be possible to create a small hydro scheme that would not have severe environmental impacts. That is not ok (Ás1). It's bad if we can't change the land use in the future (Jó2). Yes, that is far too strict (Kr2).*

In group 1 and 3 the discussion shifted towards economic impacts of a national park. Participants believed that the local and national economy would not benefit from a national park. Some participants mentioned that only few jobs would be created during the summer, and that income would not be increased. However, it was also realised that the profitability of a national park depends on the number of visitors that would be attracted. An increase in tourist numbers was viewed as bad for wilderness users and nature: *Do we really want more tourists? Icelandic nature is very sensitive and can't cope with lots of tourists (ED1). It is just possible to have a limited amount of tourists, because many people come to Iceland because they don't want to see other people (NB3)*

Summary 4: Payment method and property rights

Participants were told that the costs of managing the wilderness area would be paid for from a government fund that is generated by tax payers' money. Almost all participants objected the fact that this would mean an increase in their income tax. Reasons for this included:

We should not have to pay.

I first need to know how much a national park will cost. I can't imagine that the costs will be that high that there is a need to increase tax (P03)

We want income to be increased but not tax (P03)

I don't pay anything for a national park before I know for sure that it is profitable (Rú3).

We can't be sure whether the tax would really be used for that project (In3)

One participant mentioned that donations would be better, as there is more certainty that the money would be used for paying for the national park and nothing else.

Participants' comments were mostly characterised by protesting behaviour towards any kind of payment method, and a strong belief that they would not have to pay. However, in each group it was mentioned that entrance fees to a national park would be a fair and acceptable option, as only those that actually want to use the area would need to pay.

While not wanting to pay for the future management was on the one hand due to lacking trust in the payment vehicle, it was also influenced by property right perceptions:

No, I have the right to the area as it is, so I don't want to pay extra tax for example, for a national park or hydro schemes, if I don't want them (Ás1).

While all participants in group 1 agreed that they had the property rights to wilderness, in group 2 and 3, some participants thought the state and the hydro scheme developers had entitlement to the area:

I accept that I have to pay, because obviously the hydro scheme developers, would need to be compensated if they are prevented from damming the rivers. But I have difficulties believing that the money would really be used for the national park.

Overall, respondents were unsure about the legislation on property rights.

Summary 5: Survey administration

Focus group participants were asked what they liked and disliked about different survey methods, such as telephone surveys, mailed questionnaires and personal interviews.

One of the major disadvantages of telephone-based and personal interviews is the limited amount of time to form an opinion:

It is sometimes very difficult to decide on the correct answer, especially if one has no opinion on a certain issue. I would prefer a mailed questionnaire- then I have more time to think about the questions (Fr3)

I prefer not to have to answer the questions immediately and to be given time to think (NH1).

In addition to that, the timing of telephone surveys is often very inconvenient. All focus group participants tend to terminate telephone interviews quickly by 'yeah'-saying or they refuse to participate.

Personal interviews are, apart from time pressure, viewed to be alright, although participants do not like to be interviewed in the street. Preferred settings for personal interviews are airports or similar places where one has nothing else to do.

At least I get a chance to ask a question if I don't understand (Hu3)

It's also nice to meet the interviewer- that's much more personal than phone or mail surveys (Kr3). Interviewers are also so incredibly polite and friendly (Óm2)

Appendix 3

Questionnaires

Questionnaire for in-person interviews

Questionnaire: General public (In-person interviews)

SECTION A: GENERAL ATTITUDES TOWARDS THE ENVIRONMENT

Q 1: The government spends tax payers' money to pay for different things. Please rank your priorities for government spending using a scale from 1-5 (1= top priority and 5 = lowest priority). **Enter number 1-5 in each box.**

Health	
Environment & countryside	
Regional development	
Education	
Reducing crime	

Q 2: Please tell me the importance you place on government spending on the following environmental programmes. Please indicate for each programme how important it is to you.

TICK BOX

	+	+	+/-	-	-
Action to protect fish stocks					
Action to reforest Iceland					
Action to stop desertification					
Action to protect wilderness					
Action to clean the coastline					

SECTION B: QUESTIONS ABOUT WILDERNESS

I would now like to tell you a little about wilderness.

Show card 1: Wilderness definition

Q 3: Which of the following statements applies to you? **Circle one box only.**

I have visited the highlands north of Vatnajökull	1
I have visited the highlands	2
I have never been to the highlands	3
I have never heard about the area	4

SECTION C: MANAGEMENT OF WILDERNESS AREA

I would now like to tell you a little about plans for the future management of wilderness in Iceland. Please read this card carefully.

Show card 2: Hydro scheme proposals

Hydro schemes also have negative impacts on the natural features and cultural heritage in the wilderness area. Please read this show card.

Show card 3: Wilderness assets and impacts

Here is some more information on hydro scheme development in the wilderness area, and it's potential implications on the general public.

Show card 4: Hydro scheme development

SECTION D: WTP/ WTA ELICITATION

Q 4: I am now going to read out different levels to you that represent either an increase or decrease in your annual household expenses. For each level, please tick, whether you would support the three hydro scheme projects.

Enter code of payment sheet. Respondent fills in payment sheet.

--	--	--	--

Read payment/saving levels. Rotate starting level.

-2500 +700 +3000 -7000 -1000 +13,500 -500 +6000 -14,000 +1500

Q 5: Are you in favour of hydro schemes?

Yes		Go to section A
No		Go to section B
Not sure		

WTP to obtain HS

Q 6: What is the **most** increase in your household's **annual** expenses in the next 10 years that you would tolerate, so that hydro schemes can go ahead?

Before you answer, please consider

- *what you can afford.*
- *that if you and others are not willing to contribute to hydro schemes, they might not go ahead.*

Respondent states WTP bid on payment sheet.

Q 7: Please explain your answer. What is the most important factor influencing your decision?

WTA to endure HS

Q 6: What is the **least** decrease in your household's **annual** expenses that you would accept to make up for the disadvantages of the three hydro schemes?

Before you answer, please remember that the savings to your household would be limited.

Respondent states WTA bid on payment sheet.

Q 7: Please explain your answer. What is the most important factor influencing your decision?

SECTION E: SOCIO-ECONOMIC QUESTIONS

Q 8: Are you a member of any of the following environmental groups or touring clubs? **Circle all that apply.**

Ferðafélag Íslands	1
Íslenski Alpaklúbburinn	2
Náttúruverndarsamtök Íslands	3
Hjálpasveit	4
Landvernd	5
Other _____	6
None	7

Q 9: Which kind of outdoor activities have you participated in over the past 3 years? **Circle all that apply.**

Recreational walking	1
Hill-walking	2
Mountain biking	3
Horse riding	4
Camping	5
Bird-watching	6
Fishing	7
Hunting	8
Jeep driving	9
Other: _____	10
None	11

I would now like you to answer a few questions about yourself, so that we can better understand your answers to this questionnaire. All information gained from this survey is completely confidential and anonymous.

Q 10: What is your approximate age?

- | | | |
|--------------------------------------|--------------------------------|--------------------------------------|
| <input type="checkbox"/> yngri en 16 | <input type="checkbox"/> 36-45 | <input type="checkbox"/> 66-75 |
| <input type="checkbox"/> 16-25 | <input type="checkbox"/> 46-55 | <input type="checkbox"/> 75-84 |
| <input type="checkbox"/> 26-35 | <input type="checkbox"/> 56-65 | <input type="checkbox"/> eldri en 85 |

Q 11: Are you

male or female?

Q 12: What is your household's approximate income per month before tax?

	minna en 100.000 kr.
	101.000-150.000 kr.
	151.000-200.000 kr.
	201.000-250.000 kr.
	251.000-300.000 kr.
	301.000-350.000 kr.
	351.000-400.000 kr.
	401.000-450.000 kr.
	451.000-500.000 kr.
	meira en 501.000 kr.

Q 13: Do you have strong views about the hydro schemes?

	strong
	moderate
	weak
	none

Q 14: Did the interview change your mind?

	a little
	a lot
	not at all

Q 15: How do you feel about the information provided in this exercise?

	Just the right amount
	Too much
	Not enough

Q 16: What do you think about this exercise?

	It was interesting and I understood everything.
	It was interesting, but some things were a little confusing.
	It was confusing.
	It was boring and a waste of time.

Introductory questionnaire for Market Stall participants

Questionnaire: General public (Market Stall)

Q 1: General attitudes to the environment

Programmes about the environment are often on TV and radio. Please indicate which statement most accurately reflects your views about these programmes.

Please tick one box only.

<input type="checkbox"/>	I make a special effort to watch/listen
<input type="checkbox"/>	I watch/listen to them when I can
<input type="checkbox"/>	I watch/listen if there is nothing better on
<input type="checkbox"/>	I hardly ever watch/listen to them

Q 2: Priorities for government spending

The government spends tax payers' money to pay for different things. Please rank your priorities for government spending using a scale from 1-5 (1= top priority and 5 = lowest priority). **Please enter number 1-5 in each box.**

<input type="text"/>	Health
<input type="text"/>	Environment & countryside
<input type="text"/>	Regional development
<input type="text"/>	Education
<input type="text"/>	Reducing crime

Q 3: Priorities for government spending on the environment

Please indicate the importance you place on government spending on the following environmental programmes.

TICK BOX

	+	+	+/-	-	-
Action to protect fish stocks	<input type="checkbox"/>				
Action to reforest Iceland	<input type="checkbox"/>				
Action to stop desertification	<input type="checkbox"/>				
Action to protect wilderness	<input type="checkbox"/>				
Action to clean the coastline	<input type="checkbox"/>				

Q 4: Wilderness area north of Vatnajökull

Which of the following statements applies to you? **Please tick one box only.**

<input type="checkbox"/>	I have visited the highlands north of Vatnajökull
<input type="checkbox"/>	I have visited the highlands, but not this area
<input type="checkbox"/>	I have never been to the highlands
<input type="checkbox"/>	I have never heard about the area

Q 5: Membership of environmental groups

Are you a member of any of the following environmental groups or touring clubs?
Please tick all boxes that apply.

	Ferðafélag Íslands
	Íslenski Alpaklúbburinn
	Náttúruverndarsamtök Íslands
	Landvernd
	Annað _____
	Engin

Q 6: Outdoor recreation

Which kind of outdoor activities have you participated in within the last year?
Please tick all boxes that apply.

Recreational walking	1
Hill-walking	2
Mountain biking	3
Horse riding	4
Camping	5
Bird-watching	6
Fishing	7
Hunting	8
Jeep driving	9
Other: _____	10
None	11

Q 7: Your age

What is your approximate age?

- | | | |
|------------------------------------------|--------------------------------|----------------------------------------|
| <input type="checkbox"/> younger than 16 | <input type="checkbox"/> 36-45 | <input type="checkbox"/> 66-75 |
| <input type="checkbox"/> 16-25 | <input type="checkbox"/> 46-55 | <input type="checkbox"/> 75-84 |
| <input type="checkbox"/> 26-35 | <input type="checkbox"/> 56-65 | <input type="checkbox"/> older than 85 |

Q 8: Household income

What is your household's approximate income per month before tax? (Please remember that all replies are treated in the strictest confidence)

	less than 100.000 kr.		300.000-350.000 kr.
	100.000-150.000 kr.		350.000-400.000 kr.
	150.000-200.000 kr.		400.000-450.000 kr.
	200.000-250.000 kr.		450.000-500.000 kr.
	250.000-300.000 kr.		more than 500.000 kr.

Debriefing questions for Market Stall participants

Q 1: Do you have strong views about the hydro schemes?

	strong
	moderate
	weak
	none

Q 2: Did the meeting change your mind?

	a little
	a lot
	not at all

Q 3: How do you feel about the information provided in this exercise?

	Just the right amount
	Too much
	Not enough

Q 4: What do you think about this exercise?

	It was interesting and I understood everything.
	It was interesting, but some things were a little confusing.
	It was confusing.
	It was boring and a waste of time.

Appendix 4

Information folder

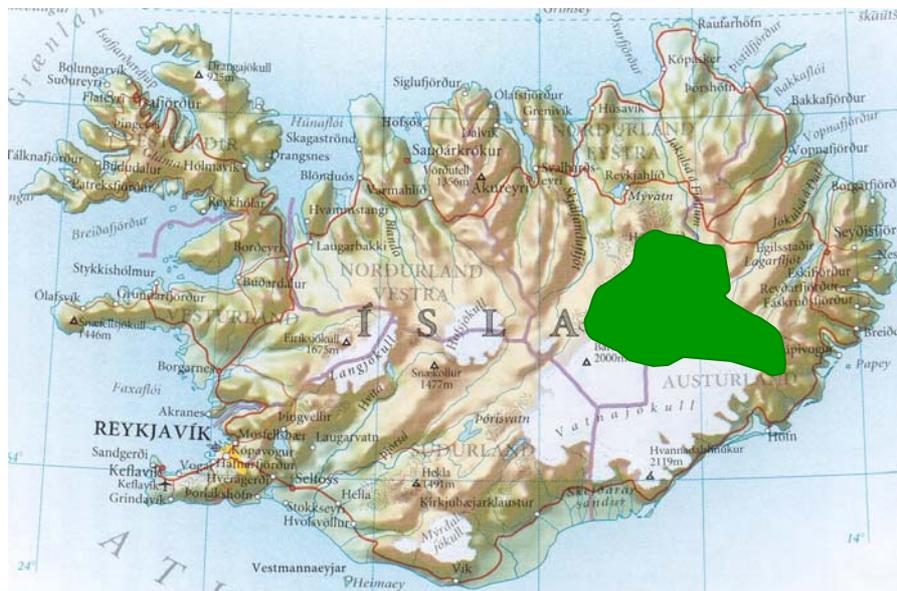
WILDERNESS

Wilderness is a large area of unmodified or slightly modified land that retains its natural character without permanent habitation. Wilderness is a finite resource that is non-renewable and cannot be substituted or replaced.

Iceland's interior has one of the largest remaining wilderness areas in Europe (green areas on the map).



The wilderness area north of Vatnajökull has, apart from a few tracks and mountain huts, not been modified by man. It comprises a desert-like plateau with mountains, rivers, glaciers and oases of vegetation.

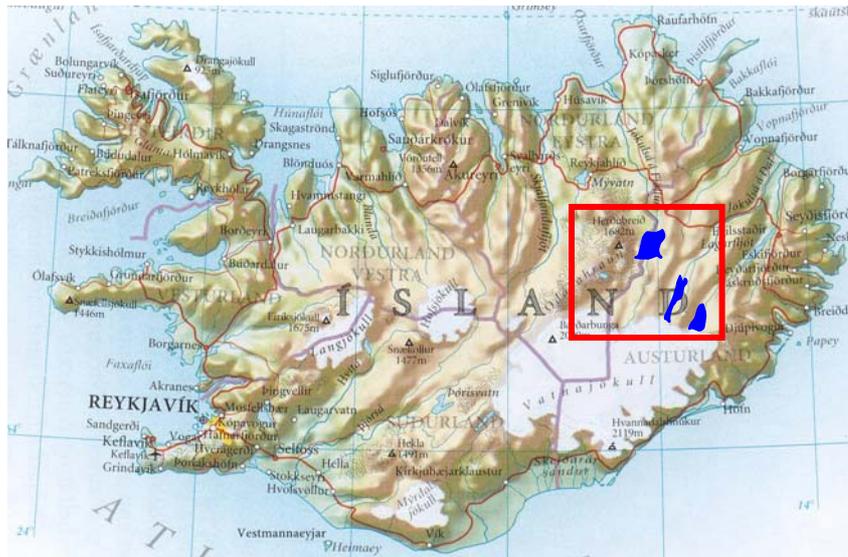


It is important for several reasons:

- suitable habitat for wildlife
- diversity of geological features
- attractive landscapes
- outdoor recreation
- powerful glacial rivers

HYDROPOWER GENERATION

The area comprises three of Iceland's most powerful rivers. The map shows the location of hydro schemes that have been proposed.



Hydro schemes involve dams, big reservoirs, new roads in the wilderness area, diversion tunnels, power houses and powerlines.

The positive impacts of the hydro schemes are mainly associated with the use of electricity for aluminium smelting.

These are:

- Increased economic activity in Iceland
- More diverse employment opportunities in East Iceland
- Help to counter outmigration from East Iceland
- Hydro power pollutes less than coal
- Hydro power is possibly less dangerous than nuclear power
- Water is a renewable resource

Recreational impacts include

- easy access and recreational walking around reservoirs, and
- angling in dammed rivers

Hydro schemes also have negative impacts, especially on the environment. Most environmental impacts are irreversible:

- Landscape changes
- Reduction or loss of vegetation and animals
- Geological features are inundated
- Damage to cultural heritage

The pictures show how the landscape looks like now and how it would look like when a hydro scheme is has been constructed.

Before the reservoir...



...after the reservoir

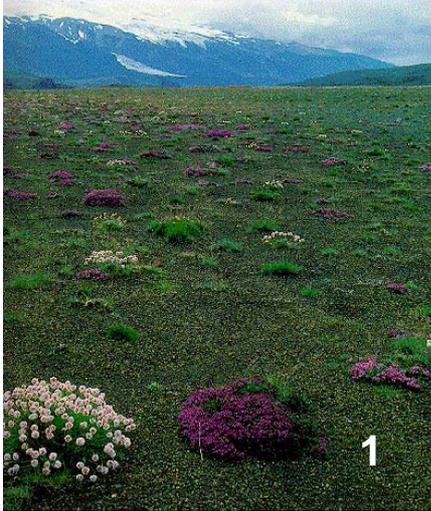


The following pages contain some information about wildlife, geology and cultural heritage in the area, as well as predicted impacts that would follow the hydro scheme developments.

VEGETATION

General:

- Most of the wilderness area is a desert-like plateau with sparse vegetation (picture 1).
- But there are also a number of oases and wetland areas with luxuriant vegetation (picture 2).



Rarity/Protection Status

- there is one of the largest vegetation areas in the highlands. It is internationally recognised for its ecological importance.
- 3 oases are under protection for wildlife
- most flowering plants are common in Iceland (3&4), but there are 4 or 5 plants that are rare in Iceland and Europe (5).
- common and rare moss & lichen species (some endangered and unique on a global scale)

Hydro Scheme Impacts

- much vegetation would be inundated or lost due to blowing of sand from the reservoir shores.
- numbers of flowering plants reduced
- rare moss and lichen might vanish



Friggjargras



Eyrarrós



Blástjarna

ANIMALS

Pink-footed geese



General:

The area is internationally important for pink-footed geese as 6000 pairs breed and 10.000 pairs moult there.

Rarity/Protection Status	Hydro scheme impacts
<ul style="list-style-type: none"> the global population is not endangered and numbers are increasing however, the geese depend on Iceland, as the entire global population breed and moult in Iceland and Greenland. 	<ul style="list-style-type: none"> flooding of rare moulting sites and traffic disturbance would reduce the Icelandic stock size considerably. impacts on the global population would be small.

Reindeer



General:

Half of the Icelandic reindeer stock (1,500 animals) lives in the north of Vatnajökull where vegetation areas serve as grazing, breeding and calving grounds from spring until autumn.

Rarity/protection Status	Hydro scheme impacts
<ul style="list-style-type: none"> Today numbers are constant and the animal is a quarry species. one of their most important grazing and calving grounds is designated as a nature reserve. 	<ul style="list-style-type: none"> main grazing, breeding and calving grounds and parts of nature reserve flooded migration routes disturbed disturbance due to traffic and noise considerable reduction of herd size

Invertebrates

General:

The area has a number of rare insects, such as flies, moths, and spiders.

Rarity status:

- some species are rare on a global scale .
- new species that are unique to Iceland and the world are still being discovered.

Hydro scheme impacts:

Species that only occur in Iceland may be at risk of extinction.

GEOLOGY

Volcanoes and geothermal heat

General:

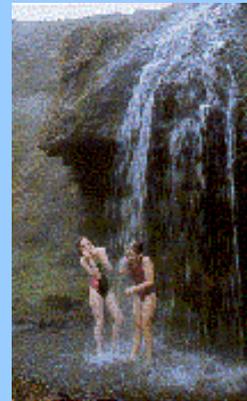
The wilderness area lies on the Middleatlantic Ridge. This entails volcanic and geothermal activity.



Snæfell



Geothermal heat



Hot waterfall

Rarity/Protection Status	Hydro scheme impacts
<ul style="list-style-type: none"> • Snæfell, Herðubreið, Kverkfjöll and Askja are under protection for spectacular landscapes, geothermal heat and ice caves. 	<ul style="list-style-type: none"> • none of these features directly affected but the landscape would change considerably.

Hraukar



General:

- In 1890 the glacier surged through vegetated land pushing up ridges of soil named "Hraukar".
- Hraukar are a relic of the furthest advance of the glacier since the Ice Age.
- They contain luxuriant vegetation and attract geese and reindeer.

Rarity/protection status	Hydro scheme impacts
<ul style="list-style-type: none"> • Hraukar have only one counterpart in the northern hemisphere. • they are protected for their rarity and a unique diversity of plant communities • Hraukar have a high scientific value on a worldwide scale. 	<ul style="list-style-type: none"> • Parts of Hraukar flooded. • Loss of educational and scientific values.

Dimmugljúfur



General:

Dimmugljúfur is a 10km long and up to 180m deep gorge.

Rarity/protection status

Dimmugljúfur is Iceland's most tremendous gorge and a site of special interest.

Hydro scheme impacts

- a 190m high dam would be placed in the gorge
- no water would be running in the gorge below the dam (picture 1), and the part above the dam would be inundated (picture 2)

Sethjallar



General:

These banks consist of layers of sediment which previously filled a lagoon towards the end of the Ice Age.

Rarity/protection status

- layers in the sediment contain information on climate change in the Northatlantic region and are of international importance

Hydro scheme impacts

- sethjallar would be flooded and further scientific research would be impossible.

Waterfalls

General:

The wilderness area contains a variety of waterfalls.



Rarity/protection status

- a series of 15 waterfalls in Fljótsdal River is unique in Iceland
- the diversity of waterfalls in the area is very unusual

Hydro scheme impacts

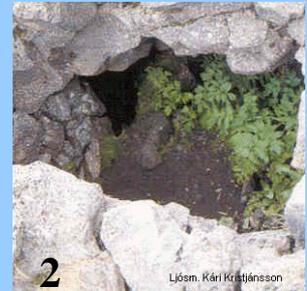
- a few waterfalls would disappear under the reservoirs
- waterfalls located downstream the dams would be diminished.

CULTURAL HERITAGE

Archaeological remains

General:

- **farmhouse mounds** from colonisation period and Middle Ages.
- **cairns** marking ancient horse trails
- **aerial ropeways** that were used to haul materials over rivers (picture 1).
- **cabins** with traditional turf and stone walls.
- **ruins of outlaw lairs** (picture 2).



Rarity/protection status	Hydro scheme impacts
<ul style="list-style-type: none"> • Most of these relics also occur in other parts of the country. • Outlaw huts have a historical value and are protected. 	<ul style="list-style-type: none"> • some ancient farming sites, aerial ropeways, cabins and cairns would be lost. • outlaw huts would remain unaffected.

Hidden people

General:

- **Elves** live in stones and mounds. They prefer quietness. Elves are usually very helpful, but if angered, they can become dangerous and take revenge.
- **Trolls** have their domicile in boulders, caves and lava in the mountains. They are active at night, and their main occupation is fishing.

Rarity/protection status	Hydro scheme impacts
<ul style="list-style-type: none"> • Trolls and elves are common in many places in Iceland. There are few elves in the wilderness area, as they prefer living near settlements, whereas trolls are very common. 	<ul style="list-style-type: none"> • troll and elf habitats would be damaged or destroyed • there is uncertainty regarding the consequences.

Appendix 5

Question and Answer sheet

QUESTIONS AND ANSWERS

THE WILDERNESS AREA

Is there not lots of uncertainty regarding the hydro scheme impacts?

Yes, that's right. It is very difficult to predict how the environment will be affected, e.g. we don't know the exact number by which the reindeer and geese would be reduced.

Why is this area so important for pink-footed geese?

Geese moult there and are flightless for 3-4 weeks. The wilderness is ideal for geese because there are numerous ponds, open views (to see predators), sufficient grazing grounds, and quietness.

Why are there so many reindeer in this area?

Reindeer became almost extinct in the beginning of the 20th century. The only reindeer that survived were in the wilderness area. Since then numbers have increased and most of them stay north of Vatnajökull due to favourable climatic conditions and little snow in springtime.

Which plants are rare?

Snækobbi, melasól, hvítstör og héluvorblóm are rare on a European scale.

HYDRO POWER GENERATION

Will all three hydro scheme proposals materialise?

Some of the project proposals are vague and additional research is required before it is possible to give a definite answer to this question. However, all three proposals are included in the master plan for hydro schemes. We can assume that all of them will be created within the next 50-100 years.

What do we need the electricity for?

The purpose of some of the proposals is dubious and vague. Some of the electricity is to be used for large-scale industry and some for the public market.

Would there be enough electricity to meet Iceland's needs if hydro schemes did not develop?

The demand for electricity will grow but there are other ways to meet this demand, e.g. extend existing hydro-power stations or generate wave- and wind power.

IMPACTS ON HOUSEHOLD FINANCE

Why would household finance either improve or deteriorate?

We do not know yet, how the hydro schemes would influence government budget, and hence your household finance. The government will gain revenue from profit, resource levy charged, etc., but it will also have to pay for infrastructure related to the HS, subsidies and pollution permits. Depending on this, income tax and other things would rise or fall.

Why tax?

The money supporting management schemes like this normally comes from taxation. Tax is also the fairest and least expensive way of paying.

Why is existing tax-money not just reallocated? These are additional projects which are not being budgeted for, so tax-money could increase. The money would be exclusively used for these specific hydro schemes. On the other hand, if the projects turn out to be an additional income source for the government, income tax would be reduced. Even if tax-money was reallocated, prices of other things such as VAT, electricity rates and certain goods would change.

Will all the costs for the hydro schemes be paid for from tax money?

No, the national power company will also have to pay.

Will everyone's household finances be altered by the same amount?

How much each household pays or saves depends on income and spending patterns, etc.

By how much should my household finances be altered?

We are trying to find out what is a fair change in your household's income based on how important it is to you that the project goes ahead.

Why different levels?

We don't know yet how much the project will cost and what the revenue will be. Changes in the government's budget depend on a range of factors, e.g. gained revenue from electricity sale, resource levy, and expenses for pollution permits.

ECONOMIC DEVELOPMENT

Are hydro schemes not fundamental for Iceland's economy?

That's a good point. If hydro schemes and associated large-scale industry would not go ahead, economic development could be achieved in other ways. Iceland has great potential for development in eco-tourism, biotechnology, the pharmaceutical industry, windpower, etc.

Appendix 6

The hypothetical market

FUTURE MANAGEMENT

Current plans suggest the utilisation of three rivers for hydropower generation. It would be possible to achieve economic development and job creation in other ways (e.g. eco-tourism, small-scale development, research institutes, business parks and forestry in East Iceland) which would protect the wilderness area. Despite of this, hydro schemes are the management option that is most likely to be approved.

Hydro schemes would affect the environment, but would also have impacts on the fiscal policy, the economy, and hence all Icelandic citizens.

Economists have yet not assessed whether government expenditure for the three hydro schemes would be less or more than gained revenue. This means, there will be either a rise or a fall in prices for consumer goods, VAT, electricity rates, income tax, etc. In consequence, hydro schemes would have implications on your household finances. You could either save or you could pay.

I am now going to read out different levels to you that could be either an **annual** increase or decrease in your household's expenses. For each level, please tick on the enclosed sheet whether you would support the three hydro schemes.

Appendix 7

Payment sheets

Market Stall

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10
Agree										
Disagree										

Are you in favour of the three hydro schemes?

- Yes go to box **A**
- No go to box **B**
- Not sure

A

What is the **most** increase in your household's **annual** expenses in the next 10 years that you would tolerate due to the three hydro schemes?

Please keep in mind

- *what you can afford*
- *that if you and others are not prepared to pay the hydro schemes might not be created.*

_____kr.

Please explain your answer.

B

What is the **least** decrease in your household's **annual** expenses that you would accept to make up for the disadvantages of the three hydro schemes?

Please keep in mind that the total saving to your household will be limited and therefore has to be realistic.

_____kr.

Please explain your answer.

In-person interviews

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10
Agree										
Disagree										

_____krona

Appendix 8

Regression results

Dependent variable: WTAPC1

wtapc1	Coefficient Beta	T	Sig.
Constant		5.087	.000
Survey method	-.179	-1.664	.102
Env. group	-.316	-2.600	.012
Income	-.079	-.630	.531
Strength of pref.	.100	.873	.387
Outdoor	.125	1.098	.277
Gov. exp.	-.393	-3.342	.001

R: 0.613 R²: 0.376 Adjusted R²: 0.309
 N: 62 F: 5.624 Sig: 0.001

Since untransformed WTA bids and their residuals are close to normality, the adjusted R² and the relation between WTA and independent variables are very similar to the regression run on the transformed data set. However, the regression run on untransformed data shows that the variables SURVEY METHOD and STRENGTH OF PREF have no influence on WTA, and instead the variable ENV. GROUP plays a role, implying that respondents who are member in an environmental group have a higher WTA.

Dependent variable: WTAOE1

wtaoe1	Coefficient Beta	T	Sig.
Constant		.171	.865
Survey method	-.221	-1.480	.147
Env. Group	-.140	-.832	.410
Income	.199	1.140	.261
Strength of pref.	.037	.239	.812
Outdoor	.319	2.000	.052
Gov. exp.	-.213	-1.335	.189

R: 0.387 R²: 0.150 Adjusted R²: 0.025
 N: 47 F: 1.204 Sig: 0.324

In comparison to the regression run on the logarithmic format, the regression model for untransformed WTA data is poorer. The robustness of WTA is below Mitchell and Carson's (1989) recommended standard of 15% and according to the F-test there is no significant relation between the dependent and the independent

variables. However, the variable OUTDOOR exerts an influence at the 5% level with people involved in many outdoor activities having a higher WTA.

Dependent variable: WTAOE2

wtaoe2	Coefficient Beta	T	Sig.
Constant			.626
Survey method	*	*	*
Env. Group	-.228	-.228	.360
Income	.397	.397	.150
Strength of pref.	-.128	-.128	.580
Outdoor	.460	.460	.077
Gov. exp.	-.332	-.332	.193

* SURVEY METHOD deleted from the analysis due to missing correlation

R: 0.551 R²: 0.304 Adjusted R²: 0.072
 N: 20 F: 1.311 Sig: 0.311

The untransformed regression version for OE WTA data has less explanatory power, with a low adjusted R² (0.072) and an insufficient relation between independent and dependent variables according to the F-test (Sig F: 0.311). One variable (OUTDOOR) has as statistical influence on WTA at a 10% level, implying that respondents who engage in more outdoor activities require a higher level of compensation.